Educational Psychology

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Nicole Arduini-Van Hoose, Ph.D.

Hudson Valley Community College

Reviewers/Editors

Mele Nelson, MAED/TED-S, MED/Instructional Leadership
Adjunct Instructor, Humanities
Genesee Community College

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How to Read this Textbook

Organization

Chapters are organized predictably with figures, tables, and videos that further organize and explain course concepts. The videos that are directly embedded in the reading are mini-lectures on the concept and are recommended to help you understand complex ideas.

Learning Objectives

Before reading, review the learning objectives for the chapter. These objectives help guide your focus.

Exercises

Exercises provide you will an opportunity to practice and reflect on the concepts that you are learning.

Examples

Case studies, interviews, examples, and current events highlight concepts in practice. This content is not a direct explanation of concepts but exemplifies how it applies in the real world.

Effective Reading

Reading a textbook is not like reading a novel. Opening a book and reading from cover to cover does not typically result in an effective reading of the content. One of the most recommended methods for effective reading is the SQ4R method. SQ4R is an acronym for: Survey, Question, Read, Respond, Record, and Review. The SQ4R method may seem time-consuming at first, but once you know the steps, it only takes a few minutes.

What are the benefits of using SQ4R?

- It's an active learning strategy that can be adapted to suit an individual's study preferences.
- It provides a strategy to retain a lot of factual detail, reducing the amount of information that has to be relearned for exams.
- It prompts the creation of study material to be used when preparing for exams.
- It helps to identify errors or areas of confusion.

Step 1: Survey the Textbook and Chapters

- Read the preface and introduction to the text, and browse through the table of contents and the index. This section describes the main topics and the basic organizational structure of the book.
- Read the introduction and conclusion in each chapter and subsection.
- Scan the titles and subtitles. Study the pictures, charts, or graphs.
- Read the summary and any chapter questions.

Step 2: Start with a Question

- Take the section title, subtitle, or the first sentence of each paragraph and turn it into a question.
- For example: "Functions of the spinal cord" becomes "What are the functions of the spinal cord?"

Step 3: Read Actively

- Read carefully and actively by creating a "dialogue" with the text.
- Try to find the answer to the question you created, and ask questions as you read.
- Be careful not to skim the text looking for the answer, as you might miss other important information.

Step 4: Respond to Your Question

- Close the textbook and answer the question you created in

your own words.
- If you can't answer the question, reread the section until you can.
- If, after a few tries, you still can't answer the question, go on to the next few sections and see if things become clearer.
- If that doesn't help, you may need to change your question. Try making it broader or narrower.
- If changing your question doesn't help, get some assistance. Your instructor or TA are good places to start, or contact Learning Services.

Step 5: Record Your Notes

- Once you understand the material and can summarize it in your own words make a record of it.
- Common methods are highlighting and/or marking the text, or taking notes, or some combination of both.
- Whichever methods you choose, it's critical to read and understand the material first, and then go back and record.
- See below for the pros and cons of notetaking and highlighting.
- See our resources for help with note-taking.

Step 6: Review Your Notes

- Do a thorough review of lecture and text notes weekly, and briefly before each class.
- Make weekly review periods effective by starting from the beginning of the course in each review session. Though the volume of review material increases as the semester progresses, the amount of time needed to review older material decreases. After you've reviewed the first week's material a few times, it will take only minutes to skim over it

and recall the key points.

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Other Books by Author

Adolescent Psychology
- Child Psychology
- Lifespan Development: A Topical Approach

THE STUDY OF EDUCATIONAL PSYCHOLOGY

Theme: Teaching as an Art

Outline of Concepts:

- Educational Psychology: The art of classroom practice
- Teaching as decision making

Learning Objectives:

- Understand educational psychology as a resource for educators
- Identify pioneers in educational psychology and their contributions to the field
- Differentiate the main psychological approaches applied to educational psychology
- Identify the three stages of teacher development and the role of Concern Theory
- Describe different ontologies and philosophies of education
- Define and create a philosophy of education

Educational Psychology

Educational psychology is the branch of psychology concerned with the scientific study of human learning. The study of learning processes, from both cognitive and behavioral perspectives, allows researchers to understand individual differences in intelligence, cognitive development, affect, motivation, self-regulation, and self-concept, as well as their role in learning. The field of educational psychology relies heavily on quantitative methods, including testing and measurement, to enhance educational activities related to instructional design, classroom management, and assessment, which serve to facilitate learning processes in various educational settings across the lifespan (Snowman, 1997).

Educational psychology can in part be understood through its relationship with other disciplines. It is informed primarily by psychology, bearing a relationship to that discipline analogous to the relationship between medicine and biology. It is also informed by neuroscience. Educational psychology, in turn, informs a wide range of specialties within educational studies, including instructional design, educational technology, curriculum development, organizational learning, special education, classroom management, and student motivation. Educational psychology both draws from and contributes to cognitive science and the learning sciences.

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Video 1.1.1 What is *Educational Psychology*?
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History of Educational Psychology

Early Educational Psychologists

Educational psychology is a fairly new and growing field of study. While philosophers dating back to the time of Aristotle and Plato contemplated development, learning, education, and the relationship between teacher and learner educational psychology was not considered a specific practice. It was unknown that everyday teaching and learning in which individuals had to think about individual differences, assessment, development, the nature of a subject being taught, problem-solving, and transfer of learning was the beginning of the field of educational psychology. These topics are important to education and, as a result, they are important in understanding human cognition, learning, and social perception (Berliner, 1993).

Johann Herbart

Johann Herbart (1776–1841) is considered the father of educational psychology. He believed that learning was influenced by an interest in the subject and the teacher. He thought that teachers should consider the students' existing mental sets—what they already know—when presenting new information or material. Herbart proposed what are now known as the formal steps (Hergenhahn, 2009):

1. Review material that has already been learned by the student
2. Prepare the student for new material by giving them an overview of what they are learning next
3. Present the new material
4. Relate the new material to the old material that has already been learned
5. Show how the student can apply the new material and show the material they will learn next

The period of 1890–1920 is considered the golden era of educational psychology where aspirations of the new discipline rested on the application of the scientific methods of observation and experimentation to educational problems. From 1840 to 1920, 37 million people immigrated to the United States. This created an expansion of elementary schools and secondary schools. The increase in immigration also provided educational

psychologists the opportunity to use intelligence testing to screen immigrants at Ellis Island. At the end of the 19th century, there were three major figures that distinguished themselves in the emerging field of educational psychology: William James, G. Stanley Hall, and John Dewey (Berliner, 1993).

William James

William James (1842–1910) is the father of psychology in America but he also made contributions to educational psychology. In his famous series of lectures *Talks to Teachers on Psychology*, published in 1899, James defines education as "the organization of acquired habits of conduct and tendencies to behavior". He states that teachers should "train the pupil to behavior" so that he fits into the social and physical world. Teachers should also realize the importance of habit and instinct. They should present information that is clear and interesting and relate this new information and material to things the student already knows about. He also addresses important issues such as attention, memory, and association of ideas (James, 1983).

Alfred Binet

Alfred Binet (1857-1911) published *Mental Fatigue* in 1898, in which he attempted to apply the experimental method to educational psychology. In this experimental method, he advocated for two types of experiments, experiments done in the lab, and experiments done in the classroom. In 1904 he was appointed the Minister of Public Education. This is when he began to look for a way to distinguish children with developmental disabilities. Binet strongly supported special education programs because he believed that "abnormality" could be cured. The Binet-Simon test was the first intelligence test and was the first to distinguish between "normal children" and those with developmental disabilities. Binet believed that it was important to study individual differences between age groups and children of the same age. He also believed that it was important for teachers to take into account individual students' strengths and also the needs of the classroom as a whole when teaching and creating a good learning environment. He also believed that it was important to train teachers in observation so that they would be able to see individual differences among children and adjust the curriculum to the students. Binet also emphasized that the practice of material was important. The test became known as the Stanford-Binet and was one of the most widely used tests of intelligence (Zimmerman & Schunk, 2003).

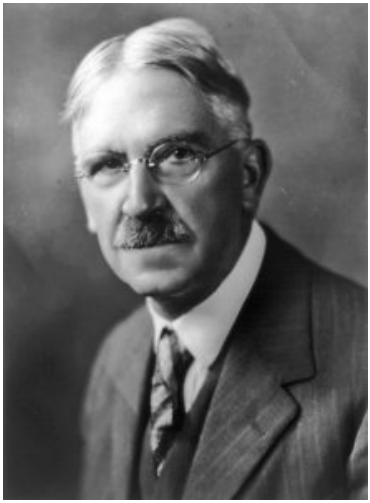
Edward Thorndike

Edward Thorndike (1874–1949) supported the scientific movement in education. He based teaching practices on empirical evidence and measurement. Thorndike developed the theory of instrumental conditioning or the law of effect. The law of effect states that associations are strengthened when it is followed by something pleasing and associations are weakened when followed by something not pleasing. He also found that learning is done a little at a time or in increments, learning is an automatic process and all the principles of learning apply to all mammals. Thorndike's research with Robert Woodworth on the theory of transfer found that learning one subject will only influence your ability to learn another subject if the subjects are similar. This discovery led to less emphasis on learning the classics because they found that studying the classics does not contribute to overall general intelligence. Thorndike was one of the first to say that individual differences in cognitive tasks were due to how many stimulus-response patterns a person had rather than a general intellectual ability. He contributed word dictionaries that were scientifically based to determine the words and definitions used. The dictionaries were the first to take into consideration the user's maturity level. He also integrated pictures and an easier pronunciation guide into each of the definitions. Thorndike contributed arithmetic books based on learning theory. He made all the problems more realistic and relevant to what was being studied, not just to improve general intelligence. He developed tests that

were standardized to measure performance in school-related subjects. His biggest contribution to testing was the CAVD intelligence test which used a multidimensional approach to intelligence and was the first to use a ratio scale (Zimmerman & Schunk, 2003). His later work was on programmed instruction, mastery learning, and computer-based learning.

> "If, by a miracle of mechanical ingenuity, a book could be so arranged that only to him who had done what was directed on page one would page two become visible, and so on, much that now requires personal instruction could be managed by print" (Thorndike, 1912).

John Dewey



John Dewey (1859–1952) had a major influence on the development of progressive education in the United States. He believed that the classroom should prepare children to be good citizens and facilitate creative intelligence. He pushed for the creation of practical classes that could be applied outside of a school setting (Zimmerman & Schunk, 2003). He also thought that education should be student-oriented, not subject-oriented. For Dewey, education was a social experience that helped bring together generations of people. He stated that students learn by doing. He believed in an active mind that was able to be educated through observation, problem-solving, and inquiry.

In his 1910, book *How We Think*, he emphasizes that material should be provided in a way that is stimulating and interesting to the student since it encourages original thought and problem-solving. He also stated that material should be relative to the student's own experience (Dewey, 1910).

> "The material furnished by way of information should be relevant to a question that is vital in the student's own experience" (Dewey, 1910).

Jean Piaget

Jean Piaget (1896-1980) is considered one of the most influential psychologists of the twentieth century, and his stage theory of cognitive development revolutionized our view of children's thinking and learning. His work inspired more research than any other theorist, and many of his concepts are still foundational to

developmental psychology. His interest lay in children's knowledge, their thinking, and the qualitative differences in their thinking as it develops. Although he called his field "genetic epistemology," stressing the role of biological determinism, he also assigned great importance to experience. In his view, children "construct" their knowledge through processes of "assimilation," in which they evaluate and try to understand new information, based on their existing knowledge of the world, and "accommodation," in which they expand and modify their cognitive structures based on new experiences.

Contemporary Educational Psychologists

The number of people receiving a high school and college education increased dramatically from 1920 to 1960. Because very few jobs were available to teens coming out of eighth grade, there was an increase in high school attendance in the 1930s (Zimmerman & Schunk, 2003). The progressive movement in the United States took off at this time and led to the idea of progressive education. John Flanagan, an educational psychologist, developed tests for combat trainees and instructions in combat training. In 1954, the work of Kenneth Clark and his wife on the effects of segregation on black and white children was influential in the Supreme Court case Brown v. Board of Education (Hergenhahn, 2009). From the 1960s to the present day, educational psychology has switched from a behaviorist perspective to a more cognitive-based perspective because of the influence and development of cognitive psychology at this time (Zimmerman & Schunk, 2003).

Jerome Bruner

Jerome Bruner is notable for integrating Piaget's cognitive approaches into educational psychology. He advocated for discovery learning where teachers create a problem-solving environment that allows the student to question, explore, and experiment. In his book, *The Process of Education* Bruner stated that the structure of the material and the cognitive abilities of the person are important in learning. He emphasized the importance of the subject matter. He also believed that how the subject was structured was important for the student's understanding of the subject and it is the goal of the teacher to structure the subject in a way that was easy for the student to understand. In the early 1960s, Bruner went to Africa to teach math and science to school children, which influenced his view of schooling as a cultural institution. Bruner was also influential in the development of Man: a Course of Study (M.A.C.O.S.) which was an educational program that combined anthropology and science. The program explored human evolution and social behavior. He also helped with the development of the Head Start program. He was interested in the influence of culture on education and looked at the impact of poverty on educational development (Zimmerman & Schunk, 2003).

Benjamin Bloom

Benjamin Bloom (1903–1999) spent over 50 years at the University of Chicago, where he worked in the department of education. He believed that all students can learn. He developed a taxonomy of educational objectives (Zimmerman & Schunk, 2003). The taxonomy provided broad educational objectives that could be used to help expand the curriculum to match the ideas in the taxonomy. The taxonomy is used in every aspect of education from the training of the teachers to the development of testing material. Bloom believed in communicating clear learning goals and promoting an active student. He thought that teachers should provide feedback to the students on their strengths and weaknesses. Bloom also did research on college students and their problem-solving processes. He found that they differ in understanding the basis of the problem and the ideas in the problem. He also found that students differ in the process of problem-solving in their approach and attitude toward the problem (Zimmerman & Schunk, 2003).

Nathaniel Gage

Nathaniel Gage (1917 -2008) is an important figure in educational psychology as his research focused on improving teaching and understanding the processes involved in teaching. He edited the book *Handbook of Research on Teaching* (1963), which helped develop early research in teaching and educational psychology. Gage founded the Stanford Center for Research and Development in Teaching, which contributed to research on teaching as well as influenced the education of important educational psychologists (Zimmerman & Schunk, 2003).

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Educational Psychology: Art or Science?

A basic human characteristic is the need to understand our world. Both art and science are attempts to understand and describe that world. Depending on whether we approach a subject as an art or science will impact the methods of study, expression, and application of our understanding.

Art is defined as the "skill acquired by experience, study, or observation…an occupation requiring knowledge or skill" (Merriam-Webster, 2020a). It is an expression of thoughts and ideas; a manifestation of experience and understanding. Art is the practice of what we know and involves creativity in how we approach the world. However, to be creative, to make something new, requires a level of knowledge and expertise.

Science is "the state of knowing…something that may be studied or learned like systematized knowledge…knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method…a system or method reconciling practical ends with scientific laws" (Merriam-Webster, 2020b). Science is the process of acquiring understanding and discovering truths. Systematic study helps us acquire knowledge about our world.

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Video 1.3.1. *The Art of Science* explains how scientists integrate art and science in their field.

Educational psychology is both an art and a science. Researchers in educational psychology use the scientific method and research designs to study phenomena that influence learning and education, which can be applied to the art of teaching. Education practitioners use this research to hone their craft and become effective teachers. With expertise comes innovation. And with innovation comes more questions for systematic study.
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The Nature of Teaching

Exercise 1.1. Your Core Convictions and Teaching Goals

Learning is an active process. Reflecting on what you already know and what you are learning enhances understanding and application of course content. Before you read further, consider your current teaching beliefs, values, and priorities. For example, what is the role of the teacher? Which skills are required? How should teachers support student development? Motivation? Which instructional techniques are best? How will you know what students have learned? List your core convictions and teaching goals. These lists will help you formulate your teaching philosophy later.

Core Convictions About Teaching & Learning	**Teaching Goals**

Source: Adapted from The nature of teaching (n.d.).

Teaching is Multidimensional

Teaching involves many domains, which we will explore throughout this course. Not only do teachers need to be experts on content, but they also need to understand student development, the learning process, factors that influence learning, classroom management, instructional techniques, and assessment. All of these domains impact the effectiveness of the teacher and the ability for students to learn.

Whether working with preschoolers, elementary children, adolescents, or adults, teachers must understand their student's development. Cognitively, learners may be in different stages, possessing varying capacities for thinking, learning, and decision-making. Physically, brain maturation, sensory-perceptual abilities, and motor skills will change with age. Psychosocial development will affect social relationships, self-regulation, and emotion management. Understanding the cognitive, physical, and psychosocial development of the students we serve makes us more effective teachers.

Teachers must learn the theories and practices of the learning processes from various approaches. These different approaches may be utilized depending on what and how something is to be learned. The **behavioral approach** is a set of learning theories that focuses on how we are conditioned to respond to events or stimuli with predictable, observable behavior. These theories explain how experience determines behavior. In the 1950s. the **cognitive approach** gained attention as new disciplinary perspectives in linguistics, neuroscience, and computer science were emerging, and these areas revived interest in the mind as a focus of scientific

inquiry. The **contextual approach** considered the relationship between individuals and their physical, cognitive, and social worlds. They also examine socio-cultural and environmental influences on development. **Biopsychology** explores how our biology influences our behavior. and thinking. Neuroscience has helped us understand more about how the structure of the brain, neuro-communication, and neurochemistry allows us to learn. An educational psychologist would be interested in how these physiological systems impact learning.

Helping students learn also requires understanding motivation and learning differences. Some students are highly motivated to learn, while others need to be motivated by external factors. In some cases, there may be factors that interfere with the motivation to learn. In addition, students may have learning differences that also impact learning. Teachers need to be aware of how factors like intelligence, learning disabilities, or mental health issues can affect students' learning and how a teacher can assist students.

A significant domain for teachers to consider is classroom management and instruction. Teachers learn many techniques for how to manage student behavior, structure their classrooms and instructional time, as well as many teaching strategies. Approaches that work well with one class or student may not work well with another. Choosing the best techniques and strategies to be effective is part of the art of teaching.

Teachers cannot assume that what they teach is what students learn. Assessment, both informal and formal, helps teachers understand what students know and do not know. In some cases, assessment is meant to inform teaching so the teacher can create opportunities for additional learning. In other cases, assessment is the final summary of what students have learned about a subject. Assessments may be teacher-created or standardized, but regardless, how, when, and what to assess must be considered as part of a complete teaching plan for effective teaching.

Teachers are Part of a System

Teachers are not an island. They, and their students, are part of a larger system with this microcosm at the core of the system. Teachers are directly influenced by the policies and practices of their departments, schools, districts, and states. School systems are influenced by larger macrosystems, such as laws, professional organization recommendations, and cultural norms.

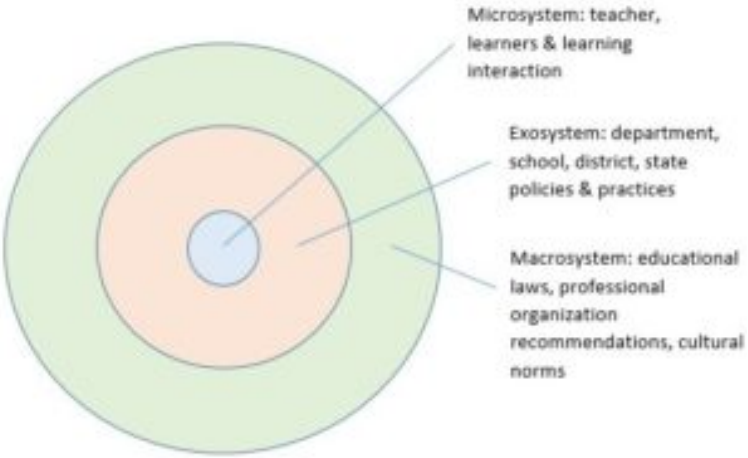


Figure 1.4.1. Circles of systemic influence on teachers.

At the macrosystem level, federal legislation dictates that all states and school districts adhere to specific mandates that guarantee access to education and protects students' rights (many of those laws are linked below). These laws are the basis for state and local regulations, policies, and practices. Professional organizations, such as the National Board for Professional Teaching Standards, provide standards for teacher proficiency to promote effective teaching and improvement in schools. Historical and cultural contexts also influence the classroom. Consider the increase in school shootings in the United States in recent decades.

Active shooter plans are now required by state and local policies. Active shooter drills have become a regular practice. The anxiety associated with this risk is now woven into the school and American culture.

Federal Education Legislation

Legislation, regulations, guidance, and other policy documents can be found here for the **Every Student Succeeds Act (ESSA)**, and other topics.

Please note that in the U.S., the federal role in education is limited. Because of the Tenth Amendment, most education policy is decided at the state and local levels. So, if you have a question about a policy or issue, you may want to check with the relevant organization in your state or school district.

Elementary and Secondary Education Act of 1965 (ESEA), as amended

- Every Student Succeeds Act (ESSA) Information page
- ESEA Flexibility: Information about flexibility from certain No Child Left Behind requirements that ED is offering to states.
- Text of the Elementary and Secondary Education Act of 1965, as amended by ESSA and the National Defense Authorization Act, 2017: Introductory materials — Title I — Title II — Title III — Title IV — Title V — Title VI — Title VII — Title VIII
- Text of No Child Left Behind Act: For certain ESEA

programs, the requirements of NCLB apply through the 2016-2017 school year.

- Guidance and Regulations

FERPA (Family Educational Rights and Privacy Act)

- Overview
- Regulations

Civil Rights

- Disability Discrimination (Title II of the Americans with Disabilities Act)
- Sex Discrimination (Title IX of the Education Amendments of 1972)
- Race and National Origin Discrimination (Title VI of the Civil Rights Act of 1964)

IDEA (Individuals with Disabilities Education Act)

- IDEA Website
- Text of the Individuals with Disabilities Education Act (PDF, 529KB)

WIOA (Workforce Innovation and Opportunities Act)

- WIOA Information Page
- Text of the Workforce Innovation and Opportunities Act

Rehabilitation Act of 1973, as amended through P.L. 114–95

- Text of the Rehabilitation Act of 1973 (PDF, 505KB)

Higher Education Act

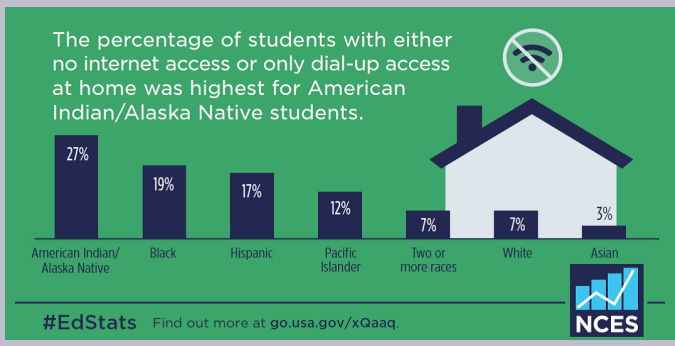
- Text of the Higher Education Opportunity Act
- Postsecondary Policy Initiatives

Teachers and students are directly influenced by the exosystem. These are the policies, practices, and standards established by state and local agencies. The curriculum that is mandated, the teaching materials adopted, the technology available, and the assessments required will directly impact a teacher's choices in the classroom and students' achievement. When considering what to teach, how to teach it, and when, teachers will need to follow the standards and curriculum set form by this ecosystem. Students' learning experiences may be enhanced or hindered by their exosystem.

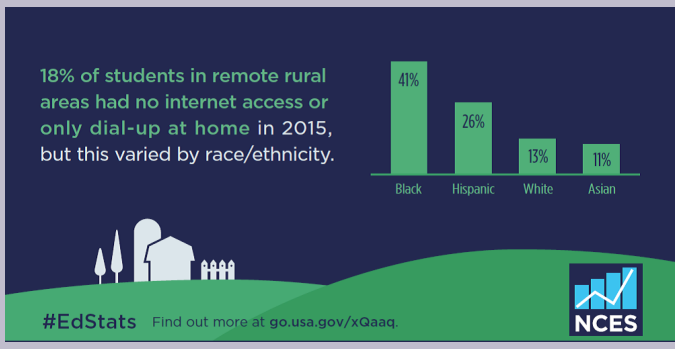
The Digital Divide

The expanding use of technology affects the lives of students both inside and outside the classroom. While exposure to learning technology inside schools and classrooms is important, access can also differ once those students are in their homes. It's important for educators to be aware of the potential barriers to technology and internet access that students may face. A recent report from NCES, *Student Access to Digital Learning Resources Outside the Classroom*, highlighted some differences in home internet access for students.

The percentage of 5- to 17-year-old students with either no internet access or only dial-up access differed by students' race/ethnicity.

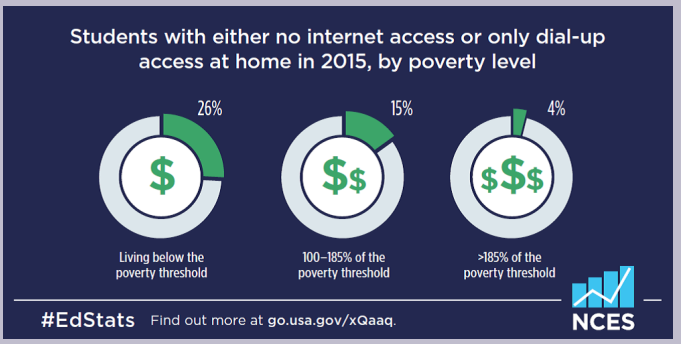


Access also differed geographically. Remote rural locales had the highest percentage of students with either no internet access or only dial-up access at home. Within these remote rural areas, the percentage of students lacking access differed by students' race/ethnicity. Forty-one percent of Black students and 26 percent of Hispanic students living in remote rural areas had either no internet access or only dial-up access at home. This was higher than the percentage of White students (13 percent) and Asian students (11 percent) living in remote rural areas who had either no internet access or only dial-up access at home.



The percentage of students who had no access to the Internet or only dial-up access was higher for students

living below the poverty threshold (26 percent) than for students living between 100 and 185 percent of the poverty threshold (15 percent) and at greater than 185 percent of the poverty threshold (4 percent).



In 2015, the two most common main reasons for children ages 3 to 18 to not have home internet access were that it was too expensive or that the family did not believe they needed it/ were not interested in having it (38 percent each). Other main reasons for not having home internet access included that the home lacked a computer or a computer adequate for internet use (8 percent), internet service was not available in the area (5 percent), the Internet could be used somewhere else (3 percent), and privacy and security concerns (i.e., online privacy and cybersecurity and personal safety concerns) (2 percent).

What Teachers Should Know and Be Able to Do

The National Board for Professional Teaching Standards proposes five core propositions for teaching. These five propositions provide

a vision for accomplished teaching and are the basis for National Board Certification.

1. *Accomplished teachers are committed to their students and their learning.* They recognize individual differences and adjust their teaching according to their students' needs. Teachers understand how their students develop and learn, but understand that their mission goes beyond students' cognitive development. They treat students equitably.
2. *Accomplished teachers know their subject and know how to teach their subjects to students.* They understand how knowledge in their subject is created, organized, and linked to other subjects. They also know how to convey their subject to students by utilizing multiple paths to knowledge.
3. *Accomplished teachers are responsible for managing and monitoring student learning.* They utilize multiple methods for meeting their instructional goals and supporting student learning in various settings. Teachers engage students in the learning process and value student participation. They also regularly assess student progress.
4. *Accomplished teachers think systematically about their teaching and learn from their experience.* They use feedback and research to improve their practice and make difficult choices that challenge their professional judgment.
5. *Accomplished teachers are members of learning communities.* They collaborate with other professionals, families, and the community.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=28#oembed-2

Video 1.4.1. *What Teachers Should Know* reviews the National Board for Professional Teach Standards five core propositions.

Exercise 1.2. Self-Assessment of Teaching

Questionnaire for self-assessment of teaching. Reflect on these characteristics and consider which skills you will improve during this course.

	Strongly Disagree			Strongly Agree
I can explain how people develop and learn.	1	2	3	4
I know my subject matter and can explain it to others.	1	2	3	4
I can identify several ways to get to know my students and what they know.	1	2	3	4
I know what content standards are and can plan a lesson that meets those standards.	1	2	3	4
I can demonstrate more than one instructional strategy.	1	2	3	4
I can assess other's learning using a traditional test and at least one other measure.	1	2	3	4
I often reflect on teaching and learning and can identify how I can modify my teaching based on data collected about student learning.	1	2	3	4
I can identify several ways to demonstrate respect for students.	1	2	3	4
I can identify at least three members of my learning community.	1	2	3	4

Source: Adapted from The nature of teaching (n.d.).

Effective Teaching

Exercise 1.3. Traits of an Effective Teacher

Think about the most effective teachers in your experience. What made them effective? What characteristics, attributes, or skills did they possess that made them effective?

Personal Attributes	Professional Skills, Attributes, Abilities

Source: Adapted from The nature of teaching (n.d.).

What is an effective teacher? Walker (2008) asked in-service and pre-service teachers to identify characteristics of their most effective teachers–"effective" meaning that these teachers made the most significant and positive impact on their lives. From those responses, twelve characteristics emerged.

1. *Prepared.* Effective teachers are prepared for each class and are ready to teach. Time on task is a priority. Students report that it is easy to learn because the teacher is prepared and time passes quickly because they are engaged in learning.
2. *Positive.* Effective teachers are optimistic about teaching and about their students. They look for the positives in every situation. They also are available to students, communicate with students about their progress, and give praise. These teachers also support students to respond positively to each other.
3. *Hold High Expectations*. Effective teachers hold the highest standards and believe that all students can be successful. They challenge their students to do their best and build students' confidence.
4. *Creative*. Effective teachers are resourceful and inventive. They will do things outside of the norm to keep students engaged and motivated.
5. *Fair.* Effective teachers are fair in how they handle students and grading. They allow students equal opportunities. They give clear and consistent expectations. They also recognize that not all students learn the same way, and "fair" does necessarily mean treating everyone the same.
6. *Display a Personal Touch.* Effective teachers are approachable and connect with their students personally. They share experiences and take an interest in their students.
7. *Cultivate a Sense of Belonging.* Effective teachers project that their preferred place is in the classroom and they make students feel welcome and comfortable there as well.
8. *Compassionate.* Effective teachers are concerned about students' academics, but also their personal issues. They show sensitivity and compassion toward their students.
9. *Have a Sense of Humor.* Effective teachers can make learning fun and do not take everything seriously. They use humor while teaching and dealing with difficult situations.
10. *Respect Students.* Effective teachers give the highest respect

and get the highest respect from students. They do not deliberately embarrass students. They respect their privacy and speak to students alone about sensitive issues, grades, or conduct.

11. *Forgiving.* Effective teachers forgive students for inappropriate behavior and do not hold grudges. They refuse to give up on difficult students.
12. *Admit Mistakes.* Effective teachers admit when they are wrong and apologize for mistakes.

What Makes a Good Teacher Great?

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://edpsych.pressbooks.sunycreate.cloud/?p=28#oembed-1

Video 1.4.2. *What Makes a Good Teacher Great* discusses some of the lessons Azul Terronez learned about being an effective teacher from his students.

Exercise 1.4. Traits that Make Me an Effective

Teachers

Which of these personal and professional characteristics and skills do you possess? When you formulate your teaching philosophy, you can discuss the characteristics of an effective teacher that you possess.

My Personal Attributes	My Professional Skills, Attributes, Abilities

Source: Adapted from The nature of teaching (n.d.).

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Teacher Development

How does a beginning teacher develop into a mature, confident, and competent professional? What conditions must you experience? What knowledge must you acquire? What skills must you develop? Educators and educational psychologists have studied the developmental process of teachers from pre-service to in-services and have found that it unfolds in some predictable ways. We will discuss the stages of development that all teachers go through on the way to becoming expert practitioners.

Stages of Teacher Development

At this point in your training, you probably see yourself in the role of a teacher, and you may have constructed some images or pictures of your first class. You may have promised yourself that you are going to be better than some of the teachers who taught you when you were in elementary or high school. You probably hope to be as good as some other teachers you have known. But as you begin your first regular teaching assignment you will find that there is a difference between your student teaching experiences and the "real world of teaching." First, the classrooms you have been in came with a made-to-order instructional and behavior management system. All you had to do was adjust to it. Soon, no such system will exist, and you will have to create one of your own. Second, during student teaching, you have had instructional materials and lessons to draw on as aids to help you plan and teach. This may not be the case when you start your first teaching assignment. You will have to make many decisions about what, for how long, and in what manner to teach a group of learners you know little about. Finally, your cooperating teacher has been an important advisor and confidante during your student teaching experience, someone you could

approach for advice on how to teach particular learners or how to cope with the psychological and physical demands of teaching. It is possible that such a mentor may not exist in your first regular teaching assignment.

The Survival Stage

This transition to the real world of teaching ushers in the first stage of teacher development, sometimes called the survival stage (Borich, 1993; Burden, 1986; Fuller, 1969; Ryan, 1992). The distinguishing feature of the survival stage of teaching is that your concerns will focus on your own well-being more than on the teaching task or your learners. Bullough (1989) has described this stage as "the fight for one's professional life" (p. 16). During this stage, you will typically have the following concerns:

- Will my learners like me?
- Will they listen to what I say?
- What will parents and teachers think of me?
- Will I do well when the principal observes me?
- Will I ever have time to myself?

Typically, during this time you become so focused on behavior management concerns that you feel like you are struggling merely to survive the day-to-day give-and-take of classroom life. Listen to Kerrie, a first-year teacher, reflect on some assumptions she made during the fall semester of her first teaching assignment:

> *...I thought that if you planned the curriculum really well, the management just falls into place. I really thought that when I was student teaching. If you are not well planned you are going to have problems, but planning well doesn't solve those problems; you still*

> *have management problems. At first…I thought that you could plan your curriculum and [good] behavior would fall into place; you could handle it as it comes. But you really can't. The other half of planning is what you will require behaviorally and you can plan for that. Now [sixth month] I plan a lot more things, like transition time and walking into the other room [to check on students].* (Bullough, 1989, pp. 25–26)

The Task Stage

For most teachers, survival concerns and concerns about self begin to diminish rapidly during the first months of teaching, but there is no precise time when they are over. What signals their end is the transition to a new set of concerns and a gradual diminishing of concerns about your own well-being. This new set of concerns focuses on how best to deliver instruction. Various labels have been used to describe this second stage, such as the mastery stage of teaching (Ryan, 1992), consolidation and exploration (Burden, 1986), and trial and error (Sacks & Harrington, 1982). Fuller (1969) described this as the task stage: the stage in which the new teacher focuses on the teaching task itself. At this stage, you begin to feel confident that you can manage the day-to-day
routines of the classroom and deal with a variety of behavior problems. You are at the point where you can plan your lessons without an exclusive focus on managing the classroom. Your focus turns toward improving your teaching skills and achieving greater mastery over the content you are teaching.

Typically, your concerns during this second stage of teacher growth and development are these:

- How good are my instructional materials?
- Will I have enough time to cover all the content?

- How can I add variety to my presentations?
- Where can I get some ideas for a learning center?
- What's the best way to teach writing skills?

The Impact Stage

The final stage of teacher growth and development is characterized by concerns that have to do less with management and lesson delivery and more with the impact of your teaching on learners. This point in a teacher's career is sometimes referred to as the impact stage. At this time, you will naturally view learners as individuals and will be concerned that each of your students fulfills his or her potential. At this stage, your principal concerns might be these:

- How can I increase my learners' feelings of accomplishment?
- How do I meet my learners' social and emotional needs?
- What is the best way to challenge my unmotivated learners?
- What skills do they need to best prepare them for the next grade?

If you are a typical beginning teacher, your thoughts and concerns will focus at first on your own well-being and only later on the teaching task and your students. Fuller (1969), for example, found that during the early, middle, and late phases of student teaching, preservice teachers' concerns shifted from a focus on self (Will the students like me? Can I control the class?) to concerns that emphasized the teaching task (Are there sufficient instructional materials? Is there time to cover all the content?) to concerns that emphasized the needs of pupils (Are the pupils learning? Can they apply what they've learned?). Fuller speculated that concerns for self, task, and impact are the natural stages that most teachers pass through, representing a developmental growth pattern extending

over months and even years of a teacher's career. Although some teachers pass through these stages more quickly than others and at different levels of intensity, Fuller suggested almost all teachers can be expected to move from one to another, with the most effective and experienced teachers expressing student-centered (impact) concerns at a high level
of commitment.

Concerns theory grew out of the analysis of recorded transcripts of interviews with student teachers. Over an extended period of time, these records were used to identify and classify problems that student teachers experienced and the concerns they expressed about these problems. These expressed concerns, when grouped into developmental and sequential stages, showed that student teachers with the least experience were concerned about self and self-survival, while student teachers with more experience and in-service teachers were concerned about student achievement and learning.

Stated in its simplest terms, concerns theory conceptualizes the learning process for a prospective teacher as a natural flow from concerns for self (teacher) to task (teaching) to impact (pupil). The physical, mental, and emotional states of the prospective teacher play an important role in the shift of focus from self to the task to impact. The lack of adequate knowledge or emotional support during the critical pre-teaching and student teaching periods can result in a slower, more labored shift of focus to the task. This, in turn, can result in failure on the part of the teacher to reach a concern for his or her impact on students.

Fuller's concerns theory has several other implications. A teacher may return to an earlier stage of concern, for example, from a concern for pupils back to a concern for the task as a result of suddenly having to teach a new grade or subject. Or, she may move from a concern for task back to a concern for self as a result of having to teach in a different and unfamiliar school. Thus, teacher concerns may not always be determined developmentally but can be context-dependent as well. The time spent in a given stage the

second time may be shorter than the first. Finally, the three stages of concern need not be exclusive of one another. A teacher may have concerns predominately in one area and still have concerns of lesser intensity in one or both of the other stages.

Educational Psychology and Teacher Growth and Development

An important question for any teacher is this: What type of knowledge and experiences are needed to pass successfully from an exclusive concern for self-survival to a concern for the impact the teacher is having on the students? Another question: What role can the study of educational psychology play in this passage from survival to impact?

Shulman (1992) identifies four types of knowledge that are crucial for teacher growth and development: (1) practical knowledge, which comes from student field experiences, student teaching, and regular teaching; (2) case knowledge, which comes from reading about what both successful and unsuccessful teachers have done; (3) theoretical knowledge, which comes from reading about important ideas, conceptual systems, and paradigms for thinking about teaching; and (4) empirical knowledge, which comes from reading what the research says about a particular subject and how to teach it.

Educational psychology is a discipline of inquiry that focuses primarily on the latter two categories of knowledge. We'll look at how this knowledge is developed and used by educational psychologists to solve important classroom learning problems. But before learning how educational psychologists provide information to help teachers progress through the stages of teacher concerns, you may want to determine your own levels of concern for self, task, and impact at this point in your teaching career. In the accompanying box, you will find a Teacher Concerns Checklist. By

completing this checklist and scoring your responses according to the directions provided, you can determine which stage of concern you presently identify with most closely. You may also want to complete the checklist again at the end of your educational psychology course and compare your scores to determine how much your levels of concern have changed from self to impact.

Exercise 1.5 Teacher Concerns Checklist

This checklist explores what teachers are concerned about at different stages of their careers. There are no right or wrong answers because each teacher has their own concerns. The following are statements of concerns you might have. Read each statement and ask yourself: WHEN I THINK ABOUT TEACHING, AM I CONCERNED ABOUT THIS?

	1 not concerned	2 Little concerned	3 Moderately concerned	4 Very concerned	5 Preoccupied with concern
Whether students respect me.					
Doing well when I'm observed.					
Managing my time efficiently.					
Losing the respect of my peers.					
My ability to prepare adequate lesson plans.					
Having my inadequacies become known to other teachers.					
What the principal may think if there is too much noise in my classroom.					
Obtaining a favorable evaluation of my teaching.					
Losing the respect of my students.					

My ability to maintain the appropriate degree of class control.

Getting students to behave.

Having an embarrassing incident occur in my classroom for which I might be judged responsible.

That my peers may think I'm not doing an adequate job.

Appearing competent to parents.

Teaching effectively when another teacher is present.

SUBTOTAL SELF SCORES

Insufficient clerical help for teachers.

Too many extra duties and responsibilities.

Insufficient time for rest and class preparation.

Not enough assistance from specialized teachers.

Not enough time for grading and testing.

The inflexibility of the curriculum.

Too many standards and regulations set for teachers.

The rigid instructional routine.

Having too many students in a class.

Lack of public support for schools.

Not having sufficient time to plan.

Not being able to cope with troublemakers in my classes.

My ability to work with disruptive students.

The large number of administrative interruptions.

Working with too many students each day.

SUBTOTAL TASK SCORES

Helping students to value learning.

Increasing students' feelings of accomplishment.

Diagnosing student learning problems.

Whether each student is reaching his or her potential.

Recognizing the social and emotional needs of students.

Challenging unmotivated students.

Understanding why certain students make slow progress.

Understanding ways in which student health and nutrition problems can affect learning.

Meeting the needs of different kinds of students.	
Seeking alternative ways to ensure that students learn the subject matter.	
Understanding the psychological and cultural differences that can affect my students' behavior.	
Adapting myself to the needs of different students.	
Guiding students toward intellectual and emotional growth.	
Whether students can apply what they learn.	
Understanding what factors motivate students to learn.	
SUBTOTAL IMPACT SCORES	

To determine your score, total the number of responses in each of the three categories of concern—self, task, and impact. The higher your score in a category (out of a maximum 75 points), the more you are identified with that stage of concern.

Source: Adapted from Borich and Tombari (1997).

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- Educational Psychology: A Contemporary Approach. **Authored by**: Gary D. Borich and Martin L. Tombari. **Retrieved from**: http://sites.edb.utexas.edu/uploads/sites/113/2017/01/chapter1.pdf. **License**: CC BY: Attribution

Teaching Philosophy

A philosophy grounds or guides practice in the study of existence and knowledge while developing an ontology (the study of being) on what it means for something or someone to be—or exist. Educational philosophy, then, provides a foundation that constructs and guides the ways knowledge is generated and passed on to others. Therefore, it is of critical import that teachers begin to develop a clear understanding of philosophical traditions and how the philosophical underpinnings inform their educational philosophies; because a clear educational philosophy will help guide and develop cohesive reasons for how each teacher designs classroom spaces and learning interactions with both teachers and students. A clear philosophy also frames the curriculum along a spectrum from teacher-centered curriculum to student-centered curriculum to society-centered curriculum.

There are many different ways to teach, varying circumstances to take into account, and philosophies to apply to each classroom. And what better way to have a positive impact on the world than to offer knowledge for consumption? The term 'teacher' can be applied to anyone who imparts knowledge of any topic, but it is generally more focused on those who are hired to do so. In imparting knowledge to our students, it is inevitable that we must consider our own personal philosophies, or pedagogies, and determine not only how we decide what our philosophies are, but also how those impact our students.

In order to develop a teaching philosophy, a teacher should examine and continuously reflect on the following:

- Creation of an articulated philosophy that can become a foundation upon which an individual's life work can be built.
- Consideration of how your attitude is a function of who you are, how it affects your philosophy towards education, and

how it shapes who you are as a teacher.
- Formulation of a teaching style that integrates teaching strategies with one's own personality and philosophy.

Exercise 1.6 Educational Philosophies Self-Assessment Survey

Before reading about the various philosophies, take this assessment to find with which you most align. This assessment will assist you in writing your teaching philosophy.

1. Complete the Educational Philosophies Self-Assessment Survey
2. Compile your score using Educational Philosophies Self-Assessment Scoring Guide

What does this survey reveal about your underlying philosophy?

Lessons in Pedagogy

Teacher preparation classes frequently separated the concept of philosophy into separate schools. "Philosophy has been taught in the theoretical realm rather than the practical sense," meaning that the ideas were placed before the teachers without the scaffolding to create a bridge into the classroom (Roberson, 2000, p. 7). The teachers, as students, were given a body of thought and expected to translate that into lessons for their own students. Once you have the idea, how do you apply it to teaching?

What, exactly, are teaching philosophies? According to Thelma Roberson (2000), most prospective teachers confuse their beliefs with the ideas of teaching. Teaching philosophies, then, are not what you want to do in class to aid learning, but why you do them and how they work. For example, Roberson's students state they "want to use cooperative learning techniques" in their classroom. The question posed is, why? "[I]s cooperative learning a true philosophy or is it something you do in the classroom because of your belief about the way children learn?" (Roberson, 2000, p. 6). Philosophies need to translate ideas into action – if you want to use certain techniques, then you need to understand how they are effective in the classroom to create that portion of your teaching philosophy. It helps to have an overview of the various schools out there.

Ontological Frameworks of Philosophy

Generally, four ontological perspectives frame schools of educational philosophy. Two ontological frameworks, idealism and realism, stem from Ancient Greece. The Ancient Greek philosopher Plato developed the tradition of idealism; whereas, Aristotle, Plato's student, formed an antithetical ontology of realism. Progressivism and existentialism grew from the philosophical remnants of the Age of Enlightenment in the 19th century. Pragmatism formed within the United States during the late 1800s; at the same time, existentialism developed as a continental philosophy in Europe. While the early public education system in the United States was guided by idealism and realism, pragmatism and existentialism have served as the influential foundations of the 20th and 21st-century educational philosophies.

Idealism

For Idealists, ideas are the only true reality. Conscious reasoning is the only way to locate what is true, beautiful, and just. Plato founded Idealism and outlined its tenets in his book The Republic. For Plato, there are two worlds. The first world is home to the spiritual or mental world where universal ideas and truth were permanent; this world can only be found through conscious reasoning. The second world is the world of appearances and imperfection; a world experienced through sensory experiences of sight, sound, touch, smell, and taste. Plato outlines this duality between the two worlds in "The Allegory of the Cave." In this famous allegory, people are chained against walls with a fire behind them. What the people perceive as real are only shadowed projections on the wall of the cave. If one were to break free, leave the cave, and discover the sun, this new "realm" would discover the true source of everything that was previously known. It would be the realm of pure fact and form. This is the source of all that is real. The real world is just an imperfect projection of these ideas, forms, and truth.

Almost two centuries later, Dutch philosopher Renè Descartes shifted Platonic Idealism

toward mind-body dualism with his famous phrase "Cogito, ergo sum (I think; therefore, I am)." For Descartes, the only proof of his existence is his thinking—a thinking being. Like Plato, Descartes outlined a rationale for why perceptions are unreliable, and the external world is illusory. Only through rational deduction could one obtain truth. While Plato described a dualism between two separate worlds, Descartes established an Idealism founded on mind-body dualism where the thinking mind is given privilege over the physical body and external world. This dualism would heavily influence philosophy and educational philosophy well into the 20th century.

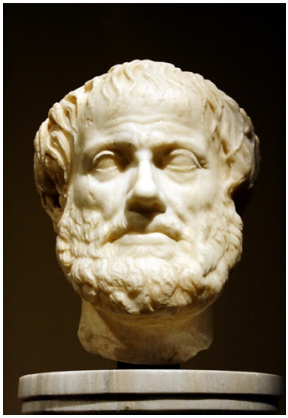
Teaching, for Idealists, focuses on moral excellence that will benefit society. Students should focus on subjects of the mind like literature, history, and philosophy. Students will demonstrate understanding through participation in lectures and through Socratic-dialogues, which engage students in introspection and insight that bring to consciousness the universal forms and concepts.

Figure 1.6.1. Plato.

Realism

Realism's central tenet is based on reality, or the external universe, independent from the human mind. Aristotle, Plato's student, contradicted his teacher's Idealist philosophy and formulated a philosophy on determining truth through observation. Reality can be truly understood by careful observation of all the data. Because of his emphasis on careful observation, Aristotle is often referred to as the Father of the Scientific Method. Through logic, humans can reason about the physical universe. The essence of things or substances, therefore, can be determined by examination of the object or substance. Aristotle's logic, then, emphasizes induction as well as

deduction, and the real world can be determined through both.



During the Enlightenment, Common Sense Realism began to counter the Idealism of Descartes. Rather than the skepticism of the external world espoused by Idealists, the Common Sense Realists, like John Locke, argue that ordinary experiences intuit a self and the physical world without the skepticism of the real world outside the mind. This realism would influence the development of Empiricism and Pragmatism later in the Enlightenment.

For realists, teaching methods should focus on basic skills and memorization and mastery of facts. Students demonstrate content mastery of these skills through critical observation and applied experimentation.

Figure 1.6.2. Aristotle. viena-Wien. Kunsthistorisches Museum. Cap d'Aristotil. Copia romana d' un original qrez. Ca. 320 Dc." by Pilar Torres.

Pragmatism

Like Realism, Pragmatism requires empirical observation of the real world; however, unlike Realism and Idealism, the real world is not an unchanging whole but is evolving and changing according to how thought is applied to action towards a problem. Thought cannot or should not describe or represent reality, but rather, should be applied by the practical applying thoughts and experiences to problems that arise. The universe, then, is always evolving according to new applied thoughts turned into actions. Pragmatism's founder

Charles Sanders Pierce posits thought must produce action towards an ever-changing universe.

John Dewey, the founder of Progressivism, believed that experience is central to explaining the world; moreover, the experience is what is needed to be explained. One needs practical experiences and uses explanations to find models that would best fit any given problem or situation. As new experiences and explanations arise, reality will evolve or change to new situations and problems.

Pragmatists focus on hands-on, experiential learning tasks such as experimenting, and working on projects in groups. Students will demonstrate understanding through applied learning tasks to concrete problems or tasks.

Existentialism

Existentialism grew from the continental philosophies forming in Europe during the 19th and early 20th centuries, most notably hermeneutic phenomenology—the examination of lived experience. Hermeneutic phenomenology and existentialism countered the dualisms inherent in both Idealism and Realism. The world does not have any meaning outside human existence within a world. The mind/body or mind/physical world duality and cannot have any meaning without a human being actively absorbed in the world. Jean-Paul Sarte posited that "existence precedes essence," which means one's existence comes before the nature, or fact, of a thing. This means that individual human beings are free to determine their own meaning for life and do not possess any inherent identity different than one the individual chooses or creates.

Existentialists position the individual as responsible for their own being, or existence. "Who am I? What should I do?" become central questions for an individual's project in being. If one identifies with being a teacher, or any other identity like being a parent, then one

must evaluate what does one who teaches (or any other identity) do? After thoughtful and careful reflection, one must choose to authentically do the project of being a teacher (or any other identity). Acting in accordance with one's chosen beliefs and values despite social pressures is the way to have an authentic existence. However, acting or adopting false values based on social pressures would be acting in "bad faith," and one would be living an inauthentic existence, according to Sartre.

In educational settings, Existentialists focus on giving students personal choices where they must confront others' views in order to clarify and develop authentic actions in terms of the students' developing identities. Existentialists have difficulty positioning students as objects to be measured, tracked, or standardized. Teachers who adhere to an Existentialist ontology create activities that guide students to self-direction and self-actualization.

Philosophical Perspective of Education

There are several philosophical perspectives currently used in educational settings. Unlike the more abstract ontology, these perspectives focus primarily on what should be taught and how it should be taught, i.e., the curriculum.

Essentialism

Essentialism adheres to a belief that a core set of essential skills must be taught to all students, a universal pool of knowledge needed by all. Essentialists tend to traditional academic disciplines that will develop prescribed skills and objectives in different content areas as well as develop a common culture. Typically, essentialism argues for a back-to-basics approach to teaching intellectual and moral

standards. Schools should prepare all students to be productive members of society.

The fundamentals of teaching are the basis of the curriculum: math, science, history, foreign language, and English. Vocational classes are not seen as a necessary part of educational training. Schools should be sites of rigor where students learn to work hard and respect authority. Because of this stance, essentialism tends to subscribe to tenets of realism. Essentialist classrooms tend to be teacher-centered in instructional delivery with an emphasis on lecture and teacher demonstrations. Assessments are predominately through testing, and there are few, if any, projects or portfolios. These instructors easily accept the No Child Left Behind Act because test scores are the main form of evaluation (Ornstein & Levine, 2003).

Perennialism

Perennialism advocates for seeking, teaching, and learning universal truths that span across the ages. These truths, Perennialists argue, have everlasting importance in helping humans solve problems regardless of time and place. While Perennialism resembles essentialism at first glance, perennialism focuses on the individual development of the student rather than emphasizing skills. Perennialism supports liberal arts curricula that help produces well-rounded individuals with some knowledge across the arts and sciences. All students should take classes in English Language Arts, foreign languages, mathematics, natural sciences, fine arts, and philosophy. Like Essentialism, Perennialism may tend to favor teacher-centered instruction; however, Perennialists do utilize student-centered instructional activities like Socratic Seminar, which values and encourages students to think, rationalize, and develop their own ideas on topics.

Perennialists are instructors who believe that knowledge passed

through the ages should continue to be the basis of the curriculum, like the classic works of Plato and Einstein. Perennialists base their teachings on reason, logic, and analytical thought. Only information that stood the test of time is relevant. They do not elicit student input. The classes most likely to be considered under this approach would be history, science, math, and religion classes (Ganly, 2007).

Positivism

Positivism is a philosophical theory that believes information is derived from sensory experience and interpreted through reason and logic. The instructors whose teaching philosophies are based on documented facts and objective truths are normally those who would be in the math and science departments. These teachers do not feel that religion and the supernatural should be a part of the thinking process. The idea of uncertainty and the unknown is considered illogical (Ganly, 2007).

Behaviorism

Behaviorists believe in rewards and punishments as an approach to controlling the teaching environment due to their belief in the intrinsic nature of humans to react to internal or external stimuli. This teacher-centered system ultimately allows the students to be controlled by the educator, who makes the environment pleasant or unpleasant, depending on the students' behavior (Ornstein & Levine, 2003).

Progressivism

Progressivism focuses its educational stance on experiential learning with a focus on developing the whole child. Students learn by doing rather than being lectured to by teachers. This pedagogy is a student-centered form of instruction where students follow the scientific method of questioning and searching for the answer. Students work in cooperative/collaborative groups to do project-based, expeditionary, problem-based, or service-learning activities, and students have opportunities to follow their interests. The teacher is a facilitator rather than the center of the educational process, and students have shared authority in planning and decision-making with teachers (Ganly, 2007).

The curriculum is usually integrated across contents instead of siloed into different disciplines. Progressivism's stance is in stark contrast to both Essentialism and Perennialism in this manner. Progressivism follows an explicit pragmatic ontology where the learner focuses on solving real-world problems through real experiences. Current events are used to keep students interested in the required subject matter. Students are active learners as opposed to passive learners. Evaluations include projects and portfolios.

Figure 1.6.3. Progressive John Dewey.

Social Reconstructionism & Critical Pedagogy

Social reconstructionism was founded as a response to the atrocities of World War II and the Holocaust to assuage human cruelty. Social reform in response to helping prepare students to make a better world through instilling democratic values. Critical pedagogy emerged from the foundation of the early social reconstructionist movement.

Critical pedagogy is the application of critical theory to education. For critical pedagogues, teaching and learning is inherently a political act, and they declare that knowledge and language are not neutral, nor can they be objective. Therefore, issues involving social, environmental, or economic justice cannot be separated from the curriculum. Critical pedagogy's goal is to emancipate marginalized or oppressed groups by developing, according to Paulo Freire, conscientização, or critical consciousness in students.

Figure 1.6.4. Gloria Jean Watkins, better known by her pen name bell hooks.

Critical pedagogy de-centers the traditional classroom, which positions the teacher at the center. The curriculum and classroom with a critical pedagogy stance are student-centered strives to instill a desire to make the world a better place. It places a focus on controversial world issues and uses current events as a springboard for the thinking process. These students are taught the importance of working together to bring about change. These teachers incorporate what is happening in the world with what they are learning in the classroom (Ganly, 2007).

Constructivism

Active participation is the key to this teaching style. Students are free to explore their own ideas and share concepts with one another in nontraditional ways. "Hands on activity [...] is the most effective way of learning and is considered true learning" (Ganly, 2007).

Humanism/ Existentialism

Also a student-centered philosophy, this educational method is based on the idea that the students should be presented with choices about the learning process. Students are engaged in all aspects of learning and work together with the teacher and her peers to develop a curriculum and evaluation system that allows for individual interests and abilities (Ganly, 2007).

> "*Your philosophy of education is what you believe about education and the way children learn*" (Roberson, 2000, p. 4).

Four Philosophies in Assessment

In addition, the 'constructivist' school of philosophy, rooted in the Pragmatic pedagogy and branched off from the 'Social Reconstructivist' school, has gained much popularity. Around the turn of the century (the early 1990s), many teachers felt the rote memorization and mindless routine that was common at that time was ineffective and began to look for alternate ways to reach their students (Ornstein & Levine, 2003). Through the constructivist approach, "students "construct" knowledge through an interaction between what they already think and know and with new ideas

and experiences" (Roberson, 2000, p. 8). This is an active learning process that leads to a deeper understanding of the concepts presented in class and is based on the abilities and readiness of the children rather than set curriculum guidelines. Constructivism "emphasizes socially interactive and process-oriented 'hands-on' learning in which students work collaboratively to expand and revise their knowledge base" (Ornstein & Levine, 2003, p. 112). Essentially, knowledge that is shaped by experience is reconstructed, or altered, to assist the student in understanding new concepts (Ornstein & Levine, 2003). You, as the teacher, help the students build the scaffolding they need to maintain the information even after the test is taken and graded.

Once you know how you want to lead your classroom, it is important to consider how to assess your students' progress. And when we think of school, we automatically consider the threesome subjects, Reading, Writing, and 'Rithmatic. In all aspects of learning, however, the ability to communicate comes to the forefront. Communication is used in-class discussion as well as unit test short answers. Writing is present in almost all subjects in some form, and writing translates to communication. Richard Fulkerson (2000), in his article "Four Philosophies of Composition," questions whether "a [...] set of four philosophies of composition might exist, each one stressing a different element in the communicative transaction" (p. 3). Fulkerson's schools of communicative philosophy fall into the following categories:

- **Expressionism:** a way of writing that demonstrates the students' thoughts and can be led by "non-directive teachers, some of whom insist that one neither can nor should evaluate writing" or more hands-on teachers who "design classroom activities to maximize student self-discovery" (p. 5). This school of thought emphasizes the student.
- **Rhetorical:** this school states that good writing is adapted to achieve a specific reaction from the audience (p. 6). This is focused on the connection between goal and process in

completing assignments, and it emphasizes the audience.

- **Mimesis:** states that "a clear connection exists between good writing and good thinking" and focuses on logic and reason as exemplified in the completion of assignments (p. 5). This school emphasizes a well-rounded student in that, research, prior knowledge, and the ability to recognize both sides of an argument are necessary for success (p. 6).
- **Formalism:** this school focuses primarily on the form of the assignment – it disregards content to the extent that poor grammar can distract the audience from absorbing the content, and therefore, the work is judged "primarily by whether it shows certain internal [mistakes]" (p. 4).

While most teachers fall primarily into one school of composition pedagogy, Fulkerson (2000) points out that it is necessary to hold on to them all when he states "they are not mutually exclusive" (p. 6). The trick is to learn when each is applicable and to what extent it should be employed.

Conclusion

Teaching philosophies are as abundant. How do you narrow the choices down? And even though the difference between one philosophy and the next seems small at the onset, the two are by no means exactly alike. Your classes will be just as diverse. You will have students from all economic classes, with differing levels of language ability, and all bringing various and beautiful experiences to your class. How do you reach each individual?

Knowing who you are as a teacher before you enter the classroom will help significantly. Teaching is so much more than just the content. Teaching is a learning curve on a philosophy that will never be finished. Just as your classroom will change every year, continue

to alter your philosophies. See what works for you and your students on a collaborative level.

> "A *working philosophy is never completely developed, the ultimate working philosophy never reached. We're always moving toward, hopefully, a more complete, and thus more useful, working philosophy*" (Apps, 1973, p. 1).

Exercise 1.7 Draft Your Philosophy

While your teaching philosophy will never be finished, now is a good time to start writing one. This will be your first of many drafts. With each domain of teaching that you explore, you should expect that your new understanding will help you further develop and refine your philosophy.

Here are some helpful tools to get started:

Teaching Perspectives Inventory

Teaching Styles Inventory

Teaching Goals Inventory

Statement of Teaching Philosophy – Questions to Consider

Writing Your Teaching Philosophy

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Chapter Summary: The Study of Educational Psychology

Although the term learning has many possible meanings, the term as used by teachers emphasizes its relationship to curriculum, to teaching, and to the issues of sequencing, readiness, and transfer. Viewed in this light, the two major psychological perspectives of learning—behaviorist and constructivist—have important ideas to offer educators. Within the behaviorist perspective one of the most relevant theories is operant conditioning, which describes how the consequences and cues for a behavior can cause the behavior to become more frequent. Operant conditioning is especially relevant for understanding much of what students *do*; it offers less help in understanding how they think.

The other major psychological perspective—constructivism—describes how individuals build or "construct" knowledge by engaging actively with their experiences. Psychological constructivism emphasizes the learners' individual responses to experience—their tendency both to assimilate it and to accommodate to it. Social constructivism (or sociocultural theory) emphasizes how other, more expert individuals can create opportunities for the learner to construct new knowledge. Social constructivism suggests that a teacher's role must include deliberate, scaffolded dialogue. It also needs to include deliberate instructional planning, such as facilitated by Bloom's taxonomy of learning objectives. Both of these strategies can promote students' metacognition, or ability to monitor their own learning. Psychological emphasizes the teacher's responsibility for arranging a rich learning environment and for emphasizing rich sensory, motor, and concrete experiences wherever possible.

Glossary

behavioral approach: the approach that suggests that the keys to understanding development are observable behavior and outside stimuli in the environment

biopsychology: how our biology influences our behavior

cognitive approach: an approach that focuses on the process that allows people to know, understand and think about the world

concerns theory: conceptualizes the learning process for a prospective teacher as a natural flow from concerns for self (teacher) to task (teaching) to impact (pupil)

contextual approach: a theory that considers the relationship between individuals and their physical, cognitive, and social worlds

educational psychology: branch of psychology concerned with the scientific study of human learning

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USING SCIENCE TO INFORM EDUCATIONAL PRACTICES

Theme: The Science of Teaching

Outline of Concepts:

- The science of studying educational psychology

Learning Objectives:

- Determine elements of research studies that make a study worth of consideration
- Differentiate between quantitative, qualitative and mixed-method studies
- Differentiate between research methods: descriptive, correlational, and experimental
- Identify the strengths and weaknesses of each method of data collection
- Differentiate between developmental designs: longitudinal, cross-sectional, and sequential

The Science of Educational Psychology

Teaching is often perceived to be an art and not a science. Because it has not traditionally been seen as an evidence-based profession, it has subject to interventions from politicians, based on ideology rather than on evidence. Ben Goldacre (2013) argues that teaching should be an evidence-based profession and that this would lead to better outcomes for children. In particular, he suggests that:

- a change in culture is needed, where we recognize that we don't necessarily 'know' what works best – we need evidence that something works
- teachers need better access to the outcomes of research
- teachers need to understand how research works so that they can become critical consumers
- teachers need access to networks where they can engage with others who are interested in research.

The main assumption here is that evidence-based practice is a good thing and that the changes advocated by Goldacre can be achieved through research. And not just research by academics and theorists, but through teachers researching their own practice. Indeed, research practices are embedded in an increasing number of schools and there is a recognition that this can contribute to school improvement.

Research in Educational Psychology

An essential part of learning any science is having a basic knowledge of the techniques used in gathering information. The hallmark of

scientific investigation is that of following a set of procedures designed to keep questioning or skepticism alive while describing, explaining, or testing any phenomenon. Not long ago, a friend said to me that he did not trust academicians or researchers because they always seem to change their story. That, however, is precisely what science is all about; it involves continuously renewing our understanding of the subjects in question and an ongoing investigation of how and why events occur. Science is a vehicle for going on a never-ending journey. In the area of development, we have seen changes in recommendations for nutrition, in explanations of psychological states as people age, and in parenting advice. So think of learning about human development as a lifelong endeavor.

Personal Knowledge

How do we know what we know? Take a moment to identify two things that you know about adolescence. Now, how do you know? Chances are you know these things based on your own history (experiential reality), what others have told you, or cultural ideas (agreement reality) (Seccombe and Warner, 2004). There are several problems with personal inquiry, or drawing conclusions based on our personal experiences. Read the following sentence aloud:

Paris in the
the spring

Are you sure that is what it said? Read it again.

If you read it differently the second time (adding the second "the"), you just experienced one of the problems with relying on personal inquiry; that is, the tendency to see what we believe. Our assumptions very often guide our perceptions; consequently, when we believe something, we tend to see it even if it is not there. Have you heard the saying, "seeing is believing"? Well, the truth is just the

opposite: believing is seeing. This problem may just be a result of cognitive 'blinders,' or it may be part of a more conscious attempt to support our own views. Confirmation bias is the tendency to look for evidence that we are right, and in so doing, we ignore contradictory evidence.

Philosopher Karl Popper suggested that the distinction between that which is scientific and that which is unscientific is that science is falsifiable; scientific inquiry involves attempts to reject or refute a theory or set of assumptions (Thornton, 2005). A theory that cannot be falsified is not scientific. And much of what we do in personal inquiry involves drawing conclusions based on what we have personally experienced or validating our own experience by discussing what we think is true with others who share the same views.

Science offers a more systematic way to make comparisons and guard against bias. One technique used to avoid sampling bias is to select participants for a study in a random way. This means using a technique to ensure that all members have an equal chance of being selected. Simple random sampling may involve using a set of random numbers as a guide in determining who is to be selected. For example, if we have a list of 400 people and wish to randomly select a smaller group or sample to be studied, we use a list of random numbers and select the case that corresponds with that number (Case 39, 3, 217, etc.). This is preferable to asking only those individuals with whom we are familiar to participate in a study; if we conveniently chose only people we know, we know nothing about those who had no opportunity to be selected. There are many more elaborate techniques that can be used to obtain samples that represent the composition of the population we are studying. But even though a randomly selected representative sample is preferable, it is not always used because of costs and other limitations. As a consumer of research, however, you should know how the sample was obtained and keep this in mind when interpreting results. It is possible that what was found was limited to

that sample or similar individuals and not generalizable to everyone else.

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The Scientific Method

The general scientific approach has three fundamental features (Stanovich, 2010). The first is *systematic empiricism*. Empiricism refers to learning based on observation, and scientists learn about the natural world systematically, by carefully planning, making, recording, and analyzing observations of it. The second feature of the scientific approach is that it is concerned with *empirical questions*. These are questions about the way the world actually is and, therefore, can be answered by systematically observing it. The third feature is that it creates *public knowledge*. After asking empirical questions, making observations and drawing their conclusions, scientists publish their work. This usually means writing an article for publication in a professional journal, in which they put their research question in the context of previous research, describe in detail the methods they used to answer their question, and clearly present their results and conclusions. Publication is an essential feature of science for two reasons. One is that science is a social process—a large-scale collaboration among many researchers distributed across both time and space. Our current scientific knowledge of most topics is based on many different studies conducted by many different researchers who have shared their work with each other over the years. The second is that publication allows science to be self-correcting. Individual scientists understand that despite their best efforts, their methods can be flawed, and their conclusions incorrect. Publication allows others in the scientific community to detect and correct these errors so that, over time, scientific knowledge increasingly reflects the way the world actually is.

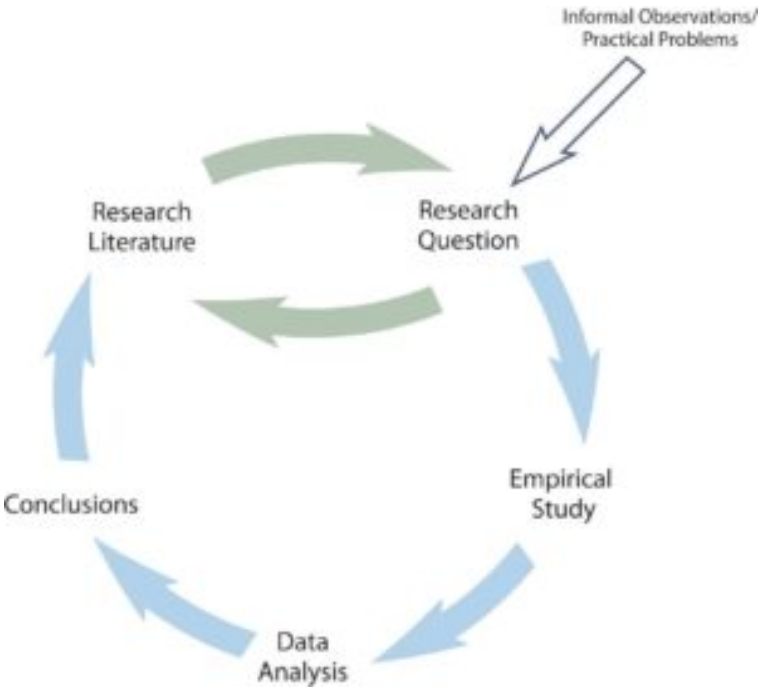

Figure 2.2.1. Simple model of scientific research in psychology.

Figure 2.1 is a simple model of scientific research in psychology and presents a more specific model of scientific research in psychology. The researcher (who more often than not is really a small group of researchers) formulates a research question, conducts a study designed to answer the question, analyzes the resulting data, draws conclusions about the answer to the question, and publishes the results so that they become part of the research literature. Because the research literature is one of the primary sources of new research questions, this process can be thought of as a cycle. New research leads to new questions, which lead to new research, and so on. The model also indicates that research questions can originate outside of this cycle, either with informal observations or with practical problems that need to be solved. But

even in these cases, the researcher would start by checking the research literature to see if the question had already been answered and to refine it based on what previous research had already found.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
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Video 2.2.1. The Scientific Method explains the basic steps taken for most scientific inquiry.

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Quantitative and Qualitative Approaches to Research

When designing a study, typically, researchers choose a quantitative or qualitative research design. In some cases, a mixed-method approach may be appropriate. Which approach used will develop on the research question and the type of information sought. Quantitative methods may be better for understanding what is happening, while qualitative methods may be better for understanding the hows and why of a phenomenon.

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Video 1. *Types of Research* explains the difference between qualitative and quantitative research. A closed-captioned version of this video is available here.

Quantitative Research

Quantitative research typically starts with a focused research question or hypothesis, collects a small amount of data from each of a large number of individuals, describes the resulting data using statistical techniques, and draws general conclusions about some large population. The strength of quantitative research is its ability

to provide precise answers to specific research questions and to draw general conclusions about human behavior; however, it is not nearly as good at *generating* novel and interesting research questions. Likewise, while quantitative research is good at drawing general conclusions about human behavior, it is not nearly as good at providing detailed descriptions of the behavior of particular groups in particular situations. And it is not very good at all at communicating what it is actually like to be a member of a particular group in a particular situation. But the relative weaknesses of quantitative research are the relative strengths of qualitative research.

Qualitative Research

Although this is by far the most common approach to conducting empirical research in psychology, there is a vital alternative called **qualitative research**. Qualitative research can help researchers to generate new and interesting research questions and hypotheses. Qualitative researchers generally begin with a less focused research question, collect large amounts of relatively "unfiltered" data from a relatively small number of individuals, and describe their data using nonstatistical techniques. They are usually less concerned with drawing general conclusions about human behavior than with understanding in detail the *experience* of their research participants. Qualitative research can also provide rich and detailed descriptions of human behavior in the real-world contexts in which it occurs. Similarly, qualitative research can convey a sense of what it is actually like to be a member of a particular group or in a particular situation—what qualitative researchers often refer to as the 'lived experience' of the research participants.

Mixed-Methods

Given their differences, it may come as no surprise that quantitative and qualitative research do not coexist in complete harmony. Some quantitative researchers criticize that qualitative methods lack objectivity, are challenging to evaluate, and do not allow generalization to other people or situations. At the same time, some qualitative researchers criticize that quantitative methods overlook the richness of behavior and experience, and instead answer simple questions about easily quantifiable variables. However, many researchers from both camps now agree that the two approaches can and should be combined into what has come to be called mixed-methods research (Todd, Nerlich, McKeown, & Clarke, 2004). One approach to combining quantitative and qualitative research is to use qualitative research for hypothesis generation and quantitative research for hypothesis testing. A second approach to combining quantitative and qualitative research is referred to as triangulation. The idea is to use both quantitative and qualitative methods simultaneously to study the same general questions and to compare the results. If the results of the quantitative and qualitative methods converge on the same general conclusion, they reinforce and enrich each other. If the results diverge, then they suggest an interesting new question: Why do the results diverge, and how can they be reconciled?

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https://edpsych.pressbooks.sunycreate.cloud/?p=37#oembed-1

Video 2.3.1. *What are Qualitative and Quantitative Variables* explains

the difference between quantitative and qualitative variables that may be used in research.

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Becoming Familiar with Research

An excellent way to become more familiar with these research approaches, both quantitative and qualitative, is to look at journal articles, which are written in sections that follow these steps in the scientific process. Most psychological articles and many papers in the social sciences follow the writing guidelines and format dictated by the American Psychological Association (APA). In general, the structure follows: abstract (summary of the article), introduction or literature review, methods explaining how the study was conducted, results of the study, discussion and interpretation of findings, and references.

The Aftermath of Teenage Suicide: A Qualitative Study of the Psychosocial Consequences for the Supervising Family

Per Lindqvist and his colleagues (2008), wanted to learn

how the families of teenage suicide victims cope with their loss. They did not have a specific research question or hypothesis, such as, what percentage of family members join suicide support groups? Instead, they wanted to understand the variety of reactions that families had, with a focus on what it is like from *their* perspectives. To do this, they interviewed the families of 10 teenage suicide victims in their homes in rural Sweden. The interviews were relatively unstructured, beginning with a general request for the families to talk about the victim and ending with an invitation to talk about anything else that they wanted to tell the interviewer. One of the most important themes that emerged from these interviews was that even as life returned to "normal," the families continued to struggle with the question of why their loved one committed suicide. This struggle appeared to be especially difficult for families in which the suicide was most unexpected. This relationship can now be explored using quantitative research. But it is unclear whether this question would have arisen at all without the researchers sitting down with the families and listening to what they themselves wanted to say about their experience.

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Descriptive Research

There are many research methods available to psychologists in their efforts to understand, describe, and explain behavior. Some methods rely on observational techniques. Other approaches involve interactions between the researcher and the individuals who are being studied—ranging from a series of simple questions to extensive, in-depth interviews—to well-controlled experiments. The main categories of psychological research are descriptive, correlational, and experimental research. Each of these research methods has unique strengths and weaknesses, and each method may only be appropriate for certain types of research questions.

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Research studies that do not test specific relationships between variables are called **descriptive studies**. For this method, the research question or hypothesis can be about a single variable (e.g., How accurate are people's first impressions?) or can be a broad and exploratory question (e.g., What is it like to be a working mother diagnosed with depression?). The variable of the study is measured and reported without any further relationship analysis. A researcher might choose this method if they only needed to report information, such as a tally, an average, or a list of responses. Descriptive research can answer interesting and important questions, but what it cannot do is answer questions about relationships between variables.

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Video 2.4.1. *Descriptive Research Design* provides explanation and examples for quantitative descriptive research. A closed-captioned version of this video is available here.

Descriptive research is distinct from **correlational research**, in which researchers formally test whether a relationship exists between two or more variables. **Experimental research** goes a step further beyond descriptive and correlational research and randomly assigns people to different conditions, using hypothesis testing to make inferences about causal relationships between variables. We will discuss each of these methods more in-depth later.

Table 2.4.1. Comparison of research design methods

Research design	Goal	Advantages	Disadvantages
Descriptive	To create a snapshot of the current state of affairs	Provides a relatively complete picture of what is occurring at a given time. Allows the development of questions for further study.	Does not assess relationships among variables. Maybe unethical if participants do not know they are being observed.
Correlational	To assess the relationships between and among two or more variables	Allows testing of expected relationships between and among variables and the making of predictions. Can assess these relationships in everyday life events.	Cannot be used to draw inferences about the causal relationships between and among the variables.
Experimental	To assess the causal impact of one or more experimental manipulations on a dependent variable	Allows drawing conclusions about the causal relationships among variables.	Cannot experimentally manipulate many important variables. May be expensive and time-consuming.

Source: Stangor, 2011.

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Methods of Data Collection

Regardless of the method of research, data collection will be necessary. The method of data collection selected will primarily depend on the type of information the researcher needs for their study; however, other factors, such as time, resources, and even ethical considerations can influence the selection of a data collection method. All of these factors need to be considered when selecting a data collection method because each method has unique strengths and weaknesses. We will discuss the uses and assessment of the most common data collection methods: observation, surveys, archival data, and tests.

Observation

The observational method involves the watching and recording of a specific behavior of participants. In general, observational studies have the strength of allowing the researcher to see for themselves how people behave. However, observations may require more time and man-power than other data collection methods, often resulting in smaller samples of participants. Researchers may spend significant time waiting to observe a behavior, or the behavior may never occur during observation. It is important to remember that people tend to change their behavior when they know they are being watched (known as the **Hawthorne effect**).

Observations may be done in a naturalist setting to reduce the likelihood of the Hawthorne effect. During naturalistic observations, the participants are in their natural environment and are usually unaware that they are being observed. For example, observing students participating in their class would be a naturalist observation. The downside of a naturalistic setting is that the research doesn't have control over the environment. Imagine that

the researcher goes to the classroom to observe those students, and there is a substitute teacher. The change in instructor that day could impact student behavior and skew the data.

If controlling the environment is a concern, a laboratory setting may be a better choice. In the laboratory environment, the researcher can manage confounding factors or distractions that might impact the participants' behavior. Of course, there are expenses associated with maintaining a laboratory setting, increasing the cost of the study, that would not be associated with naturalist observations. And, again, the Hawthorne effect may impact behavior.

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Surveys

Surveys are familiar to most people because they are so widely used. This method enhances accessibility to subjects because they can be conducted in person, over the phone, through the mail, or online, and are commonly used by researchers to gather information on many variables in a relatively short period of time.

Most surveys involve asking a standard set of questions to a group

of participants. In a highly structured survey, subjects are forced to choose from a response set such as "strongly disagree, disagree, undecided, agree, strongly agree"; or "0, 1-5, 6-10, etc." One of the benefits of having forced-choice items is that each response is coded so that the results can be quickly entered and analyzed using statistical software. While this type of survey typically yields surface information on a wide variety of factors, they may not allow for an in-depth understanding of human behavior.

Of course, surveys can be designed in a number of ways. Some surveys ask open-ended questions, allowing each participant to devise their own response, allowing for a variety of answers. This variety may provide deeper insight into the subject than forced-choice questions, but makes comparing answers challenging. Imagine a survey question that asked participants to report how they are feeling today. If there were 100 participants, there could be 100 different answers, which is more challenging and takes more time to code and analyze.

Surveys are useful in examining stated values, attitudes, opinions, and reporting on practices. However, they are based on self-report, and this can limit accuracy. For a variety of reasons, people may not provide honest or complete answers. Participants may be concerned with projecting a particular image through their responses, they may be uncomfortable answering the questions, inaccurately assess their behavior, or they may lack awareness of the behavior being assessed. So, while surveys can provide a lot of information for many participants quickly and easily, the self-reporting may not be as accurate as other methods.

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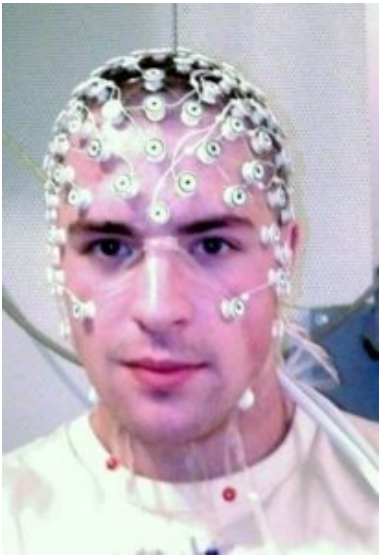
Content Analysis of Archival data

Content analysis involves looking at media such as old texts, pictures, commercials, lyrics, or other materials to explore patterns or themes in culture. An example of content analysis is the classic history of childhood by Aries (1962) called "Centuries of Childhood" or the analysis of television commercials for sexual or violent content or for ageism. Passages in text or television programs can be randomly selected for analysis as well. Again, one advantage of analyzing work such as this is that the researcher does not have to go through the time and expense of finding respondents, but the researcher cannot know how accurately the media reflects the actions and sentiments of the population.

Secondary content analysis, or archival research, involves analyzing information that has already been collected or examining documents or media to uncover attitudes, practices, or preferences. There are a number of data sets available to those who wish to conduct this type of research. The researcher conducting secondary analysis does not have to recruit subjects but does need to know the quality of the information collected in the original study. And unfortunately, the researcher is limited to the questions asked and data collected originally.

Tests



Many variables studied by psychologists—perhaps the majority—are not so straightforward or simple to measure. These kinds of variables are called constructs and include personality traits, emotional states, attitudes, and abilities. Psychological constructs cannot be observed directly. One reason is that they often represent *tendencies* to think, feel, or act in certain ways. For example, to say that a particular college student is highly extroverted does not necessarily mean that she is behaving in an extroverted way right now. Another reason psychological constructs cannot be observed directly is that they often involve internal processes, like thoughts or feelings. For these psychological constructs, we need another means for collecting data. Tests will serve this purpose.

A good test will aid researchers in assessing a particular psychological construct. What is a good test? Researchers want a test that is standardized, reliable, and valid. A standardized test is one that is administered, scored, and analyzed in the same way for each participant. This minimizes differences in test scores due to confounding factors, such as variability in the testing environment or scoring process, and assures that scores are comparable. Reliability refers to the consistency of a measure. Researchers consider three types of consistency: over time (test-retest reliability), across items (internal consistency), and across different

researchers (interrater reliability). Validity is the extent to which the scores from a measure represent the variable they are intended to. When a measure has good test-retest reliability and internal consistency, researchers should be more confident that the scores represent what they are supposed to.

There are various types of tests used in psychological research. Self-report measures are those in which participants report on their own thoughts, feelings, and actions, such as the Rosenberg Self-Esteem Scale or the Big Five Personality Test. Some tests measure performance, ability, aptitude, or skill, like the Stanford-Binet Intelligence Scale or the SATs.There are also tests that measure physiological states, including electrical activity or blood flow in the brain.

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Video 2.5.1. *Methods of Data Collection* explains various means for gathering data for quantitative and qualitative research. A closed-captioned version of this video is available here.

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Reliability and Validity

Reliability and **validity** are two important considerations that must be made with any type of data collection. Reliability refers to the ability to consistently produce a given result. In the context of psychological research, this would mean that any instruments or tools used to collect data do so in consistent, reproducible ways. Unfortunately, being consistent in measurement does not necessarily mean that you have measured something correctly. To illustrate this concept, consider a kitchen scale that would be used to measure the weight of cereal that you eat in the morning. If the scale is not properly calibrated, it may consistently under- or overestimate the amount of cereal that's being measured. While the scale is highly reliable in producing consistent results (e.g., the same amount of cereal poured onto the scale produces the same reading each time), those results are incorrect. This is where validity comes into play. Validity refers to the extent to which a given instrument or tool accurately measures what it's supposed to measure. While any valid measure is by necessity reliable, the reverse is not necessarily true. Researchers strive to use instruments that are both highly reliable and valid.
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Everyday Connection: How Valid Is the SAT?

Standardized tests like the SAT are supposed to measure an individual's aptitude for a college education, but how reliable and valid are such tests? Research conducted by the College Board suggests that scores on the SAT have high predictive validity for first-year college students' GPA

(Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008). In this context, predictive validity refers to the test's ability to effectively predict the GPA of college freshmen. Given that many institutions of higher education require the SAT for admission, this high degree of predictive validity might be comforting.

However, the emphasis placed on SAT scores in college admissions has generated some controversy on a number of fronts. For one, some researchers assert that the SAT is a biased test that places minority students at a disadvantage and unfairly reduces the likelihood of being admitted into a college (Santelices & Wilson, 2010). Additionally, some research has suggested that the predictive validity of the SAT is grossly exaggerated in how well it is able to predict the GPA of first-year college students. In fact, it has been suggested that the SAT's predictive validity may be overestimated by as much as 150% (Rothstein, 2004). Many institutions of higher education are beginning to consider de-emphasizing the significance of SAT scores in making admission decisions (Rimer, 2008).

In 2014, College Board president David Coleman expressed his awareness of these problems, recognizing that college success is more accurately predicted by high school grades than by SAT scores. To address these concerns, he has called for significant changes to the SAT exam (Lewin, 2014).

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Analyzing Data: Correlational and Experimental Research

Did you know that as sales in ice cream increase, so does the overall rate of crime? Is it possible that indulging in your favorite flavor of ice cream could send you on a crime spree? Or, after committing a crime, do you think you might decide to treat yourself to a cone? There is no question that a relationship exists between ice cream and crime (e.g., Harper, 2013), but does one thing actually caused the other to occur.

It is much more likely that both ice cream sales and crime rates are related to the temperature outside. When the temperature is warm, there are lots of people out of their houses, interacting with each other, getting annoyed with one another, and sometimes committing crimes. Also, when it is warm outside, we are more likely to seek a refreshing treat like ice cream. How do we determine if there is indeed a relationship between two things? And when there is a relationship, how can we discern whether it is attributable to coincidence or causation? We do this through statistical analysis of the data. Which analysis we use will depend on several conditions outlined next.

Introduction to Statistical Thinking

***Figure 2.6.1**. People around the world differ in their preferences for drinking coffee versus drinking tea. Would the results of the coffee study be the same in Canada as in China? [Image: Duncan, https://goo.gl/vbMyTm, CC BY-NC 2.0, https://goo.gl/l8UUGY]*

Does drinking coffee actually increase your life expectancy? A recent study (Freedman, Park, Abnet, Hollenbeck, & Sinha, 2012) found that men who drank at least six cups of coffee a day had a 10% lower chance of dying (women 15% lower) than those who drank none. Does this mean you should pick up or increase your own coffee habit? Modern society has become awash in studies such as this; you can read about several such studies in the news every day. Conducting such a study well, and interpreting the results of such studies requires understanding basic ideas of **statistics**, the science of gaining insight from data. Key components to a statistical investigation are:

- Planning the study: Start by asking a testable research question and deciding how to collect data. For example, how long was the study period of the coffee study? How many people were recruited for the study, how were they recruited, and from where? How old were they? What other variables were recorded about the individuals? Were changes made to the participants' coffee habits during the course of the study?
- Examining the data: What are appropriate ways to examine the data? What graphs are relevant, and what do they reveal? What descriptive statistics can be calculated to summarize relevant aspects of the data, and what do they reveal? What patterns do you see in the data? Are there any individual observations that deviate from the overall pattern, and what do they reveal? For

example, in the coffee study, did the proportions differ when we compared the smokers to the non-smokers?
- Inferring from the data: What are valid statistical methods for drawing inferences "beyond" the data you collected? In the coffee study, is the 10%–15% reduction in risk of death something that could have happened just by chance?
- Drawing conclusions: Based on what you learned from your data, what conclusions can you draw? Who do you think these conclusions apply to? (Were the people in the coffee study older? Healthy? Living in cities?) Can you draw a **cause-and-effect** conclusion about your treatments? (Are scientists now saying that the coffee drinking is the cause of the decreased risk of death?)

Notice that the numerical analysis ("crunching numbers" on the computer) comprises only a small part of overall statistical investigation. In this section, you will see how we can answer some of these questions and what questions you should be asking about any statistical investigation you read about.

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Video 2.6.1. *Types of Statistical Studies* explains the differences between correlational and experimental research.

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here:
https://edpsych.pressbooks.sunycreate.cloud/?p=40#oembed-2

Distributional Thinking

When data are collected to address a particular question, an important first step is to think of meaningful ways to organize and examine the data. Let's take a look at an example.

Example 1: Researchers investigated whether cancer pamphlets are written at an appropriate level to be read and understood by cancer patients (Short, Moriarty, & Cooley, 1995). Tests of reading ability were given to 63 patients. In addition, readability level was determined for a **sample** of 30 pamphlets, based on characteristics such as the lengths of words and sentences in the pamphlet. The results, reported in terms of grade levels, are displayed in Figure 2.6.2.

Patients' reading levels	< 3	3	4	5	6	7	8	9	10	11	12	> 12	Total
Count (number of patients)	6	4	4	3	3	2	6	5	4	7	2	17	63

Pamphlet's readability levels	6	7	8	9	10	11	12	13	14	15	16	Total
Count (number of pamphlets)	3	3	8	4	1	1	4	2	1	2	1	30

Figure 2.6.2. Frequency tables of patient reading levels and pamphlet readability levels.

Testing these two variables reveal two fundamental aspects of statistical thinking:

- Data vary. More specifically, values of a variable (such as reading level of a cancer patient or readability level of a cancer pamphlet) vary.
- Analyzing the pattern of variation, called the **distribution** of the variable, often reveals insights.

Addressing the research question of whether the cancer pamphlets are written at appropriate levels for the cancer patients requires comparing the two distributions. A naïve comparison might focus only on the centers of the distributions. Both medians turn out to be ninth grade, but considering only medians ignores the variability and the overall distributions of these data. A more illuminating approach is to compare the entire distributions, for example with a graph, as in Figure 2.6.3.

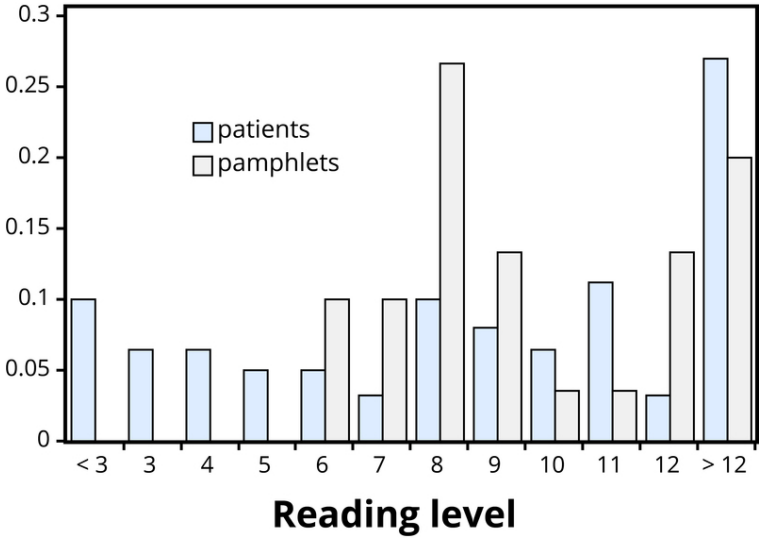

Figure 2.6.3. makes clear that the two distributions are not well aligned at all.

The most glaring discrepancy is that many patients (17/63, or 27%, to be precise) have a reading level below that of the most readable pamphlet. These patients will need help to understand the information provided in the cancer pamphlets. Notice that this conclusion follows from considering the distributions as a whole, not simply measures of center or variability, and that the graph contrasts those distributions more immediately than the frequency tables.

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Statistical Significance

Even when we find patterns in data, often there is still uncertainty in various aspects of the data. For example, there may be potential for measurement errors (even your own body temperature can fluctuate by almost 1°F over the course of the day). Or we may only have a "snapshot" of observations from a more long-term process or only a small subset of individuals from the **population** of interest. In such cases, how can we determine whether patterns we see in our small set of data is convincing evidence of a systematic phenomenon in the larger process or population? Let's take a look at another example.

Example 2: In a study reported in the November 2007 issue of *Nature*, researchers investigated whether pre-verbal infants take into account an individual's actions toward others in evaluating that individual as appealing or aversive (Hamlin, Wynn, & Bloom, 2007). In one component of the study, 10-month-old infants were shown a "climber" character (a piece of wood with "googly" eyes glued onto it) that could not make it up a hill in two tries. Then the infants were shown two scenarios for the climber's next try, one where the climber was pushed to the top of the hill by another character ("helper"), and one where the climber was pushed back down the hill by another character ("hinderer"). The infant was alternately shown these two scenarios several times. Then the infant was presented

with two pieces of wood (representing the helper and the hinderer characters) and asked to pick one to play with.

The researchers found that of the 16 infants who made a clear choice, 14 chose to play with the helper toy. One possible explanation for this clear majority result is that the helping behavior of the one toy increases the infants' likelihood of choosing that toy. But are there other possible explanations? What about the color of the toy? Well, prior to collecting the data, the researchers arranged so that each color and shape (red square and blue circle) would be seen by the same number of infants. Or maybe the infants had right-handed tendencies and so picked whichever toy was closer to their right hand?

Well, prior to collecting the data, the researchers arranged it so half the infants saw the helper toy on the right and half on the left. Or, maybe the shapes of these wooden characters (square, triangle, circle) had an effect? Perhaps, but again, the researchers controlled for this by rotating which shape was the helper toy, the hinderer toy, and the climber. When designing experiments, it is important to *control* for as many variables as might affect the responses as possible. It is beginning to appear that the researchers accounted for all the other plausible explanations. But there is one more important consideration that cannot be controlled—if we did the study again with these 16 infants, they might not make the same choices. In other words, there is some *randomness* inherent in their selection process.

P-value

Maybe each infant had no genuine preference at all, and it was simply "random luck" that led to 14 infants picking the helper toy. Although this random component cannot be controlled, we can apply a *probability model* to investigate the pattern of results that would occur in the long run if random chance were the only factor.

If the infants were equally likely to pick between the two toys, then each infant had a 50% chance of picking the helper toy. It's like each infant tossed a coin, and if it landed heads, the infant picked the helper toy. So if we tossed a coin 16 times, could it land heads 14 times? Sure, it's possible, but it turns out to be very unlikely. Getting 14 (or more) heads in 16 tosses is about as likely as tossing a coin and getting 9 heads in a row. This probability is referred to as a **p-value**. The p-value represents the likelihood that experimental results happened by chance. Within psychology, the most common standard for p-values is "p < .05". What this means is that there is less than a 5% probability that the results happened just by random chance, and therefore a 95% probability that the results reflect a meaningful pattern in human psychology. We call this **statistical significance**.

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So, in the study above, if we assume that each infant was choosing equally, then the probability that 14 or more out of 16 infants would choose the helper toy is found to be 0.0021. We have only two logical possibilities: either the infants have a genuine preference for the helper toy, or the infants have no preference (50/50), and an outcome that would occur only 2 times in 1,000 iterations happened in this study. Because this p-value of 0.0021 is quite small, we conclude that the study provides very strong evidence that these infants have a genuine preference for the helper toy.

If we compare the p-value to some cut-off value, like 0.05, we see that the p=value is smaller. Because the p-value is smaller than that cut-off value, then we reject the hypothesis that only random

chance was at play here. In this case, these researchers would conclude that *significantly* more than half of the infants in the study chose the helper toy, giving strong evidence of a genuine preference for the toy with the helping behavior.

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Generalizability

***Figure 2.6.4**. Generalizability is an important research consideration: The results of studies with widely representative samples are more likely to generalize to the population. [Image: Barnacles Budget Accommodation]*

One limitation to the study mentioned previously about the babies choosing the "helper" toy is that the conclusion only applies to the 16 infants in the study. We don't know much about how those 16 infants were selected. Suppose we want to select a subset of individuals (a **sample**) from a much larger group of individuals (the **population**) in such a way that conclusions from the sample can be **generalized** to the larger population. This is the question faced by pollsters every day.

Example 3: The General Social Survey (GSS) is a survey on societal trends conducted every other year in the United States. Based on a sample of about 2,000 adult Americans, researchers make claims about what percentage of the U.S. population consider themselves

to be "liberal," what percentage consider themselves "happy," what percentage feel "rushed" in their daily lives, and many other issues. The key to making these claims about the larger population of all American adults lies in how the sample is selected. The goal is to select a sample that is representative of the population, and a common way to achieve this goal is to select a **random sample** that gives every member of the population an equal chance of being selected for the sample. In its simplest form, random sampling involves numbering every member of the population and then using a computer to randomly select the subset to be surveyed. Most polls don't operate exactly like this, but they do use probability-based sampling methods to select individuals from nationally representative panels.

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In 2004, the GSS reported that 817 of 977 respondents (or 83.6%) indicated that they always or sometimes feel rushed. This is a clear majority, but we again need to consider variation due to *random sampling*. Fortunately, we can use the same probability model we did in the previous example to investigate the probable size of this error. (Note, we can use the coin-tossing model when the actual population size is much, much larger than the sample size, as then we can still consider the probability to be the same for every individual in the sample.) This probability model predicts that the sample result will be within 3 percentage points of the population value (roughly 1 over the square root of the sample size, the **margin of error**). A statistician would conclude, with 95% confidence, that

between 80.6% and 86.6% of all adult Americans in 2004 would have responded that they sometimes or always feel rushed.

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The key to the margin of error is that when we use a probability sampling method, we can make claims about how often (in the long run, with repeated random sampling) the sample result would fall within a certain distance from the unknown population value by chance (meaning by random sampling variation) alone. Conversely, non-random samples are often suspect to bias, meaning the sampling method systematically over-represents some segments of the population and under-represents others. We also still need to consider other sources of bias, such as individuals not responding honestly. These sources of error are not measured by the margin of error.

Cause and Effect Conclusions

In many research studies, the primary question of interest concerns differences between groups. Then the question becomes how were the groups formed (e.g., selecting people who already drink coffee vs. those who don't). In some studies, the researchers actively form the groups themselves. But then we have a similar question—could any differences we observe in the groups be an artifact of that group-formation process? Or maybe the difference we observe in

the groups is so large that we can discount a "fluke" in the group-formation process as a reasonable explanation for what we find?

Example 4: A psychology study investigated whether people tend to display more creativity when they are thinking about intrinsic (internal) or extrinsic (external) motivations (Ramsey & Schafer, 2002, based on a study by Amabile, 1985). The subjects were 47 people with extensive experience with creative writing. Subjects began by answering survey questions about either intrinsic motivations for writing (such as the pleasure of self-expression) or extrinsic motivations (such as public recognition). Then all subjects were instructed to write a haiku, and those poems were evaluated for creativity by a panel of judges. The researchers conjectured beforehand that subjects who were thinking about intrinsic motivations would display more creativity than subjects who were thinking about extrinsic motivations. The creativity scores from the 47 subjects in this study are displayed in Figure 2.6.5, where higher scores indicate more creativity.

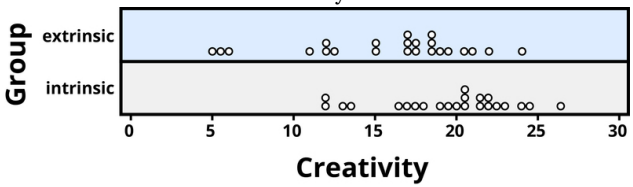

Figure 2.6.3. Comparison of patient reading levels and pamphlet readability levels.

In this example, the key question is whether the type of motivation *affects* creativity scores. In particular, do subjects who were asked about intrinsic motivations tend to have higher creativity scores than subjects who were asked about extrinsic motivations?

Figure 2.6.5 reveals that both motivation groups saw considerable variability in creativity scores, and these scores have considerable overlap between the groups. In other words, it's certainly not always the case that those with extrinsic motivations have higher creativity than those with intrinsic motivations, but there may still be a

statistical *tendency* in this direction. (Psychologist Keith Stanovich (2013) refers to people's difficulties with thinking about such probabilistic tendencies as "the Achilles heel of human cognition.")

The mean creativity score is 19.88 for the intrinsic group, compared to 15.74 for the extrinsic group, which supports the researchers' conjecture. Yet comparing only the means of the two groups fails to consider the variability of creativity scores in the groups. We can measure variability with statistics using, for instance, the standard deviation: 5.25 for the extrinsic group and 4.40 for the intrinsic group. The standard deviations tell us that most of the creativity scores are within about 5 points of the mean score in each group. We see that the mean score for the intrinsic group lies within one standard deviation of the mean score for the extrinsic group. So, although there is a tendency for the creativity scores to be higher in the intrinsic group, on average, the difference is not extremely large.

We again want to consider possible explanations for this difference. The study only involved individuals with extensive creative writing experience. Although this limits the population to which we can generalize, it does not explain why the mean creativity score was a bit larger for the intrinsic group than for the extrinsic group. Maybe women tend to receive higher creativity scores? Here is where we need to focus on how the individuals were assigned to the motivation groups. If only women were in the intrinsic motivation group and only men in the extrinsic group, then this would present a problem because we wouldn't know if the intrinsic group did better because of the different types of motivation or because they were women. However, the researchers guarded against such a problem by randomly assigning the individuals to the motivation groups. Like flipping a coin, each individual was just as likely to be assigned to either type of motivation. Why is this helpful? Because this **random assignment** tends to balance out all the variables related to creativity we can think of, and even those we don't think of in advance, between the two groups. So we should have a similar male/female split between

the two groups; we should have a similar age distribution between the two groups; we should have a similar distribution of educational background between the two groups; and so on. Random assignment should produce groups that are as similar as possible except for the type of motivation, which presumably eliminates all those other variables as possible explanations for the observed tendency for higher scores in the intrinsic group.

But does this always work? No, so by "luck of the draw" the groups may be a little different prior to answering the motivation survey. So then the question is, is it possible that an unlucky random assignment is responsible for the observed difference in creativity scores between the groups? In other words, suppose each individual's poem was going to get the same creativity score no matter which group they were assigned to, that the type of motivation in no way impacted their score. Then how often would the random-assignment process alone lead to a difference in mean creativity scores as large (or larger) than 19.88 − 15.74 = 4.14 points?

We again want to apply a probability model to approximate a **p-value**, but this time the model will be a bit different. Think of writing everyone's creativity scores on an index card, shuffling up the index cards, and then dealing out 23 to the extrinsic motivation group and 24 to the intrinsic motivation group, and finding the difference in the group means. We (better yet, the computer) can repeat this process over and over to see how often, when the scores don't change, random assignment leads to a difference in means at least as large as 4.41. Figure 2.6.6 shows the results from 1,000 such hypothetical random assignments for these scores.

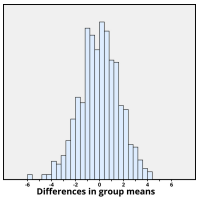

Figure 2.6.6. *Differences in group means under random assignment alone.*

Only 2 of the 1,000 simulated random assignments produced a difference in group means of 4.41 or larger. In other words, the approximate p-value is 2/1000 = 0.002. This small p-value indicates that it would be very surprising for the random assignment process alone to produce such a large difference in group means. Therefore, as with Example 4, we have strong evidence that focusing on intrinsic motivations tends to increase creativity scores, as compared to thinking about extrinsic motivations.

Notice that the previous statement implies a cause-and-effect relationship between motivation and creativity score; is such a strong conclusion justified? Yes, because of the random assignment used in the study. That should have balanced out any other variables between the two groups, so now that the small p-value convinces us that the higher mean in the intrinsic group wasn't just a coincidence, the only reasonable explanation left is the difference in the type of motivation. Can we generalize this conclusion to everyone? Not necessarily—we could cautiously generalize this conclusion to individuals with extensive experience in creative writing similar to the individuals in this study, but we would still want to know more about how these individuals were selected to participate.

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Conclusion

***Figure 2.6.7**. Researchers employ the scientific method that involves a great deal of statistical thinking: generate a hypothesis –> design a study to test that hypothesis –> conduct the study –> analyze the data –> report the results. [Image: widdowquinn]*

Statistical thinking involves the careful design of a study to collect meaningful data to answer a focused research question, detailed analysis of patterns in the data, and drawing conclusions that go beyond the observed data. Random sampling is paramount to generalizing results from our sample to a larger population, and random assignment is key to drawing cause-and-effect conclusions. With both kinds of randomness, probability models help us assess how much random variation we can expect in our results, in order to determine whether our results could happen by chance alone and to estimate a margin of error.

So where does this leave us with regard to the coffee study mentioned previously (the Freedman, Park, Abnet, Hollenbeck, & Sinha, 2012 found that men who drank at least six cups of coffee a day had a 10% lower chance of dying (women 15% lower) than those who drank none)? We can answer many of the questions:

- This was a 14-year study conducted by researchers at the National Cancer Institute.
- The results were published in the June issue of the *New England Journal of Medicine*, a respected, peer-reviewed journal.
- The study reviewed coffee habits of more than 402,000 people ages 50 to 71 from six states and two metropolitan areas. Those with cancer, heart disease, and stroke were excluded at the

start of the study. Coffee consumption was assessed once at the start of the study.
- About 52,000 people died during the course of the study.
- People who drank between two and five cups of coffee daily showed a lower risk as well, but the amount of reduction increased for those drinking six or more cups.
- The sample sizes were fairly large and so the p-values are quite small, even though the percent reduction in risk was not extremely large (dropping from a 12% chance to about 10%–11%).
- Whether coffee was caffeinated or decaffeinated did not appear to affect the results.
- This was an observational study, so no cause-and-effect conclusions can be drawn between coffee drinking and increased longevity, contrary to the impression conveyed by many news headlines about this study. In particular, it's possible that those with chronic diseases don't tend to drink coffee.

This study needs to be reviewed in the larger context of similar studies and consistency of results across studies, with the constant caution that this was not a randomized experiment. Whereas a statistical analysis can still "adjust" for other potential confounding variables, we are not yet convinced that researchers have identified them all or completely isolated why this decrease in death risk is evident. Researchers can now take the findings of this study and develop more focused studies that address new questions.

Learn More

Explore these outside resources to learn more about applied statistics:

- Video about p-values: P-Value Extravaganza
- Interactive web applets for teaching and learning statistics
- Inter-university Consortium for Political and Social Research where you can find and analyze data.
- The Consortium for the Advancement of Undergraduate Statistics

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Correlational Research

Correlation means that there is a relationship between two or more variables (such as ice cream consumption and crime), but this relationship does not necessarily imply cause and effect. When two variables are correlated, it simply means that as one variable changes, so does the other. We can measure correlation by calculating a statistic known as a correlation coefficient. A **correlation coefficient** is a number from -1 to +1 that indicates the strength and direction of the relationship between variables. The correlation coefficient is usually represented by the letter *r*.

The number portion of the correlation coefficient indicates the strength of the relationship. The closer the number is to 1 (be it negative or positive), the more strongly related the variables are, and the more predictable changes in one variable will be as the other variable changes. The closer the number is to zero, the weaker the relationship and the less predictable the relationship between the variables becomes. For instance, a correlation coefficient of 0.9 indicates a far stronger relationship than a correlation coefficient of 0.3. If the variables are not related to one another at all, the correlation coefficient is 0. The example above about ice cream and crime is an example of two variables that we might expect to have no relationship to each other.

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The sign—positive or negative—of the correlation coefficient indicates the direction of the relationship (Figure 2.2). A **positive**

correlation means that the variables move in the same direction. Put another way, it means that as one variable increases so does the other, and conversely, when one variable decreases so does the other. A **negative correlation** means that the variables move in opposite directions. If two variables are negatively correlated, a decrease in one variable is associated with an increase in the other and vice versa.

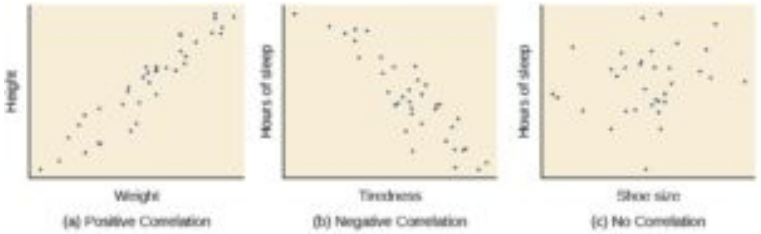

Figure 2.7.1. Scatterplots are a graphical view of the strength and direction of correlations. The stronger the correlation, the closer the data points are to a straight line. In these examples, we see that there is (a) a positive correlation between weight and height, (b) a negative correlation between tiredness and hours of sleep, and (c) no correlation between shoe size and hours of sleep.

The example of ice cream and crime rates is a positive correlation because both variables increase when temperatures are warmer. Other examples of positive correlations are the relationship between an individual's height and weight or the relationship between a person's age and number of wrinkles. One might expect a negative correlation to exist between someone's tiredness during the day and the number of hours they slept the previous night: the amount of sleep decreases as the feelings of tiredness increase. In a real-world example of negative correlation, student researchers at the University of Minnesota found a weak negative correlation (r = -0.29) between the average number of days per week that students got fewer than 5 hours of sleep and their GPA (Lowry, Dean, & Manders, 2010). Keep in mind that a negative correlation is not the

same as no correlation. For example, we would probably find no correlation between hours of sleep and shoe size.

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Video 2.7.1. *Correlational Research Design* provides explanation and examples for correlational research. A closed-captioned version of this video is available here.

Exercise 2.1. Manipulating Scatterplots

Manipulate this interactive scatterplot to practice your understanding of positive and negative correlations.

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As mentioned earlier, correlations have predictive value. Imagine that you are on the admissions committee of a major university. You are faced with a massive number of applications, but you are

able to accommodate only a small percentage of the applicant pool. How might you decide who should be admitted? You might try to correlate your current students' college GPA with their scores on standardized tests like the SAT or ACT. By observing which correlations were strongest for your current students, you could use this information to predict the relative success of those students who have applied for admission into the university.

Correlation Does Not Indicate Causation

Correlational research is useful because it allows us to discover the strength and direction of relationships that exist between two variables. However, correlation is limited because establishing the existence of a relationship tells us little about cause and effect. While variables are sometimes correlated because one does cause the other, it could also be that some other factor, a confounding variable, is actually causing the systematic movement in our variables of interest. In the ice cream/crime rate example mentioned earlier, temperature is a confounding variable that could account for the relationship between the two variables.

Even when we cannot point to clear confounding variables, we should not assume that a correlation between two variables implies that one variable causes changes in another. This can be frustrating when a cause-and-effect relationship seems clear and intuitive. Think back to our discussion of the research done by the American Cancer Society and how their research projects were some of the first demonstrations of the link between smoking and cancer. It seems reasonable to assume that smoking causes cancer, but if we were limited to correlational research, we would be overstepping our bounds by making this assumption.

Unfortunately, people mistakenly make claims of causation as a function of correlations all the time. Such claims are especially common in advertisements and news stories. For example, recent

research found that people who eat cereal on a regular basis achieve healthier weights than those who rarely eat cereal (Frantzen, Treviño, Echon, Garcia-Dominic, & DiMarco, 2013; Barton et al., 2005). Guess how the cereal companies report this finding. Does eating cereal really cause an individual to maintain a healthy weight, or are there other possible explanations, such as, someone at a healthy weight is more likely to regularly eat a healthy breakfast than someone who is obese or someone who avoids meals in an attempt to diet? While correlational research is invaluable in identifying relationships among variables, a significant limitation is the inability to establish causality. Psychologists want to make statements about cause and effect, but the only way to do that is to conduct an experiment to answer a research question. The next section describes how scientific experiments incorporate methods that eliminate or control for alternative explanations, which allow researchers to explore how changes in one variable cause changes in another variable.

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https://edpsych.pressbooks.sunycreate.cloud/?p=41#oembed-1

Video 2.7.2. *Correlation and Causality* provides explanationfor why correlation does not imply causality.

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Illusory Correlations

The temptation to make erroneous cause-and-effect statements based on correlational research is not the only way we tend to misinterpret data. We also tend to make the mistake of illusory correlations, especially with unsystematic observations. **Illusory correlations**, or false correlations, occur when people believe that relationships exist between two things when no such relationship exists. One well-known illusory correlation is the supposed effect that the moon's phases have on human behavior. Many people passionately assert that human behavior is affected by the phase of the moon, and specifically, that people act strangely when the moon is full (Figure 2).

***Figure 2**. Many people believe that a full moon makes people behave oddly. (credit: Cory Zanker)*

There is no denying that the moon exerts a powerful influence on our planet. The ebb and flow of the ocean's tides are tightly tied to the gravitational forces of the moon. Many people believe, therefore, that it is logical that we are affected by the moon as well. After all, our bodies are largely made up of water. A meta-analysis of nearly 40 studies consistently demonstrated, however, that the relationship between the moon and our behavior does not exist (Rotton & Kelly, 1985).

While we may pay more attention to odd behavior during the full phase of the moon, the rates of odd behavior remain constant throughout the lunar cycle. Why are we so apt to believe in illusory correlations like this? Often we read or hear about them and simply accept the information as valid. Or, we have a hunch about how something works and then look for evidence to support that hunch, ignoring evidence that would tell us our hunch is false; this is known as **confirmation bias**. Other times, we find illusory correlations based on the information that comes most easily to mind, even if that information is severely limited. And while we may feel confident that we can use these relationships to better understand and predict the world around us, illusory correlations can have significant drawbacks. For example, research suggests that illusory correlations—in which certain behaviors are inaccurately attributed to certain groups—are involved in the formation of prejudicial attitudes that can ultimately lead to discriminatory behavior (Fiedler, 2004).

Experimental Research

As you've learned, the only way to establish that there is a cause-and-effect relationship between two variables is to conduct a scientific experiment. Experiment has a different meaning in the scientific context than in everyday life. In everyday conversation, we often use it to describe trying something for the first time, such as experimenting with a new hairstyle or new food. However, in the scientific context, an experiment has precise requirements for design and implementation.

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Video 2.8.1. *Experimental Research Design* provides explanation and examples for correlational research. A closed-captioned version of this video is available here.

The Experimental Hypothesis

In order to conduct an experiment, a researcher must have a specific hypothesis to be tested. As you've learned, hypotheses can be formulated either through direct observation of the real world or after careful review of previous research. For example, if you think that children should not be allowed to watch violent programming on television because doing so would cause them to behave more violently, then you have basically formulated a hypothesis—namely,

that watching violent television programs causes children to behave more violently. How might you have arrived at this particular hypothesis? You may have younger relatives who watch cartoons featuring characters using martial arts to save the world from evildoers, with an impressive array of punching, kicking, and defensive postures. You notice that after watching these programs for a while, your young relatives mimic the fighting behavior of the characters portrayed in the cartoon. Seeing behavior like this right after a child watches violent television programming might lead you to hypothesize that viewing violent television programming leads to an increase in the display of violent behaviors. These sorts of personal observations are what often lead us to formulate a specific hypothesis, but we cannot use limited personal observations and anecdotal evidence to test our hypothesis rigorously. Instead, to find out if real-world data supports our hypothesis, we have to conduct an experiment.

Designing an Experiment

The most basic experimental design involves two groups: the experimental group and the control group. The two groups are designed to be the same except for one difference— experimental manipulation. The **experimental group** gets the experimental manipulation—that is, the treatment or variable being tested (in this case, violent TV images)—and the **control group** does not. Since experimental manipulation is the only difference between the experimental and control groups, we can be sure that any differences between the two are due to experimental manipulation rather than chance.

In our example of how violent television programming might affect violent behavior in children, we have the experimental group view violent television programming for a specified time and then measure their violent behavior. We measure the violent behavior

in our control group after they watch nonviolent television programming for the same amount of time. It is important for the control group to be treated similarly to the experimental group, with the exception that the control group does not receive the experimental manipulation. Therefore, we have the control group watch non-violent television programming for the same amount of time as the experimental group.

We also need to define precisely, or operationalize, what is considered violent and nonviolent. An **operational definition** is a description of how we will measure our variables, and it is important in allowing others to understand exactly how and what a researcher measures in a particular experiment. In operationalizing violent behavior, we might choose to count only physical acts like kicking or punching as instances of this behavior, or we also may choose to include angry verbal exchanges. Whatever we determine, it is important that we operationalize violent behavior in such a way that anyone who hears about our study for the first time knows exactly what we mean by violence. This aids peoples' ability to interpret our data as well as their capacity to repeat our experiment should they choose to do so.

Once we have operationalized what is considered violent television programming and what is considered violent behavior from our experiment participants, we need to establish how we will run our experiment. In this case, we might have participants watch a 30-minute television program (either violent or nonviolent, depending on their group membership) before sending them out to a playground for an hour where their behavior is observed and the number and type of violent acts are recorded.

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Ideally, the people who observe and record the children's behavior are unaware of who was assigned to the experimental or control group, in order to control for experimenter bias. **Experimenter bias** refers to the possibility that a researcher's expectations might skew the results of the study. Remember, conducting an experiment requires a lot of planning, and the people involved in the research project have a vested interest in supporting their hypotheses. If the observers knew which child was in which group, it might influence how much attention they paid to each child's behavior as well as how they interpreted that behavior. By being blind to which child is in which group, we protect against those biases. This situation is a **single-blind study**, meaning that the participants are unaware as to which group they are in (experiment or control group) while the researcher knows which participants are in each group.

In a **double-blind study**, both the researchers and the participants are blind to group assignments. Why would a researcher want to run a study where no one knows who is in which group? Because by doing so, we can control for both experimenter and participant expectations. If you are familiar with the phrase **placebo effect**, you already have some idea as to why this is an important consideration. The placebo effect occurs when people's expectations or beliefs influence or determine their experience in a given situation. In other words, simply expecting something to happen can actually make it happen.

The placebo effect is commonly described in terms of testing the effectiveness of a new medication. Imagine that you work in a pharmaceutical company, and you think you have a new drug that is effective in treating depression. To demonstrate that your medication is effective, you run an experiment with two groups: The experimental group receives the medication, and the control group does not. But you don't want participants to know whether they received the drug or not.

Why is that? Imagine that you are a participant in this study, and you have just taken a pill that you think will improve your mood. Because you expect the pill to have an effect, you might feel better simply because you took the pill and not because of any drug actually contained in the pill—this is the placebo effect.

To make sure that any effects on mood are due to the drug and not due to expectations, the control group receives a placebo (in this case, a sugar pill). Now everyone gets a pill, and once again, neither the researcher nor the experimental participants know who got the drug and who got the sugar pill. Any differences in mood between the experimental and control groups can now be attributed to the drug itself rather than to experimenter bias or participant expectations.

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Video 2.8.2. *Introduction to Experimental Design* introduces fundamental elements for experimental research design.

Independent and Dependent Variables

In a research experiment, we strive to study whether changes in one thing cause changes in another. To achieve this, we must pay attention to two important variables, or things that can be changed, in any experimental study: the independent variable and the dependent variable. An **independent variable** is manipulated or controlled by the experimenter. In a well-designed experimental study, the independent variable is the only important difference between the experimental and control groups. In our example of how violent television programs affect children's display of violent behavior, the independent variable is the type of program—violent or nonviolent—viewed by participants in the study (Figure 2.3). A **dependent variable** is what the researcher measures to see how much effect the independent variable had. In our example, the dependent variable is the number of violent acts displayed by the experimental participants.

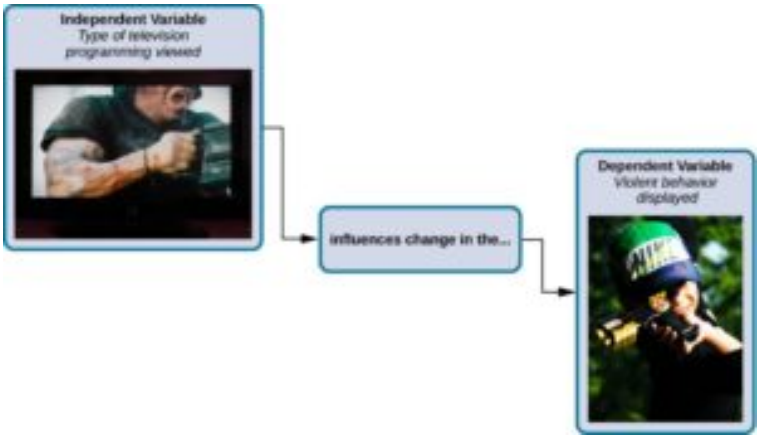

Figure 2.8.1. In an experiment, manipulations of the independent variable are expected to result in changes in the dependent variable.

We expect that the dependent variable will change as a function of the independent variable. In other words, the dependent variable *depends* on the independent variable. A good way to think about the relationship between the independent and dependent variables is with this question: What effect does the independent variable have on the dependent variable? Returning to our example, what effect does watching a half-hour of violent television programming or nonviolent television programming have on the number of incidents of physical aggression displayed on the playground?

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Selecting and Assigning Experimental Participants

Now that our study is designed, we need to obtain a sample of individuals to include in our experiment. Our study involves human participants, so we need to determine who to include. **Participants** are the subjects of psychological research, and as the name implies, individuals who are involved in psychological research actively participate in the process. Often, psychological research projects rely on college students to serve as participants. In fact, the vast majority of research in psychology

subfields has historically involved students as research participants (Sears, 1986; Arnett, 2008). But are college students truly representative of the general population? College students tend to be younger, more educated, more liberal, and less diverse than the general population. Although using students as test subjects is an accepted practice, relying on such a limited pool of research participants can be problematic because it is difficult to generalize findings to the larger population.

Our hypothetical experiment involves children, and we must first generate a sample of child participants. Samples are used because populations are usually too large to reasonably involve every member in our particular experiment (Figure 2.4). If possible, we should use a random sample (there are other types of samples, but for the purposes of this chapter, we will focus on random samples). A **random sample** is a subset of a larger population in which every member of the population has an equal chance of being selected. Random samples are preferred because if the sample is large enough we can be reasonably sure that the participating individuals are representative of the larger population. This means that the percentages of characteristics in the sample—sex, ethnicity, socioeconomic level, and any other characteristics that might affect the results—are close to those percentages in the larger population.

In our example, let's say we decide our population of interest is fourth graders. But all fourth graders is a very large population, so we need to be more specific; instead, we might say our population of interest is all fourth graders in a particular city. We should include students from various income brackets, family situations, races, ethnicities, religions, and geographic areas of town. With this more manageable population, we can work with the local schools in selecting a random sample of around 200 fourth-graders that we want to participate in our experiment.

In summary, because we cannot test all of the fourth graders in a city, we want to find a group of about 200 that reflects the composition of that city. With a representative group, we can

generalize our findings to the larger population without fear of our sample being biased in some way.

(a)

(b)

Figure 2.8.2. Researchers may work with (a) a large population or (b) a sample group that is a subset of the larger population.

Now that we have a sample, the next step of the experimental process is to split the participants into experimental and control groups through random assignment. With **random assignment**, all participants have an equal chance of being assigned to either group. There is statistical software that will randomly assign each of the fourth graders in the sample to either the experimental or the control group.

Random assignment is critical for sound experimental design. With sufficiently large samples, random assignment makes it unlikely that there are systematic differences between the groups. So, for instance, it would be improbable that we would get one group composed entirely of males, a given ethnic identity, or a given religious ideology. This is important because if the groups were systematically different before the experiment began, we would not know the origin of any differences we find between the groups: Were the differences preexisting, or were they caused by manipulation of the independent variable? Random assignment allows us to assume that any differences observed between experimental and control groups result from the manipulation of the independent variable.

Exercise 2.2 Randomization in Sampling and Assignment

Use this online tool to generate randomized numbers instantly and to learn more about random sampling and assignments.

Issues to Consider

While experiments allow scientists to make cause-and-effect claims, they are not without problems. True experiments require the experimenter to manipulate an independent variable, and that can complicate many questions that psychologists might want to address. For instance, imagine that you want to know what effect sex (the independent variable) has on spatial memory (the dependent variable). Although you can certainly look for differences between males and females on a task that taps into spatial memory, you cannot directly control a person's sex. We categorize this type of research approach as quasi-experimental and recognize that we cannot make cause-and-effect claims in these circumstances.

Experimenters are also limited by ethical constraints. For instance, you would not be able to conduct an experiment designed to determine if experiencing abuse as a child leads to lower levels of self-esteem among adults. To conduct such an experiment, you would need to randomly assign some experimental participants to a group that receives abuse, and that experiment would be unethical.

Interpreting Experimental Findings

Once data is collected from both the experimental and the control groups, a **statistical analysis** is conducted to find out if there are meaningful differences between the two groups. The statistical analysis determines how likely any difference found is due to chance (and thus not meaningful). In psychology, group differences are considered meaningful, or significant, if the odds that these differences occurred by chance alone are 5 percent or less. Stated another way, if we repeated this experiment 100 times, we would expect to find the same results at least 95 times out of 100.

The greatest strength of experiments is the ability to assert that any significant differences in the findings are caused by the independent variable. This occurs because of random selection, random assignment, and a design that limits the effects of both experimenter bias and participant expectancy should create groups that are similar in composition and treatment. Therefore, any difference between the groups is attributable to the independent variable, and now we can finally make a causal statement. If we find that watching a violent television program results in more violent behavior than watching a nonviolent program, we can safely say that watching violent television programs causes an increase in the display of violent behavior.

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Developmental Research Designs

Sometimes, especially in developmental research, the researcher is interested in examining changes over time and will need to consider a research design that will capture these changes. Remember, *research methods* are tools that are used to collect information, while r**esearch design** is the strategy or blueprint for deciding how to collect and analyze information. Research design dictates which methods are used and how. There are three types of developmental research designs: cross-sectional, longitudinal, and sequential.

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Video 2.9.1. *Developmental Research Design* summarizes the benefits of challenges of the three developmental design models.

Cross-Sectional Designs

The majority of developmental studies use cross-sectional designs because they are less time-consuming and less expensive than other developmental designs. **Cross-sectional research** designs are used to examine behavior in participants of different ages who are tested at the same point in time. Let's suppose that researchers are

interested in the relationship between intelligence and aging. They might have a hypothesis that intelligence declines as people get older. The researchers might choose to give a particular intelligence test to individuals who are 20 years old, individuals who are 50 years old, and individuals who are 80 years old at the same time and compare the data from each age group. This research is cross-sectional in design because the researchers plan to examine the intelligence scores of individuals of different ages within the same study at the same time; they are taking a "cross-section" of people at one point in time. Let's say that the comparisons find that the 80-year-old adults score lower on the intelligence test than the 50-year-old adults, and the 50-year-old adults score lower on the intelligence test than the 20-year-old adults. Based on these data, the researchers might conclude that individuals become less intelligent as they get older. Would that be a valid (accurate) interpretation of the results?

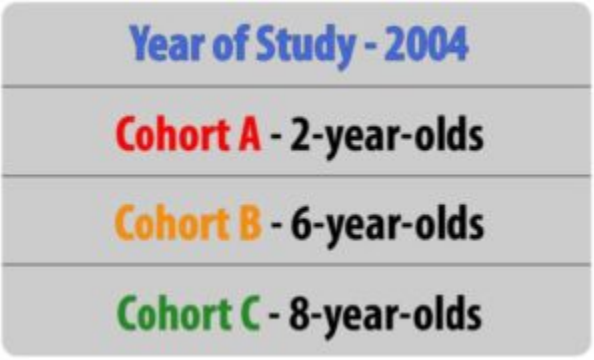

Figure 2.9.1. Example of cross-sectional research design

No, that would not be a valid conclusion because the researchers did not follow individuals as they aged from 20 to 50 to 80 years old. One of the primary limitations of cross-sectional research is that the results yield information about age *differences* not necessarily *changes* over time. That is, although the study described

above can show that the 80-year-olds scored lower on the intelligence test than the 50-year-olds, and the 50-year-olds scored lower than the 20-year-olds, the data used for this conclusion were collected from different individuals (or groups). It could be, for instance, that when these 20-year-olds get older, they will still score just as high on the intelligence test as they did at age 20. Similarly, maybe the 80-year-olds would have scored relatively low on the intelligence test when they were young; the researchers don't know for certain because they did not follow the same individuals as they got older.

With each cohort being members of a different generation, it is also possible that the differences found between the groups are not due to age, per se, but due to cohort effects. Differences between these cohorts' IQ results could be due to differences in life experiences specific to their generation, such as differences in education, economic conditions, advances in technology, or changes in health and nutrition standards, and not due to age-related changes.

Another disadvantage of cross-sectional research is that it is limited to one time of measurement. Data are collected at one point in time, and it's possible that something could have happened in that year in history that affected all of the participants, although possibly each cohort may have been affected differently.

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Longitudinal Research Designs

Longitudinal research involves beginning with a group of people who may be of the same age and background (cohort) and measuring them repeatedly over a long period of time. One of the benefits of this type of research is that people can be followed through time and be compared with themselves when they were younger; therefore, changes with age over time are measured. What would be the advantages and disadvantages of longitudinal research? Problems with this type of research include being expensive, taking a long time, and subjects dropping out over time.

Longitudinal research designs are used to examine behavior in the same individuals over time. For instance, with our example of studying intelligence and aging, a researcher might conduct a longitudinal study to examine whether 20-year-olds become less intelligent with age over time. To this end, a researcher might give an intelligence test to individuals when they are 20 years old, again when they are 50 years old, and then again when they are 80 years old. This study is longitudinal in nature because the researcher plans to study the same individuals as they age. Based on these data, the pattern of intelligence and age might look different than from the cross-sectional research; it might be found that participants' intelligence scores are higher at age 50 than at age 20 and then remain stable or decline a little by age 80. How can that be when cross-sectional research revealed declines in intelligence with age?

Figure 2.9.2. Example of a longitudinal research design

Since longitudinal research happens over a period of time (which could be short-term, as in months, but is often longer, as in years), there is a risk of attrition. **Attrition** occurs when participants fail to complete all portions of a study. Participants may move, change their phone numbers, die, or simply become disinterested in participating over time. Researchers should account for the possibility of attrition by enrolling a larger sample into their study initially, as some participants will likely drop out over time. There is also something known as **selective attrition—**this means that certain groups of individuals may tend to drop out. It is often the least healthy, least educated, and lower socioeconomic participants who tend to drop out over time. That means that the remaining participants may no longer be representative of the whole population, as they are, in general, healthier, better educated, and have more money. This could be a factor in why our hypothetical research found a more optimistic picture of intelligence and aging as the years went by. What can researchers do about selective attrition? At each time of testing, they could randomly recruit more participants from the same cohort as the original members to replace those who have dropped out.

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The results from longitudinal studies may also be impacted by repeated assessments. Consider how well you would do on a math test if you were given the exact same exam every day for a week. Your performance would likely improve over time, not necessarily because you developed better math abilities, but because you were

continuously practicing the same math problems. This phenomenon is known as a practice effect. Practice effects occur when participants become better at a task over time because they have done it again and again (not due to natural psychological development). So our participants may have become familiar with the intelligence test each time (and with the computerized testing administration).

Another limitation of longitudinal research is that the data are limited to only one cohort. As an example, think about how comfortable the participants in the 2010 cohort of 20-year-olds are with computers. Since only one cohort is being studied, there is no way to know if findings would be different from other cohorts. In addition, changes that are found as individuals age over time could be due to age or to time of measurement effects. That is, the participants are tested at different periods in history, so the variables of age and time of measurement could be confounded (mixed up). For example, what if there is a major shift in workplace training and education between 2020 and 2040, and many of the participants experience a lot more formal education in adulthood, which positively impacts their intelligence scores in 2040? Researchers wouldn't know if the intelligence scores increased due to growing older or due to a more educated workforce over time between measurements.

Sequential Research Designs

Sequential research designs include elements of both longitudinal and cross-sectional research designs. Similar to longitudinal designs, sequential research features participants who are followed over time; similar to cross-sectional designs, sequential research includes participants of different ages. This research design is also distinct from those that have been discussed previously in that individuals of different ages are enrolled into a study at various

points in time to examine age-related changes, development within the same individuals as they age, and to account for the possibility of cohort and/or time of measurement effects

Consider, once again, our example of intelligence and aging. In a study with a sequential design, a researcher might recruit three separate groups of participants (Groups A, B, and C). Group A would be recruited when they are 20 years old in 2010 and would be tested again when they are 50 and 80 years old in 2040 and 2070, respectively (similar in design to the longitudinal study described previously). Group B would be recruited when they are 20 years old in 2040 and would be tested again when they are 50 years old in 2070. Group C would be recruited when they are 20 years old in 2070, and so on.

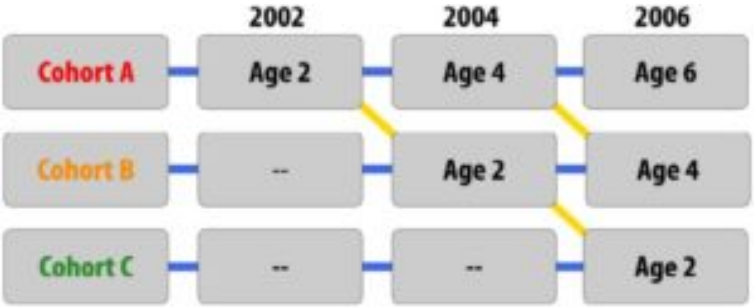

Figure 2.9.3. Example of sequential research design

Studies with sequential designs are powerful because they allow for both longitudinal and cross-sectional comparisons—changes and/or stability with age over time can be measured and compared with differences between age and cohort groups. This research design also allows for the examination of cohort and time of measurement effects. For example, the researcher could examine the intelligence scores of 20-year-olds at different times in history and different cohorts (follow the yellow diagonal lines in figure 2.9.3). This might be examined by researchers who are interested in sociocultural and historical changes (because we know that lifespan

development is multidisciplinary). One way of looking at the usefulness of the various developmental research designs was described by Schaie and Baltes (1975): cross-sectional and longitudinal designs might reveal change patterns while sequential designs might identify developmental origins for the observed change patterns.

Since they include elements of longitudinal and cross-sectional designs, sequential research has many of the same strengths and limitations as these other approaches. For example, sequential work may require less time and effort than longitudinal research (if data are collected more frequently than over the 30-year spans in our example) but more time and effort than cross-sectional research. Although practice effects may be an issue if participants are asked to complete the same tasks or assessments over time, attrition may be less problematic than what is commonly experienced in longitudinal research since participants may not have to remain involved in the study for such a long period of time.

Comparing Developmental Research Designs

When considering the best research design to use in their research, scientists think about their main research question and the best way to come up with an answer. A table of advantages and disadvantages for each of the described research designs is provided here to help you as you consider what sorts of studies would be best conducted using each of these different approaches.

Table 2.9.1. Advantages and disadvantages of different research designs

	Advantages	Disadvantages
Cross-Sectional	• Examines changes between participants of different ages at the same point in time • Provides information on age differences	• Cannot examine change over time • Limited to one time in history • Cohort differences confounded with age differences
Longitudinal	• Examines changes within individuals over time • Provides a developmental analysis	• Expensive • Takes a long time • Participant attrition • Possibility of practice effects • Limited to one cohort • Time in history effects confounded with age changes
Sequential	• Examines changes within individuals over time • Examines changes between participants of different ages at the same point in time • Can be used to examine cohort effects • Can be used to examine time in history effects	• May be expensive • May take a long time • Possibility of practice effects • Some participant attrition

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Teachers as Researchers

A good teacher will evaluate their own practice and reflect on how they can improve. That evaluation will almost certainly involve analysing data, and assessing the work students produce. It may also involve talking to students about what they enjoyed, or found difficult, or asking them to complete a short questionnaire. It may involve asking a colleague to observe you teach, or you observing someone else's lesson. The results of the evaluations will influence your planning and hopefully, will encourage you to try new things. So when does 'good practice' become 'research'? And what are the advantages of engaging in research?

'Research' is defined by the Chambers dictionary as: 'systematic investigation towards increasing the sum of knowledge'. This definition provides some clues. It is suggested that a piece of inquiry, evaluation, or development work becomes 'research' when the following apply:

- **the work involves capturing data:** Conversations or lessons might be recorded so that they can be used outside the context in which the events took place. Students' work might also be used as evidence.

- **participants are being asked to do something out of the ordinary:** You might ask people to take part in a focus group, or an interview that disrupts their normal routine in some way.

- **the output is public:** If the output is public then it can contribute to the 'sum of knowledge'. However, if the results of the piece of work are to be made public, people need to be confident that this new knowledge is based on reliable evidence, that the conclusions are valid and that the research has been carried out properly.

The advantage of conducting research is that it is systematic and contributes knowledge to the field, which in this is case is 'education'. The 'knowledge' is based on evidence, can be defended and explained, and is therefore likely to be taken more seriously than accounts of personal experience. A piece of research is also likely to take place over a significant period of time, and if conducted properly will help you to consider what works and also provide insights into why it works.

If these conditions apply, then the work does constitute 'research'. This has further implications:

- The work should take account of other studies in the field. Studying the literature will also give you some ideas about how you might tackle the issue that you are concerned about.
- The work should be systematic and purposeful. It should be underpinned by a clear philosophy and set of beliefs. There should be specific research questions and an ethical design that will give reliable results that are likely to be considered to be valid, by others.

Exercise 2.1. Thinking About Research

The following activities will help you to think about how to design good research – starting with thinking about what you might research.

Choose an area of particular interest to you and answer the following questions:

- What do you want to find out more about and why?
- What could you focus a piece of research on?
- Suggest a working title for your study.

- Write down two or three specific research questions.

Exercise 2.2. Start Researching

Spend about 30 minutes searching the internet for material related to your chosen area or topic and begin to explore other work in the field. The aim is to become familiar with the field as this might affect the questions you want to consider. You will want to see what research has already be done in this area and consider how this might refine your own research. You may find that your question has already been answered, that your question may need to be modified, or that your research is brand new.

Conductin Research

As a teacher undertaking a study in your own classroom, it is likely that it will be relatively small-scale and short-term. The methodologies that will be of most use to you are case studies and action research.

Case study

There are many definitions of case studies in the literature, and many different types of case study (Yin, 2003; Stake, 1995; Gillham, 2000; Bassey, 1999). However, they all have the following features:

- they are 'bounded' in space and time
- the research takes place in the natural context and draws on multiple methods of collecting data
- the purpose is to inform practitioners, policymakers, or theoreticians.

A case study might be designed to find out more about a situation; it might be designed to test a particular theory or it might be designed to try and explain an observed phenomenon.

The main criticism of case studies is that the findings cannot be generalized. This can be addressed by making the context clear to the reader in a detailed report; it is then up to the reader to take from the study information and ideas that might apply to their own situation.

Action research

Action research is best considered to be a strategy rather than a specific method (McNiff and Whitehead, 2011; Wilson, 2013). It involves practitioners systematically investigating their own practice, with a view to improving it. Action research involves the following steps:

- **Identify a problem that you want to solve in your classroom** This might be something quite specific such as why certain pupils do not answer questions or find an aspect of your subject hard or de-motivating, or it might be something more

general like how to organise group work effectively.

- **Define the purpose and clarify what form the intervention might take.** This will involve consulting the literature and finding out what is already known about this issue.
- **Plan an intervention designed to tackle the issue.**
- **Collect empirical data and analyze it**
- **Plan another intervention** This will be based on what you find and will be designed to further understand the issue that you have identified.

Action research is a cyclical process. Through repeated intervention and analysis, you will come to understand the issue or problem and hopefully to do something about it.

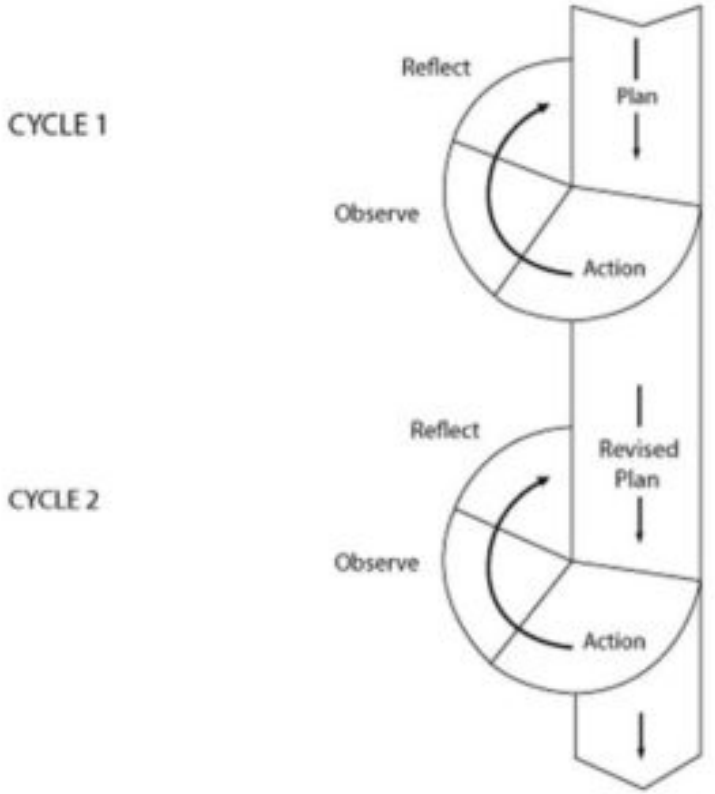

Figure 2.10.1 Action research cycle.

Action research suffers from some of the same criticisms as case studies: can the results be generalized? Rigour in this case comes from careful planning and clear reporting. The findings will be 'believable' if the researchers explain what they hope to achieve and how the intended actions link specifically to the problem. The process needs to be explicit and underpinned by a clear framework of ideas against which the findings will be judged (Kemmis, 1993).

Exercises 2.3. Planning Research Design

Given your research question and the previous research on this topic, which research design would you use? Case study? Action research? Or one of the traditional empirical designs discussed earlier in the chapter (descriptive, correlational, experimental)?

Collecting Data

Earlier in this chapter, we discussed various data collection methods used in research. Having decided on the research question and the research approach, the next decision is the method of data collection that will help answer the research question. Evidence from several sources of data will aid in the confidence of findings.

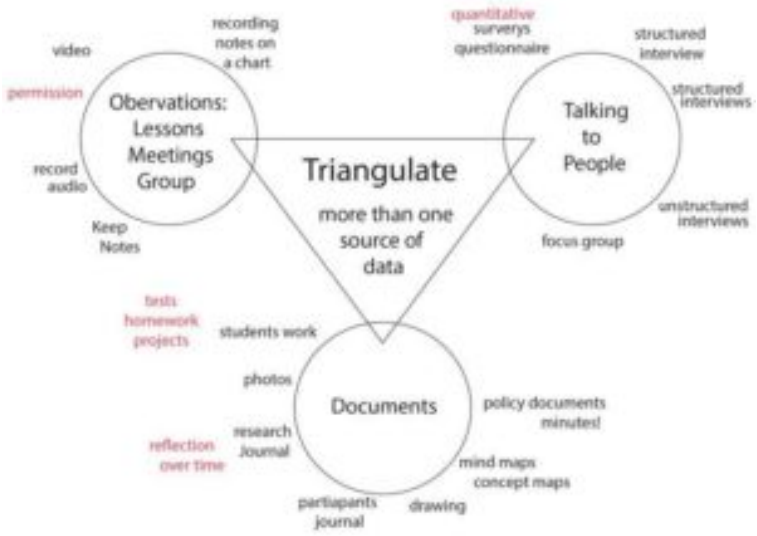

Figure 2.10.2. Overview of different data collection methods. See the previous section on data collection for more information.

Exercise 2.4. Data Collection

Based on your research question and planned research approach, which data collection method(s) might be appropriate?

Disseminating Research

Classrooms can be private places in which a teacher and the class

get on with the business of teaching and learning. If you undertake a piece of research in your classroom and discover something exciting then your instinct will be to tell people and to perhaps do a presentation at a departmental meeting. People might listen with interest, but it will not necessarily change their behavior.

David Frost (2006) argues that you have to plan for impact. An effective way to do this is to work collaboratively from the outset. Involve colleagues in your plans, invite them into your classroom and engage them in discussions about aspects of your project. In this way your department will become a 'learning community' and you are likely to get some help with your work.

Exercise 2.5. Disseminating Your Research

Go back to your research plan and think about how you might involve a colleague, or your department or someone else in your school.

- Who do you need to influence?
- What might they do to help?
- What will the benefits be?

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Chapter Summary: Using Science to Inform Classroom Practices

Glossary

attrition: reduction in the number of research participants as some drop out over time

case study: exploring a single case or situation in great detail. Information may be gathered with the use of observation, interviews, testing, or other methods to uncover as much as possible about a person or situation

cohort: a group of people who are born at roughly the same period in a particular society. Cohorts share histories and contexts for living

content analysis: involves looking at media such as old texts, pictures, commercials, lyrics or other materials to explore patterns or themes in culture

control group: a comparison group that is equivalent to the experimental group, but is not given the independent variable

correlation: the relationship between two or more variables; when two variables are correlated, one variable changes as the other does

correlation coefficient: number from -1 to +1, indicating the strength and direction of the relationship between variables, and usually represented by r

correlational research: research that formally tests whether a relationship exists between two or more variables, however, correlation does not imply causation

cross-sectional research: used to examine behavior in participants of different ages who are tested at the same point in time; may confound age and cohort differences

dependent variable: the outcome or variable that is supposedly affected by the independent variable

descriptive studies: research focused on describing an occurrence

double-blind: a research design in which neither the participants

nor the researchers know whether an individual is assigned to the experimental group or the control group

experimental group: the group of participants in an experiment who receive the independent variable

experimental research: research that involves randomly assigning people to different conditions and using hypothesis testing to make inferences about how these conditions affect behavior; the only method that measures cause and effect between variables

experiments: designed to test hypotheses in a controlled setting in efforts to explain how certain factors or events produce outcomes; the only research method that measures cause and effect relationships between variables

explanatory studies: research that tries to answer the question "why"

Hawthorne effect: individuals tend to change their behavior when they know they are being watched

hypotheses: specific statements or predictions about the relationship between variables

independent variable: something that is manipulated or introduced by the researcher to the experimental group; treatment or intervention

longitudinal research: studying a group of people who may be of the same age and background (cohort), and measuring them repeatedly over a long period of time; may confound age and time of measurement effects

negative correlation: two variables change in different directions, with one becoming larger as the other becomes smaller; a negative correlation is not the same thing as no correlation

observational studies: also called naturalistic observation, involves watching and recording the actions of participants

operationalized: concepts transformed into variables that can be measured in research

positive correlation: two variables change in the same direction, both becoming either larger or smaller

qualitative research: theoretical ideas are "grounded" in the experiences of the participants, who answer open-ended questions

quantitative research: involves numerical data that are quantified using statistics to understand and report what has been studied

reliability: when something yields consistent results

research design: the strategy or blueprint for deciding how to collect and analyze information; dictates which methods are used and how

scatterplot: a plot or mathematical diagram consisting of data points that represent two variables

secondary content analysis: archival research, involves analyzing information that has already been collected or examining documents or media to uncover attitudes, practices or preferences

selective attrition: certain groups of individuals may tend to drop out more frequently resulting in the remaining participants longer being representative of the whole population

sequential research design: combines aspects of cross-sectional and longitudinal designs, but also adding new cohorts at different times of measurement; allows for analyses to consider effects of age, cohort, time of measurement, and socio-historical change

survey: asking a standard set of questions to a group of subjects

validity: when something yields accurate results

variables: factors that change in value

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THE DEVELOPING LEARNER

Theme: *How Learner Develop Physically, Cognitively, and Psychosocially*

Outline of Concepts:

- Foundations of Development
- Physical & Brain Development
- Cognitive Development
- Psychosocial Development

Learning Objectives:

- Describe fundamental issues in the study of development
- Explain Bronfenbrenner's Bioecological Theory
- Identify physical development issues and explain how they are relevant to teaching
- Identify contributions from neuroscience to our understanding of learning
- Contrast psychological versus social constructivism
- Explain Piaget's Stages of Cognitive Development
- Describe Vygotsky's Zone of Proximal Development
- Explain factors that contribute to language development and differences in language skills
- Describe Erikson's Stages of Psychosocial Development

- Compare and contrast self-concept and self-esteem
- Describe Marcia's identity statuses and the development of identity
- Explain how moral reasoning issues become more sophisticated and gender differences in moral reasoning
- Describe how peer interactions influence schooling
- Explain the cognitive and social levels of play

Why Development Matters

Students' development matters for teachers, but the way it matters depends partly on how schooling is organized. In teaching a single, "self-contained" grade-level, the benefits of knowing about development will be less explicit, but just as real, as if you teach many grade levels. Working exclusively with a single grade (like, say, a third-grade classroom) highlights differences among students that happen in spite of their similar ages, and obscures similarities that happen because of having similar ages. Under these conditions it is still easy to notice students' diversity, but harder to know how much of it comes from differences in long-term development, compared to differences in short-term experiences. Knowledge about long term changes is still useful, however, in planning appropriate activities and in holding appropriate expectations about students. What changes in students can you expect relatively soon simply from your current program of activities, and which ones may take a year or more to show up? This is a question that developmental psychology can help to answer.

If you teach multiple grade levels, as often is true of specialists or teachers in middle school or high school, then your need for developmental knowledge will be more obvious because you will confront wide age differences on a daily basis. As a physical education teacher, for example, you may teach kindergarten children at one time during the day, but sixth-graders at another time, or teach seventh-graders at one time but twelfth-graders at another. Students will differ more obviously because of age, in addition to differing due to other factors like skills or knowledge learned recently. Nonetheless, the instructional challenge will be the same as the one faced by teachers of single-grade classes: you will want to know what activities and expectations are appropriate for your students. To answer this question, you will need to know something not only about how your students are unique but also

about general trends of development during childhood and adolescence.

Note that developmental trends vary in two important ways. The first, as indicated already, is in their generality. Some theories or models of development boldly assert that certain changes happen to virtually every person on the planet, and often at relatively predictable points in life. For example, a theory might assert that virtually *every* toddler acquires a spoken language, or that *every* teenager forms a sense of personal identity. Individuals who do not experience these developments would be rare, though not necessarily disabled as a result. Other theories propose developmental changes that are more limited, claiming only that the changes happen to *some* people or only under certain conditions. Developing a female gender role, for example, does not happen to everyone, but only to the females in a population, and the details vary according to the family, community, or society in which a child lives.

The second way that developmental trends vary is in how strictly they are sequenced and hierarchical. In some views of development, changes are thought to happen in a specific order and to build on each other—sort of a "staircase" model of development (Case, 1991, 1996). For example, a developmental psychologist (and many of the rest of us) might argue that young people must have tangible, hands-on experience with new materials before they can reason about the materials in the abstract. The order cannot be reversed. In other views of development, change happens, but not with a sequence or endpoint that is uniform. This sort of change is more like a "kaleidoscope" than a staircase (Levinson, 1990; Lewis, 1997; Harris, 2006). A person who becomes permanently disabled, for example, may experience complex long-term changes in personal values and priorities that are different both in timing and content from most people's developmental pathways.

When addressing teachers and other educators, educational psychologists have tended to emphasize explanations of development that are relatively general, universal, and sequential,

rather than specific to particular cultures or that are not sequenced or kaleidoscopic. Such models (sometimes called "grand theories") have the advantage of concisely integrating many features of development, while also describing the kind of people children or adolescents usually end up to be. The preference for integrative perspectives makes sense given educators' need to work with and teach large numbers of diverse students both efficiently and effectively. But the approach also risks overgeneralizing or oversimplifying the experiences of particular children and youth. It can also confuse what does happen as certain children (like the middle-class ones) develop with what *should* happen to children. To understand this point, imagine two children of about the same age who have dramatically very different childhood experiences—for example, one who grows up in poverty and another who grows up financially well-off. In what sense can we say that these two children experience the *same* underlying developmental changes as they grow up? And how much should they even be expected to do so? Developmental psychology, and especially the broad theories of developmental psychology, highlight the "sameness" or common ground between these two children. As such, it serves as a counterpoint to knowledge of their obvious uniqueness and places their uniqueness in a broader perspective.

In this chapter we discuss development in four major domains. The first is physical development. We begin by describing the physical changes that typically happen to children across the school years—changes in size, the effects of puberty, the growth in motor skills, maturation of senses, health trends, and brain development across childhood and adolescence. Physical development is not a central concern for most teachers, but as we point out, it does affect students' school experiences indirectly. We then move to cognitive development, specifically constructivist and information processing theories, as well as language development. Third, the domain of psychosocial development, with attention to the development of self. Finally, we will discuss moral development, a domain that spans both cognitive and social development. We look in particular at the

theoretical frameworks of Lawrence Kohlberg and Carol Gilligan, and end with suggestions for how their ideas can be translated into useful strategies for encouraging the moral development of students.
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Fundamentals of Development

Domains of Development

Development refers to the physical, cognitive, and psychosocial development of humans throughout the lifespan. What types of development are involved in each of these three domains, or areas, of life? Physical development involves growth and changes in the body and brain, the senses, motor skills, and health and wellness. Cognitive development involves learning, attention, memory, language, thinking, reasoning, and creativity. Psychosocial development involves emotions, personality, and social relationships.

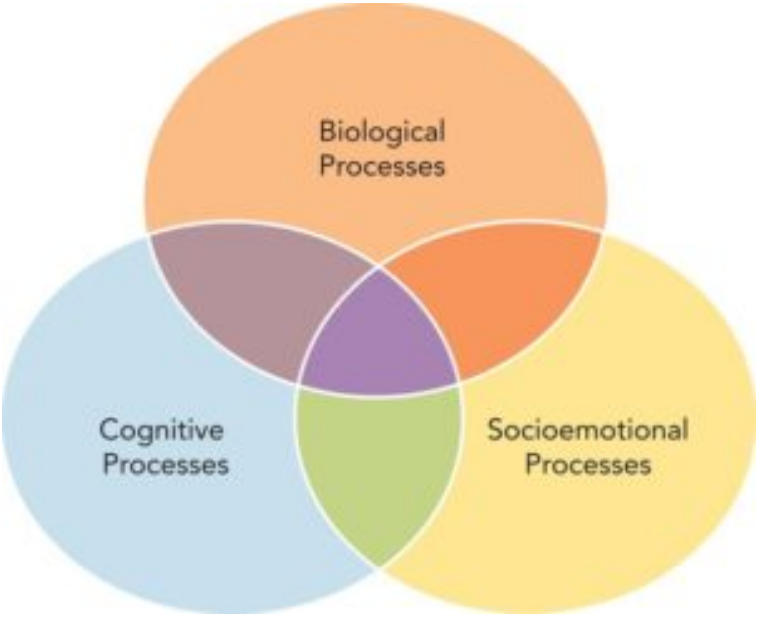

Figure 3.2.1. Physical, cognitive, and psychosocial development are interrelated.

Physical Domain

Many of us are familiar with the height and weight charts that pediatricians consult to estimate if babies, children, and teens are growing within normative ranges of physical development. We may also be aware of changes in children's fine and gross motor skills, as well as their increasing coordination, particularly in terms of playing sports. But we may not realize that physical development also involves brain development, which not only enables childhood motor coordination but also greater coordination between emotions and planning in adulthood, as our brains are not done developing in infancy or childhood. Physical development also includes puberty, sexual health, fertility, menopause, changes in our senses, and healthy habits with nutrition and exercise.

Cognitive Domain

If we watch and listen to infants and toddlers, we can't help but wonder how they learn so much so fast, particularly when it comes to language development. Then as we compare young children to those in middle childhood, there appear to be considerable differences in their ability to think logically about the concrete world around them. Cognitive development includes mental processes, thinking, learning, and understanding, and it doesn't stop in childhood. Adolescents develop the ability to think logically about the abstract world (and may like to debate matters with adults as they exercise their new cognitive skills!). Moral reasoning develops further, as does practical intelligence—wisdom may develop with

experience over time. Memory abilities and different forms of intelligence tend to change with age. Brain development and the brain's ability to adapt and compensate for losses is significant to cognitive functions across the lifespan, too.

Psychosocial Domain

Development in this domain involves what's going on both psychologically and socially. Early on, the focus is on infants and caregivers, as temperament and attachment are significant. As the social world expands and the child grows psychologically, different types of play, and interactions with other children and teachers become essential. Psychosocial development involves emotions, personality, self-esteem, and relationships. Peers become more important for adolescents, who are exploring new roles and forming their own identities. Dating, romance, cohabitation, marriage, having children, and finding work or a career are all parts of the transition into adulthood. Psychosocial development continues across adulthood with similar (and some different) developmental issues of family, friends, parenting, romance, divorce, remarriage, blended families, caregiving for elders, becoming grandparents and great grandparents, retirement, new careers, coping with losses, and death and dying.

As you may have already noticed, physical, cognitive, and psychosocial development are often interrelated, Puberty exemplifies this interaction well. Puberty is a biological change that releases hormones that spurs the maturation of sex organs and physical growth. However, puberty also triggers changes within the brain that affect cognition, emotions, and social relationships. Puberty often comes with mood swings, but also, an improved ability to self-regulate. Puberty is also when relationships change with parents and peers. While puberty may be a topic within the physical domain, there is clearly an interaction with the other areas.

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Video 3.2.1. *Domains in Development* describes the three domains and how those domains interact.

Development in Context

The **contextual approach** to development considered the relationship between individuals and their physical, cognitive, and social worlds. They also examine socio-cultural and environmental influences on development. Urie Bronfenbrenner developed the ecological systems theory to explain how everything in a child and the child's environment affects how a child grows and develops. He labeled different aspects or levels of the environment that influence children's development.

Bronfenbrenner's Ecological Systems Theory

Another psychologist who recognized the importance of the environment on development was American psychologist Urie Bronfenbrenner (1917-2005), who formulated the **ecological systems theory** to explain how the inherent qualities of a child and their environment interact to influence how they will grow and develop. The term "ecological" refers to a natural environment; human development is understood through this model as a long-

lasting transformation in the way one perceives and deals with the environment. Bronfenbrenner's ecological theory stresses the importance of studying children in the context of multiple environments because children typically find themselves enmeshed simultaneously in different ecosystems. Each of these systems inevitably interacts with and influences each other in every aspect of the child's life, from the most intimate level to the broadest. Furthermore, he eventually renamed his theory the **bioecological model** in order to recognize the importance of biological processes in development. However, he only recognized biology as producing a person's potential, with this potential being realized or not via environmental and social forces.

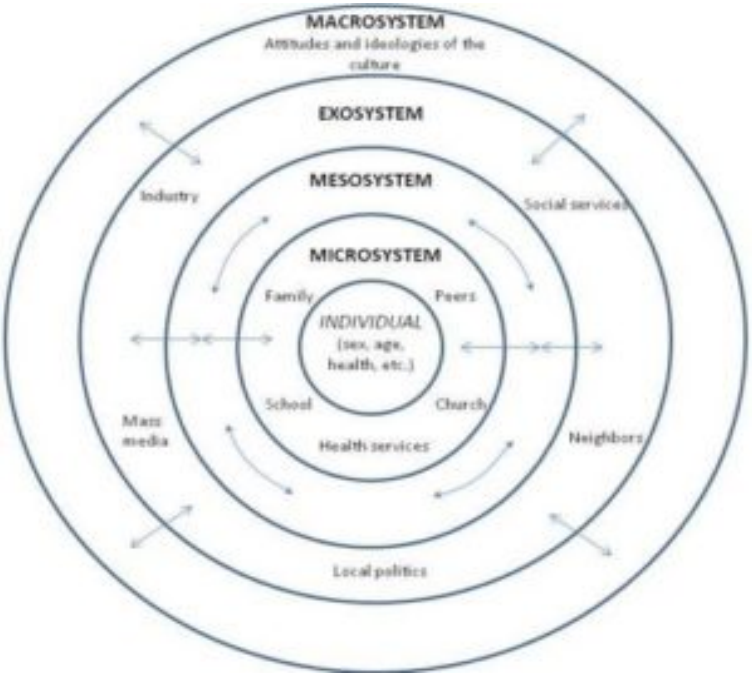

Figure 3.2.2. Bronfenbrenner's ecological theory emphasizes the influence of microsystems, mesosystems, exosystems, and

macrosystems on an individual. Not pictured is the chronosystem, or the historical context and timeframe, which provides the context for all the other systems. The chronosystem includes environmental events, major life transitions, and historical events.

An individual is impacted by **microsystems** such as parents or siblings–those who have direct, significant contact with the person. The input of those people is modified by the cognitive and biological state of the individual as well. These influence the person's actions, which in turn influence systems operating on them. The **mesosystem** includes larger organizational structures such as school, the family, or religion. These institutions impact the microsystems just described. For example, the religious teachings and traditions of a family may create a climate that makes the family feel stigmatized, and this indirectly impacts the child's view of themself and others. The philosophy of the school system, daily routine, assessment methods, and other characteristics can affect the child's self-image, growth, sense of accomplishment, and schedule, thereby impacting the child physically, cognitively, and emotionally. These mesosystems both influence and are influenced by the broader contexts of the community, referred to as the **exosystem**. A community's values, history, and economy can impact the organizational structures it houses. Furthermore, the community is influenced by **macrosystems**, which are cultural elements such as global economic conditions, war, technological trends, values, philosophies, and society's responses to the global community. In sum, a child's experiences are shaped by larger forces such as family, school, religion, and culture. All of this occurs within the relevant historical context and timeframe, or **chronosystem**. The chronosystem is made up of the environmental events and transitions that occur throughout a child's life, including any socio-historical events. This system consists of all the experiences that a person has had during their lifetime.

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Video 3.2.2. *Bronfenbrenner's Ecological Theory* explains the various layers, the interactions between them, and the influence this has on individual development.

Key Issues in Development

There are many different theoretical approaches to human development. As we evaluate them in this course, recall that development focuses on how people change, and the approaches address the nature of change in different ways:

- Are changes an active or passive process?
- Is the change smooth or uneven (continuous versus discontinuous)?
- Is this pattern of change the same for everyone, or are there different patterns of change (one course of development versus many courses)?
- Are there prescribed periods in which change must occur (critical and sensitive periods)?
- How do genetics and environment interact to influence development (nature versus nurture)?

Is Development Active or Passive?

How much does one play a role in their developmental path? Are we at the whim of our genetic inheritance or the environment that surrounds us, or are we able to decide and steer our development? Some theorists believe that humans play a much more active role in their development. Piaget, for instance, believed that children actively explore their world and construct new ways of thinking to explain the things they experience. Humanist theorists forward that people have self-determination. In contrast, many behaviorists view humans as being more passive in the developmental process, with outcomes being determined by their experiences. Evolutionary psychologists emphasize the role of heredity in determining development. As we explore various theories, ask yourself whether each approach considers development to be an active or passive process.

Is Development Continuous or Discontinuous?

Is human development best characterized as a slow, gradual process, or as one of more abrupt change? The answer to that question often depends on which developmental theorist you ask and which topic is being studied. **Continuous development** theories view development as a cumulative process, gradually improving existing skills (Figure 3.2.3). With this type of development, there is a gradual change. Consider, for example, a child's physical growth: adding inches to their height year by year. In contrast, theorists who view development as **discontinuous** believe that development takes place in unique stages and that it occurs at specific times or ages. With this type of development, the change is more sudden, such as an infant's ability to demonstrate awareness of object permanence (which is a cognitive skill that develops toward the end of

infancy, according to Piaget's cognitive theory—more on that theory in the next module).

Figure 3.2.3. Visualizations of continuous and discontinuous development.

Is There One Course of Development or Many?

Is development essentially the same, or universal, for all children (i.e., there is one course of development) or does development follow a different course for each child, depending on the child's specific genetics and environment (i.e., there are many courses of development)? Do people across the world share more similarities or more differences in their development? How much do culture and genetics influence a child's behavior?

Stage theories hold that the sequence of development is universal. For example, in cross-cultural studies of language development, children from around the world reach language milestones in a similar sequence (Gleitman & Newport, 1995). Infants in all cultures coo before they babble. They begin babbling at about the same age and utter their first word around 12 months old. Yet we live in diverse contexts that have a unique effect on each of us. For example, researchers once believed that motor development followed one course for all children regardless of culture. However, childcare practices vary by culture, and different practices have been found to accelerate or inhibit the achievement of

developmental milestones such as sitting, crawling, and walking (Karasik, Adolph, Tamis-LeMonda, & Bornstein, 2010).

For instance, let's look at the Aché society in Paraguay. They spend a significant amount of time foraging in forests. While foraging, Aché mothers carry their young children, rarely putting them down to protect them from getting hurt in the forest. Consequently, their children walk much later: They walk around 23–25 months old, in comparison to infants in Western cultures who begin to walk around 12 months old. However, as Aché children become older, they are allowed more freedom to move about, and by about age 9, their motor skills surpass those of U.S. children of the same age: Aché children can climb trees up to 25 feet tall and use machetes to chop their way through the forest (Kaplan & Dove, 1987). As you can see, our development is influenced by multiple contexts, so the timing of basic motor functions may vary across cultures. However, the functions are present in all societies.

(a) (b)

Figure 3.2.4. All children across the world love to play. Whether in (a) Florida or (b) South Africa, children enjoy exploring sand, sunshine, and the sea.

Are there Critical or sensitIve periods of development?

Various developmental milestones are universal in timing. For example, most children begin learning and expressing language during their first year. However, what happens if a person misses that window of typical experience? What if the child were not exposed to language early in life, could they learn language in later

years? Does the timing of experience influence development, and can it be corrected later?

Psychologists believe that there are time spans in which a person is biologically ready for certain developments, but successful progress is reliant on the person having essential experiences during that time. If these experiences fail to occur or occur after the time span ends, then the person will not develop normally or may not fully recover, even with later intervention.

Some aspects of development have critical periods; finite time spans in which specific experiences must occur for successful development. Once this period ends, later experiences would have no impact on this aspect of development. Failure to have the necessary experiences during the critical period will result in permanent impairments. For instance, a person that does not receive minimal nutrition during childhood would not reach their full height potential by adulthood. Even with excellent nutrition during adulthood, they would never grow taller because their critical period of growth has ended.

More often, developmental aspects are considered to have sensitive periods. Like critical periods, a sensitive period requires particular experiences during a specific time for development to occur. However, with sensitive periods, experiences after the period ends can support developmental gains later in life. It is not to say that post-period interventions will always be simple or successful. For example, someone that was not exposed to language in early childhood, with intervention and great effort, may be able to make some gains in late childhood, but may not fully recover all language-related skills.

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Video 3.2.3. *Sensitive vs Critical Periods of Learning* explains the differences between the two

How Do Nature and Nurture Influence Development?

Are we who we are because of genetics, or are we who we are because of our environment? For instance, why do biological children sometimes act like their parents—is it because of genetics or because of early childhood environment and what the child has learned from their parents? What about children who are adopted—are they more like their biological families or more like their adoptive families? And how can siblings from the same family be so different?

This longstanding question is known in psychology as the nature versus nurture debate. For any particular aspect of development, those on the side of **nature** would argue that heredity plays the most important role in bringing about that feature. While those on the side of **nurture** would say that one's environment is most significant in shaping the way we develop. However, most scholars agree that there is a constant interplay between the two forces. It is difficult to isolate the root of any single outcome as a result solely of nature or nurture.

We are all born with specific genetic traits inherited from our parents, such as eye color, height, and certain personality traits. Beyond our basic genotype, however, there is a deep interaction between our genes and our environment. Our unique experiences

in our environment influence whether and how particular traits are expressed, and at the same time, our genes influence how we interact with our environment (Diamond, 2009; Lobo, 2008). There is a reciprocal interaction between nature and nurture as they both shape who we become, but the debate continues as to the relative contributions of each.

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Video 3.2.4. *Gene-Environment Interaction* explains how nature and nurture interact to influence development.
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Physical Development

Although it may be tempting to think that physical development is the concern of physical education teachers only, it is actually a foundation for many academic tasks. In first grade, for example, it is important to know whether children can successfully manipulate a pencil. In later grades, it is important to know how long students can be expected to sit still without discomfort—a real physical challenge. In all grades, it is important to have a sense of students' health needs related to their age or maturity, if only to know who may become ill, and with what illness, and to know what physical activities are reasonable and needed.

Trends in Height and Weight

Typical height and weight for well-nourished, healthy students are shown in Table 3.3.1. The table shows averages for several ages from preschool through the end of high school. But the table does not show the diversity among children. At age 6, for example, when children begin school, the average boy or girl is about 115 centimeters tall, but some are 109 and others are 125 centimeters. Average weight at age 6 is about 20 kilograms, but ranges between about 16 and 24 kilograms—about 20% variation in either direction.

Table 3.3.1. Average height and weight of well-nourished children

Age	Height (cm)	Weight (kg)
2	85	7.0
6	115	20.0
10	135	31.0
14	162	52.0
18	169	60.5

There are other points to keep in mind about average height and weight that are not evident from Table 3.1. The first is that boys

and girls, on average, are quite similar in height and weight during childhood, but diverge in the early teenage years, when they reach puberty. For a time (approximately age 10–14), the average girl is taller, but not much heavier, than the average boy. After that the average boy becomes both taller and heavier than the average girl—though there remain individual exceptions (Malina, et al., 2004). The pre-teen difference can, therefore, be awkward for some children and youth, at least among those who aspire to look like older teenagers or young adults. For young teens less concerned with "image," though, the fact that girls are taller may not be especially important, or even noticed (Friedman, 2000).

A second point is that as children get older, individual differences in weight diverge more radically than differences in height. Among 18-year-olds, the heaviest youngsters weigh almost twice as much as the lightest, but the tallest ones are only about 10 percent taller than the shortest. Nonetheless, both height and weight can be sensitive issues for some teenagers. Most modern societies (and the teenagers in them) tend to favor relatively short women and tall men, as well as a somewhat thin body build, especially for girls and women. Yet neither "socially correct" height nor thinness is the destiny for many individuals. Being overweight, in particular, has become a common, serious problem in modern society (Tartamella, et al., 2004) due to the prevalence of diets high in fat and lifestyles low in activity. The educational system has unfortunately contributed to the problem as well, by gradually restricting the number of physical education courses and classes in the past two decades.

The third point to keep in mind is that the average height and weight are related somewhat to racial and ethnic background. In general, children of Asian background tend to be slightly shorter than children of European and North American background. The latter in turn tend to be shorter than children from African societies (Eveleth & Tanner, 1990). Body shape differs slightly as well, though the differences are not always visible until after puberty. Asian youth tend to have arms and legs that are a bit short relative to

their torsos, and African youth tend to have relatively long arms and legs. The differences are only *averages*; there are large individual differences as well, and these tend to be more relevant for teachers to know about than broad group differences.

Puberty and Its Effects on Students

A universal physical development in students is **puberty**, which is the set of changes in early adolescence that bring about sexual maturity. Along with internal changes in reproductive organs are outward changes such as the growth of breasts in girls and the penis in boys, as well as relatively sudden increases in height and weight. By about age 10 or 11, most children experience increased sexual attraction to others (usually heterosexual, though not always) that affects social life both in school and out (McClintock & Herdt, 1996). By the end of high school, more than half of boys and girls report having experienced sexual intercourse at least once—though it is hard to be certain of the proportion because of the sensitivity and privacy of the information. (Center for Disease Control, 2004b; Rosenbaum, 2006).

At about the same time that puberty accentuates gender, role differences also accentuate for at least some teenagers. Some girls who excelled at math or science in elementary school may curb their enthusiasm and displays of success at these subjects for fear of limiting their popularity or attractiveness as girls (Taylor & Gilligan, 1995; Sadker, 2004). Some boys who were not especially interested in sports previously may begin dedicating themselves to athletics to affirm their masculinity in the eyes of others. Some boys and girls who once worked together successfully on class projects may no longer feel comfortable doing so—or alternatively may now seek to be working partners, but for social rather than academic reasons. Such changes do not affect all youngsters equally, nor affect any one youngster equally on all occasions. An individual student may act

like a young adult on one day, but more like a child the next. When teaching children who are experiencing puberty, , teachers need to respond flexibly and supportively.

From Reflexes to Voluntary Motor Development

Every basic **motor skill** (any movement ability) develops over the first two years of life. The sequence of motor skills first begins with **reflexes**. Infants are equipped with several reflexes, or involuntary movements in response to stimulation. Some of thee reflexes are necessary for survival, such as breathing reflexes (this includes hiccups, sneezing, and thrashing reflexes), reflexes to obtain food (such as rooting and sucking). Other reflexes are not necessary for survival, often called primitive reflexes, but signify the state of brain and body functions. Some of these include the Babinski reflex (toes fan upward when feet are stroked), the stepping reflex (babies move their legs as if to walk when feet touch a flat surface), the palmar grasp (the infant will tightly grasp any object placed in its palm), and the Moro reflex (babies will fling arms out and then bring to the chest if they hear a loud noise). These movements occur automatically and are signals that the infant is functioning well neurologically. Within the first several weeks of life, these reflexes are replaced with voluntary movements or motor skills.

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Video 3.3.1. *Reflexes in Newborn Babies* highlights some of the reflexes present at birth. Most of these reflexes will disappear or be replaced with voluntary motor skills within the first months of life.

Motor development occurs in an orderly sequence as infants move from reflexive reactions (e.g., sucking and rooting) to more advanced motor functioning. This development proceeds in a **cephalocaudal** (from head-down) and **proximodistal** (from center-out) direction. For instance, babies first learn to hold their heads up, then sit with assistance, then sit unassisted, followed later by crawling, pulling up, cruising, and then walking. As motor skills develop, there are certain developmental milestones that young children should achieve. For each milestone, there is an average age, as well as a range of ages in which the milestone should be reached. An example of a developmental milestone is a baby holding up its head. Babies on average are able to hold up their head at 6 weeks old, and 90% of babies achieve this between 3 weeks and 4 months old. If a baby is not holding up his head by 4 months old, he is showing a delay. On average, most babies sit alone at 7 months old. Sitting involves both coordination and muscle strength, and 90% of babies achieve this milestone between 5 and 9 months old (CDC, 2018). If the child is displaying delays on several milestones, that is a reason for concern, and the parent or caregiver should discuss this with the child's pediatrician. Some developmental delays can be identified and addressed through early intervention.

Gross Motor Skills

Gross motor skills are voluntary movements that involve the use of large muscle groups and are typically large movements of the arms, legs, head, and torso. These skills begin to develop first. Examples include moving to bring the chin up when lying on the stomach, moving the chest up, rocking back and forth on hands and knees. But it also includes exploring an object with one's feet as

many babies do, as early as 8 weeks of age, if seated in a carrier or other device that frees the hips. This may be easier than reaching for an object with the hands, which requires much more practice (Berk, 2007). And sometimes an infant will try to move toward an object while crawling and surprisingly move backward because of the greater amount of strength in the arms than in the legs!

During middle childhood, physical growth slows down. One result of the slower rate of growth is an improvement in motor skills. Children of this age tend to sharpen their abilities to perform both gross motor skills such as riding a bike and fine motor skills such as cutting their fingernails.

Early childhood is a time when children are especially attracted to motion and song. Days are filled with moving, jumping, running, swinging, and clapping, and every place becomes a playground. Even the booth at a restaurant affords the opportunity to slide around in the seat or disappear underneath and imagine being a sea creature in a cave! Of course, this can be frustrating to a caregiver, but it's the business of early childhood. Children may frequently ask their caregivers to "look at me" while they hop or roll down a hill. Children's songs are often accompanied by arm and leg movements or cues to turn around or move from left to right. Running, jumping, dancing movements, etc. all afford children the ability to improve their gross motor skills.

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Video 3.3.2. *Early Childhood Gross Motor Development* demonstrates some of the motor skills expected of children during the preschool years.

Children's fundamental motor skills are already developing when they begin kindergarten, but are not yet perfectly coordinated. Five-year-olds generally can walk satisfactorily for most school-related purposes (if they could not, schools would have to be organized very differently!). For some fives, running still looks a bit like a hurried walk, but usually, it becomes more coordinated within a year or two. Similarly with jumping, throwing, and catching: most children can do these things, though often clumsily, by the time they start school, but improve their skills noticeably during the early elementary years (Payne & Isaacs, 2005). It is important to notice if a child does not keep more or less to the usual developmental timetable, and to arrange for special assessment or support if appropriate. Common procedures for arranging for help are described in the chapter on "Special education."

Even if physical skills are not a special focus of a classroom teacher, they can be quite important to students themselves. Whatever their grade level, students who are clumsy are aware of that fact and how it could potentially negatively affect respect from their peers. In the long term, self-consciousness and poor self-esteem can develop in a child who is clumsy, especially if peers (or teachers and parents) place a high value on success in athletics. One research study found, for example, what teachers and coaches sometimes suspect: that losers in athletic competitions tend to become less sociable and are more apt to miss subsequent athletic practices than winners (Petlichkoff, 1996).

Fine Motor Skills

Fine motor skills are more exact movements of the hands and fingers and include the ability to reach and grasp an object. These skills focus on the muscles in the fingers, toes, and eyes, and enable coordination of small actions (e.g., grasping a toy, writing with a pencil, and using a spoon). Newborns cannot grasp objects

voluntarily but do wave their arms toward objects of interest. At about 4 months of age, the infant is able to reach for an object, first with both arms and within a few weeks, with only one arm. Grasping an object involves the use of the fingers and palm, but no thumbs. Stop reading for a moment and try to grasp an object using the fingers and the palm. How does that feel? How much control do you have over the object? If it is a pen or pencil, are you able to write with it? Can you draw a picture? The answer is, probably not. Use of the thumb comes at about 9 months of age when the infant is able to grasp an object using the forefinger and thumb (**the pincer grasp**). This ability greatly enhances the ability to control and manipulate an object, and infants take great delight in this newfound ability. They may spend hours picking up small objects from the floor and placing them in containers. By 9 months, an infant can also watch a moving object, reach for it as it approaches, and grab it. This is quite a complicated set of actions if we remember how difficult this would have been just a few months earlier.

Figure 3.3.1. This baby is working on his pincer grasp.

Fine motor skills are also being refined in activities such as pouring water into a container, drawing, coloring, and using scissors. Some children's songs promote fine motor skills as well (have you ever heard of the song "itsy, bitsy, spider"?). Mastering the fine art of cutting one's own fingernails or tying their shoes will take a lot of practice and maturation. Fine motor skills continue to develop in middle childhood, but for preschoolers, the type of play that deliberately involves these skills is emphasized.

Table 3.3.2. Timeline of Developmental Milestones.	
~2 months	• Can hold head upright on own • Smiles at sound of familiar voices and follows movement with eyes
~3 months	• Can raise head and chest from prone position • Smiles at others • Grasps objects • Rolls from side to back
~4-5 months	• Babbles, laughs, and tries to imitate sounds· • Begins to roll from back to side
~6 months	• Moves objects from hand to hand
~7-8 months	• Can sit without support· • May begin to crawl • Responds to own name • Finds partially hidden objects
~8-9 months	• Walks while holding on· • Babbles “mama” and “dada” • Claps
~11-12 months	• Stands alone • Begins to walk • Says at least one word • Can stack two blocks

~18 months	• Walks independently· • Drinks from a cup· • Says at least 15 words • Points to body parts
~2 years	• Runs and jumps • Uses two-word sentences • Follows simple instructions • Begins make-believe play
~3 years	• Speaks in multi-word sentences· • Sorts objects by shape and color
~4 years	• Draws circles and squares • Rides a tricycle • Gets along with people outside of the family • Gets dressed
~5 years	• Can jump, hop, and skip • Knows name and address • Counts ten or more objects

Developmental Milestones Checklists zero to Five Years

For more information on developmental milestones, see the **CDC's Developmental Milestones.**

Sensory Development

As infants and children grow, their senses play a vital role in encouraging and stimulating the mind and in helping them observe their surroundings. Two terms are important to understand when learning about the senses. The first is **sensation**, or the interaction of information with the sensory receptors. The second is **perception**, or the process of interpreting what is sensed. It is possible for someone to sense something without perceiving it. Gradually, infants become more adept at perceiving, making them more aware of their environment and presenting more affordances or opportunities to interact with objects. With improved sensory-perceptual abilities also comes the ability to navigate their environment. At the same time, movement through the environment seems to scaffold the development of sensory-perceptual abilities.

Vision

What can young infants see, hear, and smell? Newborn infants' sensory abilities are significant, but their senses are not yet fully developed. Many of a newborn's innate preferences facilitate interaction with caregivers and other humans. The womb is a dark environment void of visual stimulation. Consequently, vision is the most poorly developed sense at birth. Newborns typically cannot see further than 8 to 16 inches away from their faces, have difficulty keeping a moving object within their gaze, and can detect contrast more than color differences. If you have ever seen a newborn struggle to see, you can appreciate the cognitive efforts being made to take in visual stimulation and build those neural pathways between the eye and the brain.

Although vision is their least developed sense, newborns already

show a preference for faces. When you glance at a person, where do you look? Chances are you look into their eyes. If so, why? It is probably because there is more information there than in other parts of the face. Newborns do not scan objects this way; rather, they tend to look at the chin or another less detailed part of the face. However, by 2 or 3 months, they will seek more detail when visually exploring an object and begin showing preferences for unusual images over familiar ones, for patterns over solids, faces over patterns, and three-dimensional objects over flat images. Newborns have difficulty distinguishing between colors, but within a few months are able to discriminate between colors as well as adults. Infants can also sense depth as binocular vision develops at about 2 months of age. By 6 months, the infant can perceive depth perception in pictures as well (Sen, Yonas, & Knill, 2001). Infants who have experience crawling and exploring will pay greater attention to visual cues of depth and modify their actions accordingly (Berk, 2007).

Visual Pathways

Have you ever examined the drawings of young children? If you look closely, you can almost see the development of visual pathways reflected in the way these images change as pathways become more mature. Early scribbles and dots illustrate the use of simple motor skills. No real connection is made between an image being visualized and what is created on paper.

At age 3, the child begins to draw wispy creatures with heads and not much other detail. Gradually pictures begin to have more detail and incorporate more parts of the body. Arm buds become arms and faces take on noses, lips, and eventually eyelashes. Look for drawings that you or your child has created to see this fascinating trend. Here are some examples of pictures drawn by girls from ages 2 to 7 years.

Figure 3.3.3. These drawings demonstrate the progression in both drawing skill and visual processing during early childhood. The top left drawing is done by a 2-year old, and the bottom right image is drawn by a 7-year old.

Hearing

The infant's sense of hearing is very keen at birth. If you remember from an earlier module, this ability to hear is evidenced as soon

as the 5th month of prenatal development. In fact, an infant can distinguish between very similar sounds as early as one month after birth and can distinguish between a familiar and non-familiar voice even earlier. Babies who are just a few days old prefer human voices, they will listen to voices longer than sounds that do not involve speech (Vouloumanos & Werker, 2004), and they seem to prefer their mother's voice over a stranger's voice (Mills & Melhuish, 1974). In an interesting experiment, 3-week-old babies were given pacifiers that played a recording of the infant's mother's voice and of a stranger's voice. When the infants heard their mother's voice, they sucked more strongly at the pacifier (Mills & Melhuish, 1974). Some of this ability will be lost by 7 or 8 months as a child becomes familiar with the sounds of a particular language and less sensitive to sounds that are part of an unfamiliar language.

Touch

Immediately after birth, a newborn is sensitive to touch and temperature, and is also sensitive to pain, responding with crying and cardiovascular responses. Newborns who are **circumcised** (the surgical removal of the foreskin of the penis) without anesthesia experience pain, as demonstrated by increased blood pressure, increased heart rate, decreased oxygen in the blood, and a surge of stress hormones (United States National Library of Medicine, 2016). According to the American Academy of Pediatrics (AAP), there are medical benefits and risks to circumcision. They do not recommend routine circumcision, however, they stated that because of the possible benefits (including prevention of urinary tract infections, penile cancer, and some STDs) parents should have the option to circumcise their sons if they want to (AAP, 2012).

The sense of touch is acute in infants and is essential to a baby's growth of physical abilities, language and cognitive skills, and socio-emotional competency. Touch not only impacts short-term

development during infancy and early childhood but also has long-term effects, suggesting the power of positive gentle touch from birth. Through touch, infants learn about their world, bond with their caregivers, and communicate their needs and wants. Research emphasizes the great benefits of touch for premature babies, but the presence of such contact has been shown to benefit all children (Stack, 2010). In an extreme example, some children in Romania were reared in orphanages in which a single care worker may have had as many as 10 infants to care for at one time. These infants were not often helped or given toys with which to play. As a result, many of them were developmentally delayed (Nelson, Fox, & Zeanah, 2014). When we discuss emotional and social development later in this module, you will also see the important role that touch plays in helping infants feel safe and protected, which builds trust and secure attachments between the child and their caregiver.

Taste and Smell

Not only are infants sensitive to touch, but newborns can also distinguish between sour, bitter, sweet, and salty flavors and show a preference for sweet flavors. They can distinguish between their mother's scent and that of others, and prefer the smell of their mothers. A newborn placed on the mother's chest will inch up to the mother's breast, as it is a potent source of the maternal odor. Even on the first day of life, infants orient to their mother's odor and are soothed, when crying, by their mother's odor (Sullivan et al., 2011).

Health and Illness

By world standards, children and youth in economically developed societies tend, on average, to be remarkably healthy. Even so, much

depends on precisely how well-off families are and on how much health care is available to them. Children from higher-income families experience far fewer serious or life-threatening illnesses than children from lower-income families. Whatever their income level, parents and teachers often rightly note that children—especially the youngest ones—get far more illnesses than do adults. In 2004, for example, a government survey estimated that children get an average of 6–10 colds per year, but adults get only about 2–4 per year (National Institute of Allergies and Infectious Diseases, 2004). The difference probably exists because children's immune systems are not as fully formed as adults, and because children at school are continually exposed to other children, many of whom may be contagious themselves. An indirect result of children's frequent illnesses is that teachers (along with airline flight attendants, incidentally!) also report more frequent minor illnesses than do adults in general—about five colds per year, for example, instead of just 2–4 (Whelen, et al., 2005). The "simple" illnesses are not life-threatening, but they are responsible for many lost days of school, both for students and for teachers, as well as days when a student may be present physically, but functions below par while simultaneously infecting classmates. In these ways, learning and teaching often suffer because health is suffering.

The problem is not only the prevalence of illness as such (in winter, even in the United States, approximately one person gets infected with a minor illness every few *seconds*), but the fact that illnesses are not distributed uniformly among students, schools, or communities. Whether it is a simple cold or something more serious, illness is particularly common where living conditions are crowded, where health care is scarce or unaffordable, and where individuals live with frequent stresses of any kind. Often, but not always, these are the circumstances of poverty. Table 3.3 summarizes these effects for a variety of health problems, not just for colds or flu.

Table 3.3.3. Health effects of children's economic level

Health program	Comparison: Poor vs. non-poor
Delayed immunizations	3 times higher
Asthma	Somewhat higher
Lead poisoning	3 times higher
Deaths in childhood from accidents	2–3 times higher
Deaths in childhood from disease	3–4 times higher
Having a condition that limits school activity	2–3 times higher
Days sick in bed	4o percent higher
Seriously impaired vision	2–3 times higher
Severe iron deficiency (anemia)	2 times higher

Source: Richardson, 2005; Spencer, 2000; Allender, 2005.

As students get older, illnesses become less frequent, but other health risks emerge. The most widespread are the consumption of alcohol and the smoking of cigarettes. As of 2004, about 75 percent of teenagers reported drinking an alcoholic beverage at least occasionally, and 22 percent reported smoking cigarettes (Center for Disease Control, 2004a). The good news is that these proportions show a small, but steady *decline* in the frequencies over the past 10 years or so. The bad news is that teenagers also show *increases* in the abuse of some prescription drugs, such as inhalants, that act as stimulants (Johnston, et al., 2006). As with the prevalence of illnesses, the prevalence of drug use is not uniform, with a relatively small fraction of individuals accounting for a disproportionate proportion of usage. One survey, for example, found that a teenager was 3–5 times more likely to smoke or use alcohol, smoke marijuana, or use drugs if he or she has a *sibling* who has also indulged in these habits (Fagan & Najman, 2005). Siblings, it seems, are more influential in this case than parents.

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Brain Development

The Brain in the First Two Years

Some of the most dramatic physical change that occurs during the first two years of brain development. We are born with most of the brain cells that we will ever have; that is, about 85 billion neurons whose function is to store and transmit information (Huttenlocher & Dabholkar, 1997). While most of the brain's neurons are present at birth, they are not fully mature.

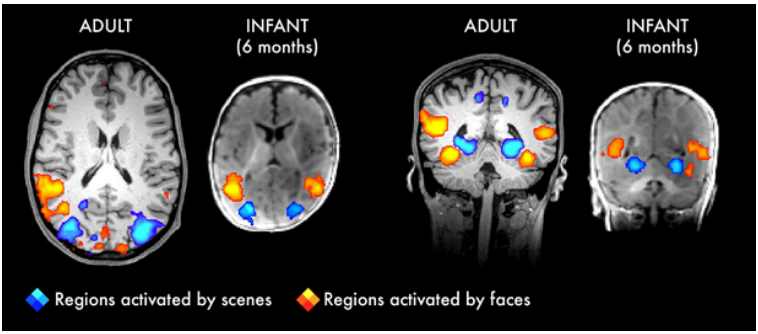

Figure 3.4.1. Research shows that as early at 4-6 months, infants utilize similar areas of the brain as adults to process information. Image from Deen et al., 2017.

Communication within the central nervous system (CNS), which consists of the brain and spinal cord, begins with nerve cells called **neurons**. Neurons connect to other neurons via networks of nerve fibers called **axons** and **dendrites**. Each neuron typically has a single axon and numerous dendrites that are spread out like branches of a tree (some will say it looks like a hand with fingers). The axon of each neuron reaches toward the dendrites of other

neurons at intersections called **synapses**, which are critical communication links within the brain. Axons and dendrites do not touch, instead, electrical impulses in the axons cause the release of chemicals called **neurotransmitters** which carry information from the axon of the sending neuron to the dendrites of the receiving neuron.

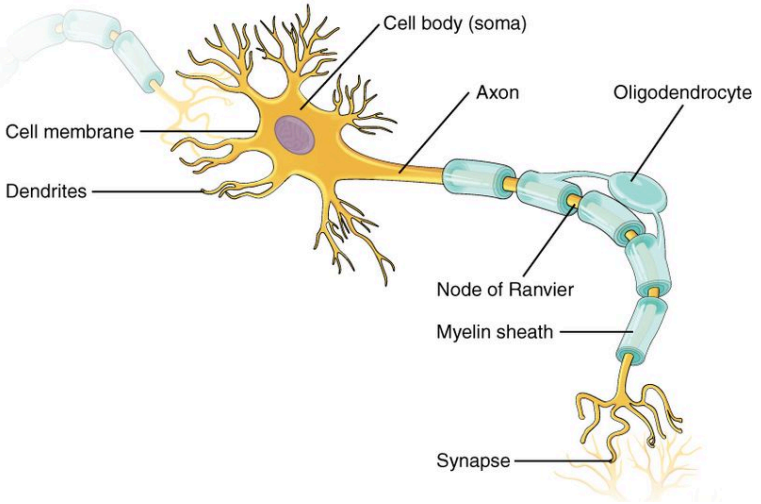

Figure 3.4.2. Neuron.

Synaptogenesis and Synaptic Pruning

While most of the brain's 100 to 200 billion neurons are present at birth, they are not fully mature. Each neural pathway forms thousands of new connections during infancy and toddlerhood. **Synaptogenesis**, *or the formation of connections between neurons*, continues from the prenatal period forming thousands of new connections during infancy and

toddlerhood. During the next several years, dendrites, or connections between neurons, will undergo a period of **transient exuberance** or temporary dramatic growth (*exuberant* because it is so rapid and *transient* because some of it is temporary). There is such a proliferation of these dendrites during these early years that by age 2 a single neuron might have thousands of dendrites.

After this dramatic increase, the neural pathways that are not used will be eliminated through a process called **synaptic pruning**, *where neural connections are reduced, thereby making those that are used much stronger.* It is thought that pruning causes the brain to function more efficiently, allowing for mastery of more complex skills (Hutchinson, 2011). Experience will shape which of these connections are maintained and which of these are lost. Ultimately, about 40 percent of these connections will be lost (Webb, Monk, and Nelson, 2001). Transient exuberance occurs during the first few years of life, and pruning continues through childhood and into adolescence in various areas of the brain. This activity is occurring primarily in the **cortex** or the thin outer covering of the brain involved in voluntary activity and thinking.

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Video 3.4.1. *How Baby Brains Develop explains* some of the brain changes expected in the first few years of life.

Myelination

Another significant change occurring in the central nervous system is the development of **myelin**, *a coating of fatty tissues around the axon of the neuron* (Carlson, 2014). myelin helps insulate the nerve cell and speed the rate of transmission of impulses from one cell to another. This increase enhances the building of neural pathways and improves coordination and control of movement and thought processes. During infancy, myelination progresses rapidly, with increasing numbers of axons acquiring myelin sheaths. This corresponds with the development of cognitive and motor skills, including language comprehension, speech acquisition, sensory processing, crawling and walking. Myelination in the motor areas of the brain during early to middle childhood leads to vast improvements in fine and gross motor skills. Myelination continues through adolescence and early adulthood and although largely complete at this time, myelin sheaths can be added in grey matter regions such as the cerebral cortex, throughout life.

Brain Structures

At birth, the brain is about 25 percent of its adult weight, and by age two, it is at 75 percent of its adult weight. Most of the neural activity is occurring in the **cortex** *or the thin outer covering of the brain involved in voluntary activity and thinking.* The cortex is divided into two hemispheres, and each hemisphere is divided into four lobes, each separated by folds known as fissures. If we look at the cortex starting at the front of the brain and moving over the top, we

see first the **frontal lobe** (behind the forehead), *which is responsible primarily for thinking, planning, memory, and judgment*. Following the frontal lobe is the **parietal lobe**, *which extends from the middle to the back of the skull and which is responsible primarily for processing information about touch*. Next is the **occipital lobe**, *at the very back of the skull, which processes visual information*. Finally, in front of the occipital lobe, between the ears, is the **temporal lobe**, which is *responsible for hearing and language*.

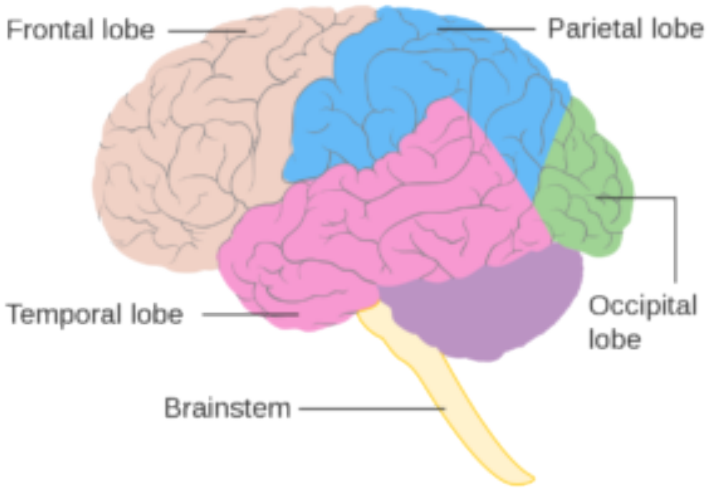

Figure 3.4.3. Lobes of the brain.

Although the brain grows rapidly during infancy, specific brain regions do not mature at the same rate. Primary motor areas develop earlier than primary sensory areas, and the prefrontal cortex, which is located behind the forehead, is the least developed. As the prefrontal cortex matures, the child is increasingly able to regulate or control emotions, to plan activities, strategize, and have better judgment. This maturation is not fully accomplished in

infancy and toddlerhood but continues throughout childhood, adolescence, and into adulthood.

Lateralization

Lateralization *is the process in which different functions become localized primarily on one side of the brain.* For example, in most adults, the left hemisphere is more active than the right during language production, while the reverse pattern is observed during tasks involving visuospatial abilities (Springer & Deutsch, 1993). This process develops over time, however, structural asymmetries between the hemispheres have been reported even in fetuses (Chi, Dooling, & Gilles, 1997; Kasprian et al., 2011) and infants (Dubois et al., 2009).

Neuroplasticity

Lastly, **neuroplasticity** *refers to the brain's ability to change, both physically and chemically, to enhance its adaptability to environmental change and compensate for injury.* Neuroplasticity enables us to learn and remember new things and adjust to new experiences. Both environmental experiences, such as stimulation, and events within a person's body, such as hormones and genes, affect the brain's plasticity. So too does age. Our brains are the most "plastic" when we are young children, as it is during this time that we learn the most about our environment. Adult brains demonstrate neuroplasticity, but they are influenced more slowly and less extensively than those of children (Kolb & Whishaw, 2011).

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Video 3.4.2. *Long-term Potentiation and Synaptic Plasticity* explains how learning occurs through synaptic connections and plasticity.

The control of some specific bodily functions, such as movement, vision, and hearing, is performed in specified areas of the cortex. If these areas are damaged, the individual will likely lose the ability to perform the corresponding function. For instance, if an infant suffers damage to facial recognition areas in the temporal lobe, likely, he or she will never be able to recognize faces (Farah, Rabinowitz, Quinn, & Liu, 2000). On the other hand, the brain is not divided up in an entirely rigid way. The brain's neurons have a remarkable capacity to reorganize and extend themselves to carry out particular functions in response to the needs of the organism, and to repair the damage. As a result, the brain constantly creates new neural communication routes and rewires existing ones.

The Amazing Power of Neuroplasticity

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view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=52#oembed-3

Video 3.4.3. *The Story of Jody* is a case study about a young girl that had the right hemisphere of her brain removed as a treatment for severe seizures. Due to neuroplasticity, Jody was able to recover from the damage caused by the removal of so much of her cerebrum.

Brain Maturation During Childhood

The brain is about 75 percent of its adult weight by three years of age. By age 6, it is at 95 percent of its adult weight (Lenroot & Giedd, 2006). Myelination and the development of dendrites continue to occur in the cortex, and as it does, we see a corresponding change in what the child is capable of doing. Greater development in the prefrontal cortex, the area of the brain behind the forehead that helps us to think, strategize, and control attention and emotion, makes it increasingly possible to inhibit emotional outbursts and understand how to play games.

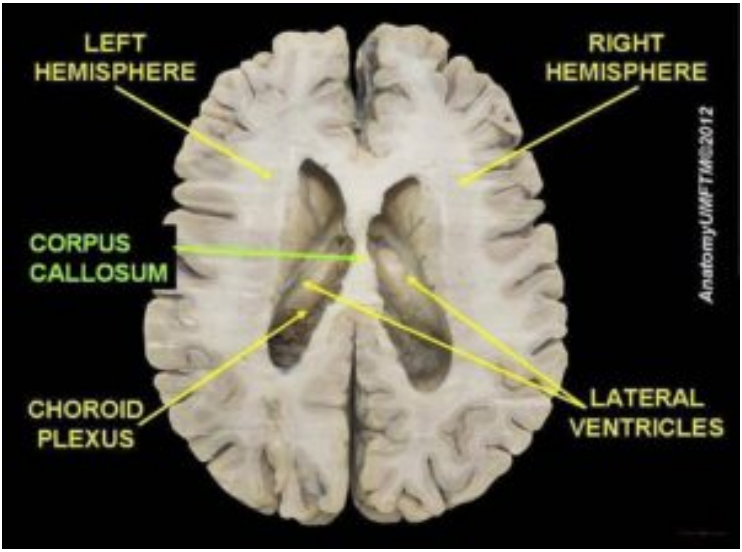

Figure 3.4.4. Corpus Callosum.

Growth in the Hemispheres and Corpus Callosum

Between ages 3 and 6, the left hemisphere of the brain grows dramatically. This side of the brain or hemisphere is typically involved in language skills. The right hemisphere continues to grow throughout early childhood and is involved in tasks that require spatial skills, such as recognizing shapes and patterns. The Corpus Callosum, *a dense band of fibers that connects the two hemispheres of the brain*, contains approximately 200 million nerve fibers that connect the hemispheres (Kolb & Whishaw, 2011).

The corpus callosum is located a couple of inches below the longitudinal fissure, which runs the length of the brain and

separates the two cerebral hemispheres (Garrett, 2015). Because the two hemispheres carry out different functions, they communicate with each other and integrate their activities through the corpus callosum. Additionally, because incoming information is directed toward one hemisphere, such as visual information from the left eye being directed to the right hemisphere, the corpus callosum shares this information with the other hemisphere.

The corpus callosum undergoes a growth spurt between ages 3 and 6, and this results in improved coordination between right and left hemisphere tasks. For example, in comparison to other individuals, children younger than 6 demonstrate difficulty coordinating an Etch A Sketch toy because their corpus callosum is not developed enough to integrate the movements of both hands (Kalat, 2016).

Adolescent Brain Development

The human brain is not fully developed by the time a person reaches puberty. Between the ages of 10 and 25, the brain undergoes changes that have important implications for behavior. The brain reaches 90% of its adult size by the time a person is six or seven years of age. Thus, the brain does not grow in size much during adolescence. However, the creases in the brain continue to become more complex until the late teens. The most significant changes in the folds of the brain during this time occur in the parts of the cortex that process cognitive and emotional information. Changes to the brain directly influence changes to behavior and mental process. We will discuss some of these issues.

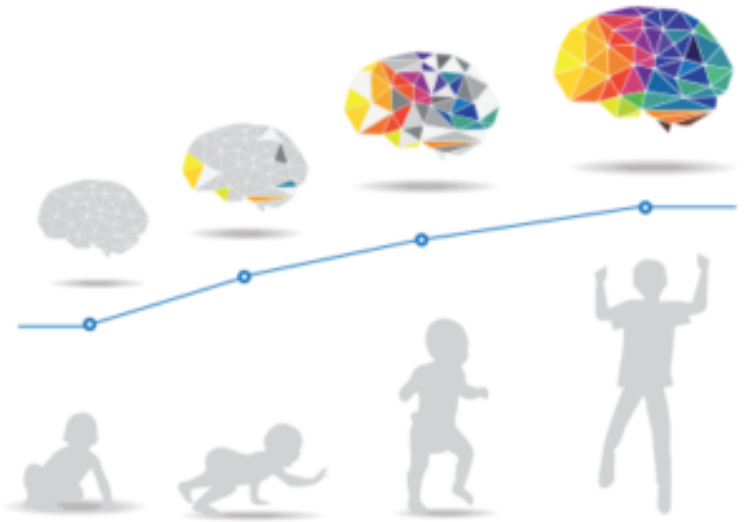

Figure 3.4.5. The brain reaches its largest size in the early teen years but continues to mature well into the 20s.

Brain Changes

Up until puberty, brain cells continue to bloom in the frontal region. Some of the most developmentally significant changes in the brain occur in the **prefrontal cortex**, which is involved in decision making and cognitive control, as well as other higher cognitive functions. During adolescence, **myelination** and **synaptic pruning** in the prefrontal cortex increases, improving the efficiency of information processing, and neural connections between the prefrontal cortex and other regions of the brain are strengthened. However, this growth takes time, and the growth is uneven.

The Limbic System

The **limbic system** develops years ahead of the prefrontal cortex. Development in the limbic system plays an essential role in determining rewards and punishments and processing emotional experience and social information. Pubertal hormones target the **amygdala** directly, and powerful sensations become compelling (Romeo, 2013). Brain scans confirm that cognitive control, revealed by fMRI studies, is not fully developed until adulthood because the prefrontal cortex is limited in connections and engagement (Hartley & Somerville, 2015). Recall that this area is responsible for judgment, impulse control, and planning, and it is still maturing into early adulthood (Casey, Tottenham, Liston, & Durston, 2005).

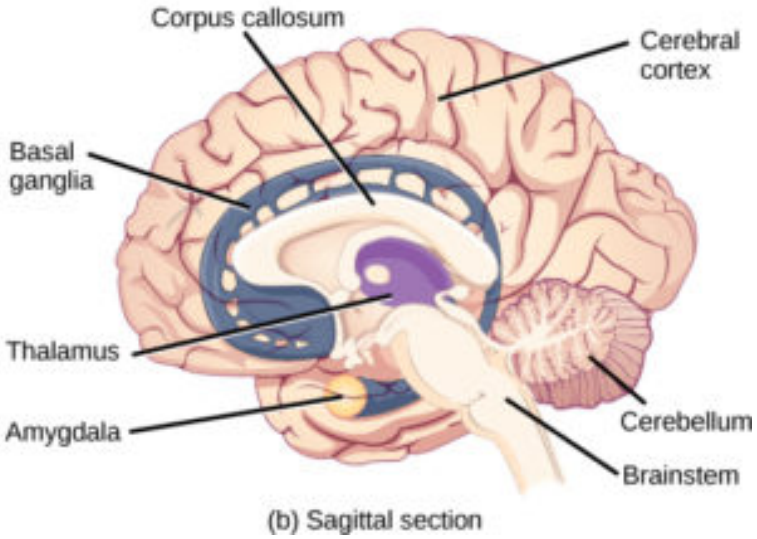

Figure 3.4.6. The limbic system.

Additionally, changes in both the levels of the neurotransmitters **dopamine** and **serotonin** in the limbic system make adolescents more emotional and more responsive to rewards

and stress. Dopamine is a neurotransmitter in the brain associated with pleasure and attuning to the environment during decision-making. During adolescence, dopamine levels in the limbic system increase, and the input of dopamine to the prefrontal cortex increases. The increased dopamine activity in adolescence may have implications for adolescent risk-taking and vulnerability to boredom. Serotonin is involved in the regulation of mood and behavior. It affects the brain differently. Known as the "calming chemical," serotonin eases tension and stress. Serotonin also puts a brake on the excitement and sometimes recklessness that dopamine can produce. If there is a defect in the serotonin processing in the brain, impulsive or violent behavior can result.

The Prefrontal Cortex

The prefrontal cortex, the part of the frontal lobes lying just behind the forehead, is often referred to as the "CEO of the brain," the cognitive control center. This brain region is responsible for cognitive analysis, abstract thought, the moderation of "correct" behavior in social situations, the capacity to exercise good judgment, self-regulation, and future orientation. The prefrontal cortex takes in information from all of the senses and orchestrates thoughts and actions to achieve specific goals (Casey, Jones, & Hare, 2008; Walsh, 2004). Around 11 years of age, this region of the brain begins an extended process of pruning and myelination and is not complete until near the age of 25. This region of the brain is one of the last to reach maturity. This delay may help to explain why some adolescents act the way they do. The so-called "executive functions" of the human prefrontal cortex include:

- Focusing attention
- Organizing thoughts and problem-solving
- Foreseeing and weighing possible consequences of behavior
- Considering the future and making predictions

- Forming strategies and planning
- Ability to balance short-term rewards with long term goals
- Shifting/adjusting behavior when situations change
- Impulse control and delaying gratification
- Modulation of intense emotions
- Inhibiting inappropriate behavior and initiating appropriate behavior
- Simultaneously considering multiple streams of information when faced with complex and challenging information

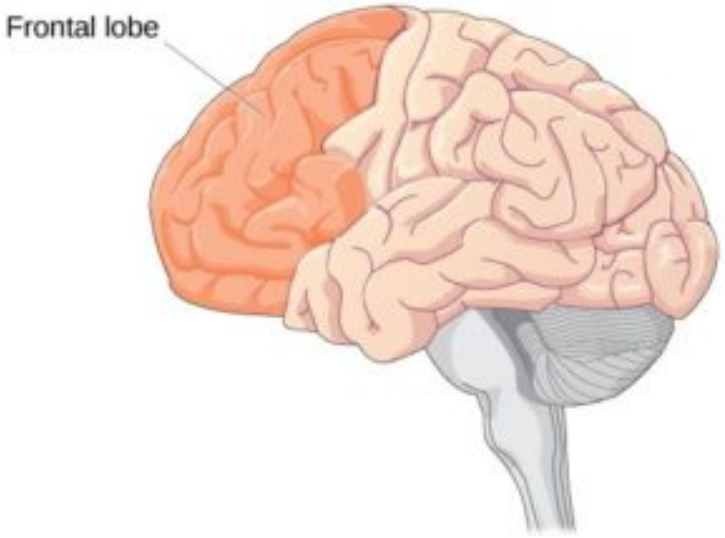

Figure 3.4.7. Brain development continues into the early 20s. The development of the frontal lobe, in particular, is important during this stage.

The difference in timing of the development of the limbic system and prefrontal cortex contributes to more risk-taking during adolescence. Because adolescents are motivated to seek thrills that sometimes come from risky behavior, they are more likely to engage

in reckless driving, smoking, or drinking, and have not yet developed the cognitive control to resist impulses or focus equally on the potential risks (Steinberg, 2008). One of the world's leading experts on adolescent development, Laurence Steinberg, likens this to engaging a powerful engine before the braking system is in place. The result is that adolescents are more prone to risky behaviors than are children or adults.

Brain Region Integration

MRI studies of the brain show that developmental processes tend to occur in the brain in a back-to-front pattern, explaining why the prefrontal cortex develops last. These studies have also found that teens have less white matter (myelin) in the frontal lobes of their brains when compared to adults, but this amount increases as the teen ages. With more myelin comes the growth of important brain connections, allowing for a better flow of information between brain regions. MRI research has also revealed that during adolescence, white matter increases in the corpus callosum, the bundle of nerve fibers connecting the right and left hemispheres of the brain. This development allows for enhanced communication between the hemispheres, which enables a full array of analytic and creative strategies to be brought to bear in responding to the complex dilemmas that may arise in a young person's life (Giedd, 2004).

In sum, the adolescent years are a time of profound brain changes. Interestingly, two of the primary brain functions develop at different rates. Brain research indicates that the part of the brain that perceives rewards from risk, the limbic system, kicks into high gear in early adolescence. The part of the brain that controls impulses and engages in longer-term perspective, the frontal lobes, mature later. This delay may explain why teens in mid-adolescence take more risks than older teens.

As the frontal lobes become more developed, two things happen.

First, self-control develops as teens are better able to assess cause and effect. Second, more areas of the brain become involved in processing emotions, and teens become better at accurately interpreting others' emotions.

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Video 3.4.4. *Brain Changes in Adolescence* describes some of the physical changes that occur during adolescence.

The Teen Brain: 6 Things to Know from the National Institute of Mental Health

Your brain does not keep getting bigger as you get older

For girls, the brain reaches its largest physical size around 11 years old, and for boys, the brain reaches its largest physical size around age 14. Of course, this difference in age does not mean either boys or girls are smarter than one another!

But that doesn't mean your brain is done maturing

For both boys and girls, although your brain may be as large as it will ever be, your brain doesn't finish developing and maturing until your mid- to late-20s. The front part of the brain, called the prefrontal cortex, is one of the last brain regions to mature. It is the area responsible for planning, prioritizing, and controlling impulses.

The teen brain is ready to learn and adapt

In a digital world that is constantly changing, the adolescent brain is well prepared to adapt to new technology—and is shaped in return by experience.

Many mental disorders appear during adolescence

All the big changes the brain is experiencing may explain why adolescence is the time when many mental disorders—such as schizophrenia, anxiety, depression, bipolar disorder, and eating disorders—emerge.

The teen brain is resilient

Although adolescence is a vulnerable time for the brain and for teenagers in general, most teens go on to become

healthy adults. Some changes in the brain during this important phase of development actually may help protect against long-term mental disorders.

Teens need more sleep than children and adults

Although it may seem like teens are lazy, science shows that melatonin levels (or the "sleep hormone" levels) in the blood naturally rise later at night and fall later in the morning than in most children and adults. This may explain why many teens stay up late and struggle with getting up in the morning. Teens should get about 9-10 hours of sleep a night, but most teens don't get enough sleep. A lack of sleep makes paying attention hard, increases impulsivity, and may also increase irritability and depression.

Educational Neuroscience

Educational neuroscience (or neuroeducation) is an emerging scientific field that brings together researchers in neuroscience, psychology, education, and even technology, to explore the interactions between biological processes and education. Researchers in educational neuroscience investigate the neural mechanisms for processes such as learning, memory, attention, intelligence, and motivation. Their research also attends to difficulties, including dyslexia, dyscalculia, and ADHD, as they relate to education. Researchers in this area may link basic findings in cognitive neuroscience with educational technology to help in curriculum implementation for specific academic areas, like

mathematics and reading education. Educational neuroscience aims to generate basic and applied research that will provide a new transdisciplinary account of learning and teaching, which is capable of informing education.

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Video 3.4.5. *Introduction to Educational Neuroscience* discusses how neuroscience can inform education and dispels several common myths about brain functioning held by teachers and students.

A Neuroeducational Case Study: Language and Literacy

Human language is a unique faculty of the mind, and the ability to understand and produce oral and written language is fundamental to academic achievement and attainments. Children who experience difficulties with oral language raise significant challenges for educational policy and practice. The difficulties are likely to persist during the primary school years where, in addition to core deficits with oral language, children experience problems with literacy, numeracy, and behavior and peer relations. Early identification and intervention to address these difficulties,

as well as identification of how learning environments can support atypical language development, are essential.

Over the last decade, there has been a significant increase in neuroscience research examining young children's processing of language at the phonetic, word, and sentence levels. There are clear indications that neural substrates for all levels of language can be identified at early points in development. At the same time, intervention studies have demonstrated how the brain retains its plasticity for language processing. Intense remediation with an auditory language processing program has been accompanied by functional changes in the left temporoparietal cortex and inferior frontal gyrus. However, the extent to which these results generalize to spoken and written language is debated.

The relationships between meeting the educational needs of children with language difficulties and the findings of neuroscience studies are not yet established. One concrete avenue for progress is to use neuroscientific methods to address questions that are significant to practice in learning environments. For example, the extent to which language skills are attributable to a single common trait, and the consistency of such a trait over development, are matters of debate. However, direct assessments of brain activity can inform these debates. A detailed understanding of the sub-components of the language system, and the ways these change over time may inevitably yield implications for educational practice.

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Cognitive Development

Cognition refers to thinking and memory processes, and **cognitive development** refers to long-term changes in these processes. Biological changes in brain structure and connectivity in the brain interact with increased experience, knowledge, and changing social demands to produce rapid cognitive growth. Development of executive functions, or cognitive skills that enable the control and coordination of thoughts and behavior, are generally associated with the prefrontal cortex area of the brain. The thoughts, ideas, and concepts developed during this period of life greatly influence one's future life and play a significant role in character and personality formation.

There are two primary perspectives on cognitive development: constructivist and information-processing. The **constructivist perspective**, based on the work of psychologists like Piaget and Vygotsky. The **information-processing perspective** explains cognitive development in terms of the growth of specific components of the overall process of thinking, such as attention, memory, processing speed, and metacognition.

Constructivist Theories

Constructivism is a perspective on learning focused on how people actively create (or "construct") knowledge out of experiences. Constructivist models of learning differ about how much a learner constructs knowledge independently, compared to how much he or she takes cues from people who may be more of an expert and who help the learner's efforts (Fosnot, 2005; Rockmore, 2005). These two perspectives are referred to as **psychological constructivism** (changes in thinking resulting from individual experiences) and **social constructivism** (changes in thinking due to assistance from

others); however, both versions are, in a sense, explanations about thinking within individuals.

The Piagetian version of psychological constructivist learning is rather "individualistic," in the sense that it does not say much about how other people involved might assist with learning. Parents and teachers are left lingering on the sidelines with few significant responsibilities for helping learners to construct knowledge. Piaget did recognize the importance of helpful others in his theory, calling the process of support or assistance social transmission; however, he did not emphasize this aspect of constructivism. Piaget was more interested in what learners could figure out on their own (Salkind, 2004). Partly for this reason, his theory is often considered less about learning and more about development, which is a long-term change in a person resulting from multiple experiences. For the same reason, educators have often found Piaget's ideas especially helpful for thinking about students' readiness to learn.

Unlike Piaget's rather individually oriented version of constructivism, some psychologists have focused on the interactions between a learner and more knowledgeable individuals. One early expression of this viewpoint came from the American psychologist Jerome Bruner (1960, 1966, 1996), who became convinced that students could usually learn more than had been traditionally expected as long as they were given appropriate guidance and resources. He called such support instructional scaffolding— literally meaning a temporary framework, like one used in constructing a building, that allows a much stronger structure to be built within it. The reason for such a bold assertion was Bruner's belief in scaffolding—his belief in the importance of providing guidance in the right way and at the right time. When scaffolding is provided, students seem more competent and "intelligent," and they learn more.

Similar ideas were proposed by Lev Vygotsky (1978), whose writing focused on how a learner's thinking is influenced by relationships with others who are more capable, knowledgeable, or expert than the learner. Vygotsky proposed that when a person is learning a

new skill or solving a new problem, he or she can perform better if accompanied and helped by an expert than if performing alone—though still not as well as the expert.

The social version of constructivism, however, highlights the responsibility of the expert for making learning possible. He or she must not only have knowledge and skill but also know how to arrange experiences that make it easy and safe for learners to gain knowledge and skill themselves. In addition to knowing what is to be learned, the expert (i.e., the teacher) needs to break the content into manageable parts, offer the parts in a sensible sequence, provide for a suitable and successful practice, bring the parts back together again at the end, and somehow relate the entire experience to knowledge and skills already meaningful to the learner.

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Video 3.5.1 *Constructivist Learning* explains the basics of constructivism.

Information Processing Theories

Information Processing is not the work of a single theorist, but based on the ideas and research of several cognitive scientists *studying how individuals perceive, analyze, manipulate, use, and remember information.* This approach assumes that humans gradually improve in their processing skills; that is, development is

continuous rather than stage-like. The more complex mental skills of adults are built from the primitive abilities of children. We are born with the ability to notice stimuli, store, and retrieve information. Brain maturation enables advancements in our information processing system. At the same time, interactions with the environment also aid in our development of more effective strategies for processing information.
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Psychological Constructivism: Piaget's Theories

Piaget believed that when we are faced with new information that we experience a cognitive disequilibrium. In response, we are continuously trying to regain cognitive homeostasis through adaptation. Piaget also proposed that, through maturation, we progress through four stages of cognitive development.

Adaptation

When it comes to maintaining cognitive equilibrium, novices have much more of a challenge because they are continually being confronted with new situations. All of this new information needs to be organized. The *framework for organizing information is referred to as a* **schema.** We develop schemata through the processes of adaptation. Adaptation can occur through assimilation and accommodation.

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Video 3.6.1 *Semantic Networks and Spreading Activation* explains the creation and use of schemas.

Sometimes when we are faced with new information, we can simply fit it into our current schema; this is called **assimilation.** For

example, a student is given a new math problem in class. They use previously learned strategies to try to solve the problem. While the problem is new, the process of solving the problem is something familiar to the student. The new problem fits into their current understanding of the math concept.

Not all new situations fit into our current framework and understanding of the world. In these cases, we may need **accommodation**, *which is expanding the framework of knowledge to accommodate the new situation.* If the student solving the math problem could not solve it because they were missing the strategies necessary to find the answer, they would first need to learn these strategies, and then they could solve the problem.

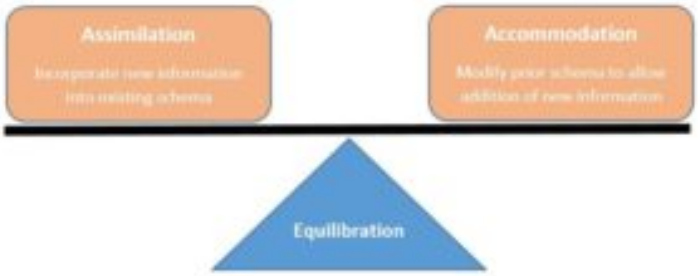

Figure 3.6.1 Model of Piaget's adaptation theory.

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Video 3.6.2. *Schemas, Assimilation, and Accommodation* explains Piaget's theory of constructing schemas through adaptation.

Piaget's Stages of Cognitive Development

After observing children closely, Piaget proposed that cognition developed through distinct stages from birth through the end of adolescence. By stages he meant a sequence of thinking patterns with four key features:

1. They always happen in the same order.
2. No stage is ever skipped.
3. Each stage is a significant transformation of the stage before it.
4. Each later stage incorporated the earlier stages into itself.

Piaget proposed four major stages of cognitive development: (1) sensorimotor intelligence, (2) preoperational thinking, (3) concrete operational thinking, and (4) formal operational thinking. Each stage is correlated with an age period of childhood, but only approximately.

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Video 3.6.3. *Piaget's Stages of Cognitive Development* explains the structure of the four stages and major cognitive developments associated with each stage.

The Sensorimotor Stage (0-2 years)

In Piaget's theory, the sensorimotor stage is first, and is defined as the period when infants' think' by means of their senses and motor actions. As every new parent will attest, infants continually touch, manipulate, look, listen to, and even bite and chew objects. According to Piaget, these actions allow them to learn about the world and are crucial to their early cognitive development.

At birth, the beginning of the sensorimotor stage, children have only a few simple reflexes (sucking, grasping, looking) to help them satisfy biological needs, such as hunger. By the end of this stage, children can move about on their own, solve simple problems in their heads, search for and find objects that are hidden from view, and even communicate some of their thoughts. Between 4 and 8 months of age, infants learn that they can make things move by banging and shaking them, which is why babies of this age love to play with rattles. Sometime between the eighth and twelfth months, they figure out how to get one thing (like a bottle) by using another (for instance, by knocking a pillow away). Between 12 and 18 months, children can represent hidden objects in their minds. They search for what they want, even when they cannot see it. At the end of this period, children are beginning to use images to stand for objects. For example, a 2-year-old places her doll inside a dollhouse and imaginatively reconstructs her doll's view of the miniature rooms and furniture. This ability, called **mediation**, is a significant achievement because it frees the child from the need to think about only those objects she can see around her. A child who can mediate can think about the whole world.

Let us examine the transition that infants make from responding to the external world reflexively as newborns, to solving problems

using mental strategies as two-year-olds by examining the various substages that children move through from birth to their second birthday.

Table 3.6.1. Sensorimotor substages.

Stage	**Age**
Stage 1 – Reflexes	Birth to 6 weeks
Stage 2 – Primary Circular Reactions	6 weeks to 4 months
Stage 3 – Secondary Circular Reactions	4 months to 8 months
Stage 4 – Coordination of Secondary Circular Reactions	8 months to 12 months
Stage 5 – Tertiary Circular Reactions	12 months to 18 months
Stage 6 – Mental Representation	18 months to 24 months

Substages of Sensorimotor Intelligence

For an overview of the substages of sensorimotor thought, it helps to group the six substages into pairs. The first two substages involve the infant's responses to its own body, call **primary circular reactions**. During the first month first (substage one), the infant's senses, as well as motor reflexes, are the foundation of thought.

Substage One: Reflexive Action (0-1month)

This active learning begins with automatic movements or reflexes (sucking, grasping, staring, listening). A ball comes into contact with an infant's cheek and is automatically sucked on and licked. This reflexive response is also what happens with a sour lemon, much to the infant's surprise! The baby's first challenge is to learn to

adapt the sucking reflex to bottles or breasts, pacifiers or fingers, each acquiring specific types of tongue movements to latch, suck, breath, and repeat. This adaptation demonstrates that infants have begun to make sense of sensations. Eventually, the use of these reflexes becomes more deliberate and purposeful as they move onto substage two.

Substage Two: First Adaptations to the Environment (1-4 months)

Fortunately, within a few days or weeks, the infant begins to discriminate between objects and adjust responses accordingly as reflexes are replaced with voluntary movements. An infant may accidentally engage in a behavior and find it interesting, such as making a vocalization. This interest motivates trying to do it again and helps the infant learn a new behavior that initially occurred by chance. The behavior is identified as circular and primary because it centers on the infant's own body. At first, most actions have to do with the body, but in months to come, it will be directed more toward objects. For example, the infant may have different sucking motions for hunger and others for comfort (i.e., sucking a pacifier differently from a nipple or attempting to hold a bottle to suck it).

The next two substages (3 and 4), involve the infant's responses to objects and people, called **secondary circular reactions.** Reactions are no longer confined to the infant's body and are now interactions between the baby and something else.

Substage Three: Repetition (4-8 months)

During the next few months, the infant becomes more and more actively engaged in the outside world and takes delight in being able to make things happen by responding to people and objects. Babies try to continue any pleasing event. Repeated motion brings

particular interest as the infant can bang two lids together or shake a rattle and laugh. Another example might be to clap their hands when a caregiver says, "patty-cake." Any sight of something delightful will trigger efforts for interaction.

Substage Four: New Adaptations and Goal-Directed Behavior (8-12 months)

Now the infant becomes more deliberate and purposeful in responding to people and objects and can engage in behaviors that others perform and anticipate upcoming events. Babies may ask for help by fussing, pointing, or reaching up to accomplish tasks, and work hard to get what they want. Perhaps because of continued maturation of the prefrontal cortex, the infant becomes capable of having a thought and carrying out a planned, goal-directed activity such as seeking a toy that has rolled under the couch or indicating that they are hungry. The infant is coordinating both internal and external activities to achieve a planned goal and begins to get a sense of social understanding. Piaget believed that at about 8 months (during substage 4), babies first understood the concept of **object permanence,** which is the realization that objects or people continue to exist when they are no longer in sight.

The last two stages (5 and 6), called **tertiary circular reactions**, consist of actions (stage 5) and ideas (stage 6) where infants become more creative in their thinking.

Substage Five: Active Experimentation of "Little Scientists" (12-18 months)

The toddler is considered a "little scientist" and begins exploring the world in a trial-and-error manner, using motor skills and planning abilities. For example, the child might throw their ball down the stairs to see what happens, or delight in squeezing all of the

toothpaste out of the tube. The toddler's active engagement in experimentation helps them learn about their world. Gravity is learned by pouring water from a cup or pushing bowls from high chairs. The caregiver tries to help the child by picking it up again and placing it on the tray. And what happens? Another experiment! The child pushes it off the tray again, causing it to fall and the caregiver to pick it up again! A closer examination of this stage causes us to appreciate how much learning is going on at this time and how many things we come to take for granted must actually be learned. This time is a wonderful and messy time of experimentation, and most learning occurs by trial and error.

Substage Six: Mental Representations (18-24 months)

The child is now able to solve problems using mental strategies, to remember something heard days before and repeat it, to engage in pretend play, and to find objects that have been moved even when out of sight. Take, for instance, the child who is upstairs in a room with the door closed, supposedly taking a nap. The doorknob has a safety device on it that makes it impossible for the child to turn the knob. After trying several times to push the door or turn the doorknob, the child carries out a mental strategy to get the door opened – he knocks on the door! Obviously, this is a technique learned from the past experience of hearing a knock on the door and observing someone opening the door. The child is now better equipped with mental strategies for problem-solving. Part of this stage also involves learning to use language. This initial movement from the "hands-on" approach to knowing about the world to the more mental world of stage six marked the transition to preoperational thinking.

Current Research

Piaget lacked today's sophisticated research techniques and scientific equipment for studying early cognition. Today researchers can study the preferences of infants by tracking their eye movements. They can also use sophisticated techniques to teach infants how to manipulate their environments (for example, suck on a bottle more vigorously to see or hear more interesting sights and sounds). This research has shown that infants gain a sense of the stability of objects (called object permanence) much earlier than Piaget estimated—at about 4 months (Baillargeon, 1987). Meltzoff (1988) showed 9- month-old infants a video of an adult playing with toys unfamiliar to the infants. A day later, the infants imitated the adult's actions they had seen. This behavior suggests that deferred imitation (a form of mediation) is present almost a year earlier than Piaget expected it to occur. Although Piaget appears to have underestimated the ability of infants to take in information, store, organize, remember, and imitate it, he appears to have described correctly the sequences by which these skills develop. Furthermore, his view of the infant as a "mini-scientist" who acts on the world and builds theories about it is very much consistent with current research findings.

The Preoperational Stage (2 to 7 years)

The **preoperational stage** builds on the accomplishments of the sensorimotor stage. Piaget postulated that a radical or qualitative change occurs at this time: the emergence of symbolic thought. In the **preoperational stage,** children use their new ability to represent objects in a wide

variety of activities; however, they do not yet do it in ways that are organized or entirely logical.

Pretend Play

One of the most obvious examples of this kind of cognition is **pretend play**, the improvised make-believe of preschool children. For example, during the preoperational period, children can make a horse out of a broom, a daddy out of a doll, or a truck or train out of a block of wood. Later (between 3 and 4 years), they play parts or roles: doctor and patient, mommy and daddy, good guys and bad guys, bus driver and passengers. In a way, children immersed in make-believe seem not to think realistically. However, at some level, these children know that it is just pretend and that they are merely representing objects. They are thinking on two levels at once—one imaginative and the other realistic. This dual processing of experience makes dramatic play an early example of **metacognition**, or reflecting on and monitoring of thinking itself. Metacognition is a highly desirable skill for success in school, one that teachers often encourage (Bredekamp & Copple, 1997; Paley, 2005). Partly for this reason, teachers of young children (preschool, kindergarten, and even first or second grade) often make time and space in their classrooms for dramatic play, and sometimes even participate in it themselves to help develop the play further.

Piaget believed that children's pretend play and experimentation helped them solidify the new schemas they were developing cognitively. This process involves both assimilation and accommodation, which results in changes in their conceptions or thoughts. As children progress through the preoperational stage, they are developing the knowledge they will need to begin to use logical operations in the next stage.

Egocentrism

Egocentrism in early childhood refers to the tendency of young children to think that everyone sees things in the same way as the child. Piaget's classic experiment on egocentrism involved showing children a three-dimensional model of a mountain and asking them to describe what a doll that is looking at the mountain from a different angle might see. Children tend to choose a picture that represents their own, rather than the doll's view. However, when children are speaking to others, they tend to use different sentence structures and vocabulary when addressing a younger child or an older adult. Consider why this difference might be observed. Do you think this indicates some awareness of the views of others? Or do you think they are merely modeling adult speech patterns?

Egocentrism

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Video 3.6.4. *Egocentrism* is a demonstration of a Piagetian task assessing a child's ability to take another's perspective. The first child in the video is a preschool-aged child. Despite just being in the same position as the adult, the child cannot imagine what the adult sees from their

perspective and assumes that the adult sees what he sees. The second child, a school-aged child, after already being in the adult's seat, can take her perspective and name the items that she likely sees from where she is sitting. Why is it that the first child cannot take the adult's perspective and the second child can?

Precausal Thinking

Similar to preoperational children's egocentric thinking is their structuring of cause-and-effect relationships based on their limited view of the world. Piaget coined the term 'precausal thinking' to describe how preoperational children use their existing ideas or views, like in egocentrism, to explain cause-and-effect relationships. Three main concepts of causality, as displayed by children in the preoperational stage, include animism, artificialism, and transductive reasoning.

Animism is the belief that inanimate objects are capable of actions and have lifelike qualities. An example could be a child believing that the sidewalk was mad and made them fall down, or that the stars twinkle in the sky because they are happy. To an imaginative child, the cup may be alive, the chair that falls down and hits the child's ankle is mean, and the toys need to stay home because they are tired. Young children do seem to think that objects that move may be alive, but after age three, they seldom refer to objects as being alive (Berk, 2007). Many children's stories and movies capitalize on animistic thinking. Do you remember some of the classic stories that make use of the idea of objects being alive and engaging in lifelike actions?

Artificialism refers to the belief that environmental characteristics can be attributed to human actions or interventions.

For example, a child might say that it is windy outside because someone is blowing very hard, or the clouds are white because someone painted them that color.

Finally, precausal thinking is categorized by transductive reasoning. **Transductive reasoning** is when a child fails to understand the true relationships between cause and effect. Unlike deductive or inductive reasoning (general to specific, or specific to general), transductive reasoning refers to when a child reasons from specific to specific, drawing a relationship between two separate events that are otherwise unrelated. For example, if a child hears a dog bark and then a balloon pop, the child would conclude that because the dog barked, the balloon popped. Related to this is **syncretism,** which refers to a tendency to think that if two events occur simultaneously, one caused the other. An example of this might be a child asking the question, "if I put on my bathing suit, will it turn to summer?"

Cognition Errors

Between about the ages of four and seven, children tend to become very curious and ask many questions, beginning the use of primitive reasoning. There is an increase in curiosity in the interest of reasoning and wanting to know why things are the way they are. Piaget called it the "intuitive substage" because children realize they have a vast amount of knowledge, but they are unaware of how they acquired it.

Centration and conservation are characteristic of preoperative thought. **Centration** is the act of focusing all attention on one characteristic or dimension of a situation while disregarding all others. An example of centration is a child focusing on the *number* of pieces of cake that each person has, regardless of the size of the pieces. Centration is one of the reasons that young children have difficulty understanding the concept of conservation. **Conservation** is the awareness that altering a

substance's appearance does not change its basic properties. Children at this stage are unaware of conservation and exhibit centration. Imagine a 2-year-old and 4-year-old eating lunch. The 4-year-old has a whole peanut butter and jelly sandwich. He notices, however, that his younger sister's sandwich is cut in half and protests, "She has more!" He is exhibiting centration by focusing on the number of pieces, which results in a conservation error.

In Piaget's famous conservation task, a child is presented with two identical beakers containing the same amount of liquid. The child usually notes that the beakers do contain the same amount of liquid. When one of the beakers is poured into a taller and thinner container, children who are younger than seven or eight years old typically say that the two beakers no longer contain the same amount of liquid. They believe that the taller container holds the greater quantity (centration), without taking into consideration the fact that both beakers were previously noted to contain the same amount of liquid.

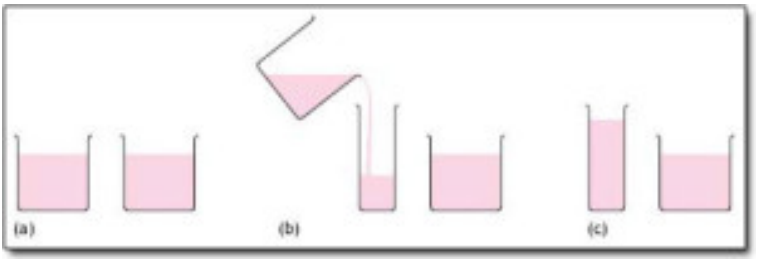

Figure 3.6.2. A demonstration of the conservation of liquid.

Irreversibility is also demonstrated during this stage and is closely related to the ideas of centration and conservation. **Irreversibility** refers to the young child's difficulty mentally reversing a sequence of events. In the same beaker situation, the child does not realize that, if the sequence of events was reversed and the water from the tall beaker was poured back into its original beaker, then the same amount of water would exist.

Centration, conservation errors, and irreversibility are indications that young children are reliant on visual representations. Another example of children's reliance on visual representations is their misunderstanding of 'less than' or 'more than.' When two rows containing equal amounts of blocks are placed in front of a child with one row spread farther apart than the other, the child will think that the row spread farther contains more blocks.

Conservation

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Video 3.6.5. *Conservation Task* is a demonstration of a few Piagetian tasks to assess children's ability to understand various types of conservation. The first child is a preschooler and is not able to understand conservation. The second child is in elementary school. She does the same task and clearly understands conservation, although she does have some difficulty explicitly articulating her reasoning. A few additional conservation tasks are demonstrated by preschool children.

Class inclusion refers to a kind of conceptual thinking that children in the preoperational stage cannot yet grasp. Children's inability

to focus on two aspects of a situation at once (centration) inhibits them from understanding the principle that one category or class can contain several different subcategories or classes. Preoperational children also have difficulty understanding that an object can be classified in more than one way. For example, a four-year-old girl may be shown a picture of eight dogs and three cats. The girl knows what cats and dogs are, and she is aware that they are both animals. However, when asked, "Are there more dogs or more animals?" she is likely to answer "more dogs." This error is due to her difficulty focusing on the two subclasses and the larger class all at the same time. She may have been able to view the dogs as dogs or animals, but struggled when trying to classify them as both, simultaneously. Similar to this is a concept relating to intuitive thought, known as "transitive inference."

Transitive inference is using previous knowledge to determine the missing piece, using basic logic. Children in the preoperational stage lack this logic. An example of transitive inference would be when a child is presented with the information 'A' is greater than 'B' and 'B' is greater than 'C.' The young child may have difficulty understanding that 'A' is also greater than "C."

Theory of Mind

How do we come to understand how our mind works? The **theory of mind** is the understanding that the mind holds people's beliefs, desires, emotions, and intentions. One component of this is understanding that the mind can be tricked or that the mind is not always accurate.

A two-year-old child does not understand very much about how their mind works. They can learn by imitating others, they are starting to understand that people do not always agree on things they like, and they have a rudimentary understanding of cause and effect (although they often fall prey to transitive reasoning). By the time a child is four, their theory of the mind allows them to

understand that people think differently, have different preferences, and even mask their true feelings by putting on a different face that differs from how they truly feel inside.

To think about what this might look like in the real world, imagine showing a three-year-old child a bandaid box and asking the child what is in the box. Chances are, the child will reply, "bandaids." Now imagine that you open the box and pour out crayons. If you now ask the child what they thought was in the box before it was opened, they may respond, "crayons." If you ask what a friend would have thought was in the box, the response would still be "crayons." Why?

Before about four years of age, a child does not recognize that the mind can hold ideas that are not accurate, so this three-year-old changes their response once shown that the box contains crayons. The child's response can also be explained in terms of egocentrism and irreversibility. The child's response is based on their current view rather than seeing the situation from another person's perspective (egocentrism) or thinking about how they arrived at their conclusion (irreversibility). At around age four, the child would likely reply, "bandaids" when asked after seeing the crayons because by this age a child is beginning to understand that thoughts and realities do not always match.

Theory of Mind

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https://edpsych.pressbooks.sunycreate.cloud/?p=54#oembed-6

Video 3.6.6. The Theory of Mind Test demonstrates various false belief tests to assess the theory of mind in young children.

Theory of Mind and Social Intelligence

This awareness of the existence of mind is part of social intelligence and the ability to recognize that others can think differently about situations. It helps us to be self-conscious or aware that others can think of us in different ways, and it helps us to be able to be understanding or empathic toward others. This developing social intelligence helps us to anticipate and predict the actions of others (even though these predictions are sometimes inaccurate). The awareness of the mental states of others is important for communication and social skills. A child who demonstrates this skill is able to anticipate the needs of others.

Impaired Theory of Mind in Individuals with Autism

People with autism or an autism spectrum disorder (ASD) typically show an impaired ability to recognize other people's minds. Under the DSM-5, **autism** is characterized by persistent deficits in social communication and interaction across multiple contexts, as well as restricted, repetitive patterns of behavior, interests, or activities.

These deficits are present in early childhood, typically before age three, and lead to clinically significant functional impairment. Symptoms may include lack of social or emotional reciprocity, stereotyped and repetitive use of language or idiosyncratic language, and persistent preoccupation with unusual objects.

About half of parents of children with ASD notice their child's unusual behaviors by age 18 months, and about four-fifths notice by age 24 months, but often a diagnosis comes later, and individual cases vary significantly. Typical early signs of autism include:

- No babbling by 12 months.
- No gesturing (pointing, waving, etc.) by 12 months.
- No single words by 16 months.
- No two-word (spontaneous, not just echolalic) phrases by 24 months.
- Loss of any language or social skills, at any age.

Children with ASD experience difficulties with explaining and predicting other people's behavior, which leads to problems in social communication and interaction. Children who are diagnosed with an autistic spectrum disorder usually develop the theory of mind more slowly than other children and continue to have difficulties with it throughout their lives.

For testing whether someone lacks the theory of mind, the *Sally-Anne* test is performed. The child sees the following story: Sally and Anne are playing. Sally puts her ball into a basket and leaves the room. While Sally is gone, Anne moves the ball from the basket to the box. Now Sally returns. The question is: where will Sally look for her ball? The test is passed if the child correctly assumes that Sally will look in the basket. The test is failed if the child thinks that Sally will look in the box. Children younger than four and older children with autism will generally say that Sally will look in the box.

Ally-Anne Test

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Video 3.6.7. *Sally-Anne test* demonstration with a young child.

Current Research

As with the sensorimotor stage, researchers are discovering that preoperational children are more cognitively capable than Piaget proposed. Donaldson (1978), Bower and Wishart (1972), Chandler, Fritz, and Hala (1989), and Gelman and Ebeling (1989) all concluded that children around the ages of 3 and 4 are not as egocentric as Piaget suggested. Researchers have shown that the difficulties children have with some of Piaget's classic experiments largely result from a lack of understanding of the researcher's questions. When researchers take pains to ensure that children understand these tasks, preoperational learners show that they can take the perspective of another; that is, they can begin to imagine another's viewpoint. Researchers such as Gelman (1972) and Bijstra, van Geert, and Jackson (1989) have shown that operations such as conservation

of liquids can be performed by preoperational children. Waxman and Gelman (1986) report that children as young as 4 can understand class inclusion.

Current research on children's cognitive abilities during the preoperational period suggests two conclusions: (1) Piaget may have underestimated what some children can do during the preoperational stage; and (2) in order to exhibit more and varied abilities at this stage, researchers must first eliminate distractions, give clues, and ensure that children understand their directions. While children's thinking is still largely dominated by what they see at this time, they can be taught to be less egocentric (Bee, 1995).

The Concrete Operational Stage (7-11 years)

Those who intend to teach at the kindergarten or first-grade level will work with learners just as they enter the concrete operational stage. According to Piaget, this is the time when children become less dominated by appearances and acquire the schemata to understand arithmetic, think in symbols, classify objects (like animal, vegetable, or mineral, or by color and shape), and understand the relationships between uppercase and lower- case letters. It is no wonder that formal education begins in so many societies around the world at this age. The critical accomplishments at this stage involve the learner's ability to perform operations or rules that involve the mediation of words and images and to modify these mediators to reach a logical conclusion.

As children continue through elementary school, they become able to represent ideas and events more flexibly and logically. Their rules of thinking still seem very basic by adult standards, and usually

operate unconsciously. However, these rules allow children to solve problems more systematically than before, and therefore, to be successful with many academic tasks. In the concrete operational stage, for example, a child may unconsciously follow the rule: "If nothing is added or taken away, then the amount of something stays the same," but may struggle to make these processes explicit.

This simple principle helps children to understand some arithmetic tasks, such as in adding or subtracting zero from a number, as well as to do certain classroom science experiments, such as ones involving judgments of the amounts of liquids when mixed. Piaget called this period the **concrete operational stage** because children mentally "operate" on concrete objects and events. They are not yet able, however, to operate (or think) systematically about representations of objects or events. Manipulating representations is a more abstract skill that develops later, during adolescence.

Reversibility

Concrete operational thinking differs from preoperational thinking in two ways, each of which renders children more skilled as students. One difference is **reversibility**, or the ability to think about the steps of a process in any order. Imagine a simple science experiment, for example, such as one that explores why objects sink or float by having a child place an assortment of objects in a basin of water. Both the preoperational and concrete operational child can recall and describe the steps in this experiment, but only the concrete operational child can recall them in any order. This skill is beneficial on any task involving multiple steps—a common feature of tasks in the classroom. In teaching new vocabulary from a story, for another example, a teacher might tell students: "First make a list of words in the story that you do not know, then find and write down their definitions, and finally get a friend to test you on your list." These directions involve repeatedly remembering to

move back and forth between a second step and a first—a task that concrete operational students—and most adults—find easy, but that preoperational children often forget to do or find confusing. If the younger children are to do this task reliably, they may need external prompts, such as having the teacher remind them periodically to go back to the story to look for more unknown words.

Decenter

The other new feature of thinking during the concrete operational stage is the child's ability to **decenter** or focus on more than one feature of a problem at a time. There are hints of decentration in preschool children's dramatic play, which requires being aware on two levels at once—for example, knowing that a banana can be both a banana and a 'telephone.' However, the decentration of the concrete operational stage is more deliberate and conscious than preschoolers' make-believe. Now the child can attend to two things at once quite purposely. Suppose you give students a sheet with an assortment of subtraction problems on it, and ask them to do this: "Find all of the problems that involve two-digit subtraction and that involve borrowing from the next column. Circle and solve only those problems." Following these instructions is quite possible for a concrete operational student (as long as they have been listening!) because the student can attend to the two subtasks simultaneously—finding the two-digit problems and identifying which actually involve borrowing. (Whether the student knows how to "borrow" however, is a separate question.)

Implications for Teachers

Elementary school learners are far better problem solvers than preschoolers. They can arrange objects in order; sequence numbers

properly; classify objects by color, size, or shape; understand rules for both mathematics and classroom behavior; think about both the past and the future. Nevertheless, concrete operational learners cannot perform these operations with things they cannot see or touch. In other words, their logic works only in concrete situations. Their mental operations are not yet ready for the realm of abstract ideas. One way to illustrate this is to show an 8-year-old three dolls of ascending height whose names are Elleni, Carlos, and Aster. Show the child that Aster is taller than Carlos, and that Carlos is taller than Elleni, and the child will easily figure out that Aster is taller than Elleni. However, present only a verbal description of the three dolls, and the child will have great difficulty determining the height of the first doll relative to the third doll. Thus K through 4 teachers should teach using concrete, hands-on activities that provide examples of more general rules and concepts. The accompanying box, Teaching Concrete Operational Learners, gives some specific examples.

In real classroom tasks, reversibility and decentration often happen together. A well-known example of joint presence is Piaget's experiments with **conservation**, the belief that an amount or quantity stays the same even if it changes apparent size or shape (Piaget, 2001; Matthews, 1998). Imagine two identical balls made of clay. Any child, whether preoperational or concrete operational, will agree that the two indeed have the same amount of clay in them simply because they look the same. However, if you squish one ball into a long, thin 'hot dog,' the preoperational child is likely to say that the amount of that ball has changed—either because it is longer or because it is thinner, but at any rate, because it now looks different. The concrete operational child will not make this mistake, thanks to new cognitive skills of reversibility and decentration. For them, the amount is the same because "you could squish it back into a ball again" (reversibility) and because "it may be longer, but it is also thinner" (decentration). Piaget would say the concrete operational child "has conservation of quantity."

The classroom examples described above also involve reversibility and decentration. As already mentioned, the vocabulary activity

described earlier requires reversibility (going back and forth between identifying words and looking up their meanings), but it can also be construed as an example of decentration (keeping in mind two tasks at once—word identification and dictionary search). Moreover, as mentioned, the arithmetic activity requires decentration (looking for problems that meet two criteria and also solving them), but it can also be construed as an example of reversibility (going back and forth between subtasks, as with the vocabulary activity). Either way, the development of concrete operational skills supports students in doing many basic academic tasks; in a sense, they make ordinary schoolwork possible

Current Research

Researchers have confirmed Piaget's conclusions about the sequence and timing at which children acquire the various concrete operations and have shown that children between the ages of 7 and 11 rarely exhibit deductive logic but are adept at inductive reasoning (Tomlinson-Keasey, Eisert, Kalle, Hardy-Brown, & Keasey, 1978). However, there is much debate about what causes these changes. Piaget emphasized that children, particularly at this stage, act as amateur scientists and discover the rules of operations largely on their own, using the functions of organization and adaptation. He said little about the contributions of social influences, such as peers and culture, to cognitive development. We will explore this perspective shortly when we present the social nature of learning as formulated by Lev Vygotsky, an influential Russian developmentalist.

The Formal Operational Stage (11+ years)

In the fourth (and last) of the Piagetian stages, an adolescent becomes able to reason not only about tangible objects and events, as younger children do, but also about hypothetical or abstract ones. Hence this stage is named the **formal operational** stage—the period when the individual can "operate" on "forms" or representations.

During the formal operational stage, adolescents can understand **abstract principles** *which have no physical reference.* They can now contemplate such abstract constructs as beauty, love, freedom, and morality. The adolescent is no longer limited by what can be directly seen or heard. Additionally, while younger children solve problems through trial and error, adolescents demonstrate **hypothetical-deductive reasoning**, *which is developing hypotheses based on what might logically occur*. They can think about all the possibilities in a situation beforehand, and then test them systematically (Crain, 2005). Now they can engage in true scientific thinking. Formal operational thinking also involves accepting hypothetical situations. Adolescents understand the concept of **transitivity**, *which means that a relationship between two elements is carried over to other elements logically related to the first two*, such as if A<B and B<C, then A<C (Thomas, 1979). For example, when asked: If Maria is shorter than Alicia and Alicia is shorter than Caitlyn, who is the shortest? Adolescents can answer the question correctly as they understand the transitivity involved.

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Video 3.6.8. *Formal Operational Stage* explains some of the cognitive development consistent with formal operational thought.

Abstract and Hypothetical thinking

One of the major premises of formal operational thought is the capacity to think of possibility, not just reality. Adolescents' thinking is less bound to concrete events than that of children; they can contemplate possibilities outside the realm of what currently exists. One manifestation of the adolescent's increased facility with thinking about possibilities is the improvement of skill in **deductive reasoning (also called top-down reasoning),** which leads to the development of **hypothetical thinking**. This development provides the ability to plan ahead, see the future consequences of an action, and provide alternative explanations of events. It also makes adolescents more skilled debaters, as they can reason against a friend's or parent's assumptions. Adolescents also develop a more sophisticated understanding of probability.

This appearance of more systematic, abstract thinking allows adolescents to comprehend the sorts of higher-order abstract logic inherent in puns, proverbs, metaphors, and analogies. Their increased facility permits them to appreciate how language can be used to convey multiple messages, such as satire, metaphor, and sarcasm (children younger than age nine often cannot comprehend sarcasm at all). This change also permits the application of advanced reasoning and logical processes to social and ideological matters such as interpersonal relationships, politics,

philosophy, religion, morality, friendship, faith, fairness, and honesty.

Deductive Reasoning

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Video 3.6.9. *Deductive Reasoning* demonstrates a Piagetian task that presents the child with a hypothetical situation and asks that they deduce what happens given this scenario. The first child is an elementary school-aged child. The second is an adolescent. You can see how these two are able to use hypothetical information differently to make predictions about what will happen next.

Intuitive and Analytic Thinking

Piaget emphasized the sequence of thought throughout four stages. Others suggest that thinking does not develop in sequence, but instead, that advanced logic in adolescence may be influenced by intuition. Cognitive psychologists often refer to intuitive and analytic thought as the **dual-process model**, the notion that humans have two distinct networks for processing information (Kuhn,

2013.) **Intuitive thought** is automatic, unconscious, and fast, and it is more experiential and emotional.

In contrast, **analytic thought** is deliberate, conscious, and rational (logical). While these systems interact, they are distinct (Kuhn, 2013). Intuitive thought is easier, quicker, and more commonly used in everyday life. As discussed in the adolescent brain development section, the discrepancy between the maturation of the limbic system and the prefrontal cortex may make teens more prone to emotional, intuitive thinking than adults. As adolescents develop, they gain in logic/analytic thinking ability and sometimes regress, with social context, education, and experiences becoming significant influences. Simply put, being 'smarter' as measured by an intelligence test does not advance cognition as much as having more experience, in school and life (Klaczynski & Felmban, 2014).

Relativistic Thinking

Adolescents are more likely to engage in **relativistic thinking**—in other words, they are more likely to question others' assertions and less likely to accept information as absolute truth. Through experience outside the family circle, they learn that rules they were taught as absolute are actually relativistic. They begin to differentiate between rules crafted from common sense (don't touch a hot stove) and those that are based on culturally relative standards (codes of etiquette). This understanding can lead to a period of questioning authority in all domains.

Risk-taking

Because most injuries sustained by adolescents are related to risky behavior (alcohol consumption and drug use, reckless or distracted

driving, and unprotected sex), a great deal of research has been done on the cognitive and emotional processes underlying adolescent risk-taking. In addressing this question, it is important to distinguish whether adolescents are more likely to engage in risky behaviors (prevalence), whether they make risk-related decisions similarly or differently than adults (cognitive processing perspective), or whether they use the same processes but value different things and thus arrive at different conclusions. The **behavioral decision-making theory** proposes that adolescents and adults both weigh the potential rewards and consequences of an action. However, research has shown that adolescents seem to give more weight to rewards, particularly social rewards, than do adults. Adolescents value social warmth and friendship, and their hormones and brains are more attuned to those values than to long-term consequences (Crone & Dahl, 2012).

Some have argued that there may be evolutionary benefits to an increased propensity for risk-taking in adolescence. For example, without a willingness to take risks, teenagers would not have the motivation or confidence necessary to leave their family of origin. In addition, from a population perspective, there is an advantage to having a group of individuals willing to take more risks and try new methods, counterbalancing the more conservative elements more typical of the received knowledge held by older adults.

Implications for Teachers

School is the main contributor to guiding students towards formal operational thought. With students at this level, the teacher can pose hypothetical (or contrary-to-fact) problems: "What if the world had never discovered oil?" or "What if the first European explorers had settled first in California instead of on the East Coast of the United States?" To answer such questions, students must use hypothetical reasoning, meaning that they must manipulate ideas that vary in several ways at once and do so entirely in their minds.

The hypothetical reasoning that concerned Piaget primarily involved scientific problems. His studies of formal operational thinking, therefore, often look like problems that middle or high school teachers pose in science classes. In one problem, for example, a young person is presented with a simple pendulum, to which different amounts of weight can be hung (Inhelder & Piaget, 1958). The experimenter asks: "What determines how fast the pendulum swings: the length of the string holding it, the weight attached to it, or the distance that it is pulled to the side?" The young person is not allowed to solve this problem by trial-and-error with the materials themselves but must reason a way to the solution mentally. To do so systematically, he or she must imagine varying each factor separately, while also imagining the other factors that are held constant. This kind of thinking requires the facility to manipulate mental representations of the relevant objects and actions—precisely the skill that defines formal operations.

As you might suspect, students with an ability to think hypothetically have an advantage in many kinds of schoolwork: by definition, they require relatively few "props" to solve problems. In this sense, they can, in principle, be more self-directed than students who rely only on concrete operations—certainly a desirable quality in the opinion of most teachers. Note, though, that formal operational thinking is desirable but not sufficient for school success, and that it is far from being the only way that students achieve educational success. Formal thinking skills do not ensure that a student is motivated or well-behaved, for example, nor does it guarantee other desirable skills. The fourth stage in Piaget's theory is really about a particular kind of formal thinking, the kind needed to solve scientific problems and devise scientific experiments. Since many people do not usually deal with such problems in the ordinary course of their lives, it should be no surprise that research finds that many people never achieve or use formal thinking fully or consistently, or that they use it only in selected areas with which they are very familiar (Case & Okomato, 1996). For teachers, the limitations of Piaget's ideas suggest a need for additional theories

about development—ones that focus more directly on the social and interpersonal issues of childhood and adolescence.

Current Research

Most current research in formal operations focuses on three questions: (1) Do all children reach formal operations? (2) Are young children capable of abstract reasoning? and (3) Are there any higher stages of intellectual development? (Bee, 1995; Berk, 1993; Shaffer, 1993). Do all children reach formal operations?

Try giving the following test to some of your friends:

Premise 1: If there is a knife, then there is a fork.

Premise 2: There is not a knife. Question: Is there a fork?

The correct answer to this question is "maybe." The wrong answer is "no." However, 40 to 60 percent of college students fail formal operational problems, such as this one (Keating, 1979). Why? It appears that much of formal operational thought is situation-specific. In other words, although college students and adults are capable of hypothetico-deductive reasoning, they tend to be better at it in the fields with which they are familiar. Thus physics majors are better able to demonstrate formal operations when dealing with physics problems than are psychology majors, who, in turn, are better at abstract reasoning in their discipline than are English majors, and so on (DeLisi & Staudt, 1980). Are young children capable of abstract reasoning? Research indicates that concrete operational children can be taught abstract reasoning. For example, they can be taught how to solve propositions, such as the knife-and-fork task. Furthermore, training improves such performance (Hawkins, Pea, Glick, & Scribner, 1984). These training effects, however, are transitory. Specific training in propositional thinking lasts longer and generalizes more readily to new tasks when the trainees are in the formal operational stage (Greenbowe et al., 1981). Are there higher stages of intellectual development?

Beyond Formal Operational Thought: Postformal Thought

Although Piaget asserts that the formal operations stage represents the apex of cognitive thought, Patricia Arlin (1975, 1977) disagrees. She believes that great thinkers like Einstein, Freud, and Piaget operate in a higher cognitive dimension in which they reconceptualize existing knowledge and reformulate it to come up with unique ways of thinking about the world. She calls this the problem-finding stage of cognitive development.

The hallmark of this type of thinking is the ability to think abstractly or to consider possibilities and ideas about circumstances never directly experienced. Thinking abstractly is only one characteristic of adult thought, however, if you compare a 15-year-old with someone in their late 30s, you would probably find that the latter considers not only what is possible but also what is likely. Why the change? The adult has gained experience and understands why possibilities do not always become realities. They learn to base decisions on what is realistic and practical, not idealistic, and can make adaptive choices. Adults are also not as influenced by what others think. This advanced type of thinking is referred to as **postformal thought** (Sinnott, 1998).

In addition to moving toward more practical considerations, thinking in early adulthood may also become more flexible and balanced. Abstract ideas that the adolescent believes in firmly may become standards by which the adult evaluates reality. Adolescents tend to think in **dichotomies**; *ideas are true or false; good or bad; there is no middle ground.* However, with experience, the adult comes to recognize that there are some right and some wrong in each position, some good or some bad in a policy or approach, some truth and some falsity in a particular idea. *This ability to bring together salient aspects of two opposing viewpoints or positions is referred to as* **dialectical thought** and is considered one of the most advanced aspects of postformal thinking (Basseches, 1984).

Such thinking is more realistic because very few positions, ideas, situations, or people are entirely right or wrong. So, for example, parents who were considered angels or devils by the adolescent eventually become just people with strengths and weaknesses, endearing qualities, and faults to the adult.

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Video 3.6.10. *Perry's Stages of Intellectual Development* explains post-formal stages of cognitive development in adulthood.

Does Everyone Reach Formal Operational or Postformal Thought?

Formal operational thought is influenced by experience and education. Most people attain some degree of formal operational thinking but use formal operations primarily in the areas of their strongest interest (Crain, 2005). Even those that can use formal or postformal thought, do not regularly demonstrate it. Moreover, in small villages and tribal communities, it is barely used at all. A possible explanation is that an individual's thinking has not been sufficiently challenged to demonstrate formal operational thought in all areas.

Some adults lead lives in which they are not challenged to think abstractly about their world. Many adults do not receive any formal education and are not taught to think abstractly about situations they have never experienced. Further, they are also not exposed to

conceptual tools used to analyze hypothetical situations formally. Those who do think abstractly, in fact, may be able to do so more easily in some subjects than others. For example, psychology majors may be able to think abstractly about psychology, but be unable to use abstract reasoning in physics or chemistry. Abstract reasoning in a particular field requires a knowledge base that we might not have in all areas. Consequently, our ability to think abstractly depends to a large extent on our experiences.

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Social Constructivism: Vygotsky's Theory

Lev Vygotsky (1896-1934) was a Russian psychologist whose **sociocultural theory** *emphasizes the importance of culture and interaction in the development of cognitive abilities.* Vygotsky differed with Piaget in that he believed that a person has not only a set of abilities but also a set of potential abilities that can be realized if given the proper guidance from others. Vygotsky developed theories on teaching that have been adopted by educators today.

Like Piaget, Vygotsky acknowledged intrinsic development, but he argued that it is the language, writings, and concepts arising from the culture that elicit the highest level of cognitive thinking (Crain, 2005). He believed that social interactions with teachers and more learned peers could facilitate a learner's potential for learning. Without this interpersonal instruction, he believed learner's minds would not advance very far as their knowledge would be based only on their own discoveries.

Figure 3.7.1. Lev Vygotsky.

Zone of Proximal Development and Scaffolding

Vygotsky's best-known concept is the **Zone of Proximal Development (ZPD). The** ZPD has been defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Vygotsky stated that learners should be taught in the ZPD. A good teacher or more-knowledgable-other (MKO) identifies a learner's ZPD and helps them stretch beyond it. Then the MKO gradually withdraws support until the learner can perform the task unaided. Other psychologists have applied the metaphor of scaffolds (the temporary platforms on which construction workers stand) to Vygotsky's theory. Scaffolding is the temporary support that a MKO gives a learner to do a task.

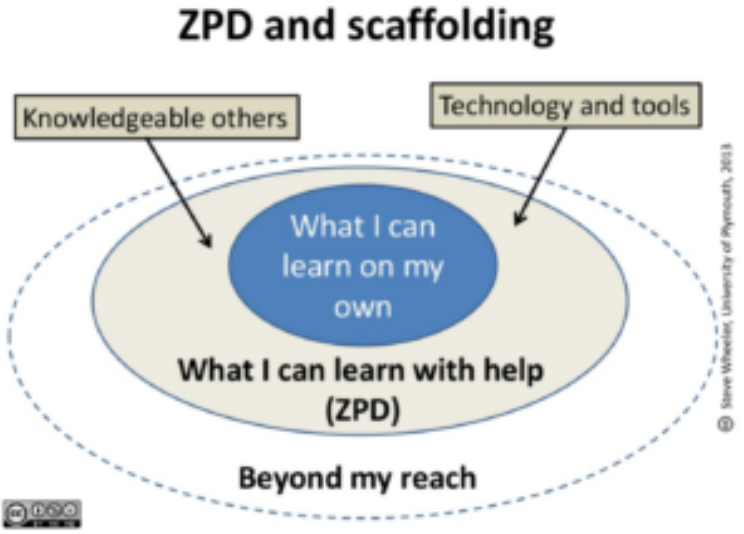

Figure 3.7.2. Model of Vygotsky's zone of proximal development.

Thought and Speech

Do you ever talk to yourself? Why? Chances are, this occurs when you are struggling with a problem, trying to remember something, or feel very emotional about a situation. Children talk to themselves too. Piaget interpreted this as **egocentric speech** or a practice engaged in because of a child's inability to see things from another's point of view. Vygotsky, however, believed that children talk to themselves in order to solve problems or clarify thoughts. As children learn to think in words, they do so aloud, referred to as **private speech**, speech meant only for one's self. Eventually, thinking out loud becomes thought accompanied by internal speech, and talking to oneself becomes a practice only engaged in when we are trying to learn something or remember something. This inner speech is not as elaborate as the speech we use when communicating with others (Vygotsky, 1962).

Implications for Education

Vygotsky's theories have been extremely influential for education. Although Vygotsky himself never mentioned the term scaffolding, it is often credited to him as a continuation of his ideas pertaining to the way adults or other children can use guidance in order for a child to work within their ZPD. (The term scaffolding was first developed by Jerome Bruner, David Wood, and Gail Ross while applying Vygotsky's concept of ZPD to various educational contexts.)

Educators often apply these concepts by assigning tasks that students cannot do on their own, but which they can do with

assistance; they should provide just enough assistance so that students learn to complete the tasks independently and then provide an environment that enables students to do harder tasks than would otherwise be possible. Teachers can also allow students with more knowledge to assist students who need more guidance. Especially in the context of collaborative learning, group members who have higher levels of understanding can help the less advanced members learn within their zone of proximal development.

Vygotsky's Influence on Education

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Video 3.7.1. *Vygotsky's Developmental Theory* introduces the applications of the theory in the classroom.

Contrasting Piaget and Vygotsky

Piaget was highly critical of teacher-directed instruction believing that teachers who take control of the child's learning place the child into a passive role (Crain, 2005). Further, teachers may present abstract ideas without the child's true understanding, and instead,

they just repeat back what they heard. Piaget believed children must be given opportunities to discover concepts on their own. As previously stated, Vygotsky did not believe children could reach a higher cognitive level without instruction from more learned individuals. Who is correct? Both theories certainly contribute to our understanding of how children learn.

Information Processing Theories

Information Processing is *how individuals perceive, analyze, manipulate, use, and remember information.* Unlike Piaget's theory, this approach proposes that cognitive development is ongoing and gradual, not organized into distinct stages. The areas of basic cognitive changes generally occur in five areas:

- *Attention*. Improvements are seen in **selective attention**(the process by which one focuses on one stimulus while tuning out another), as well as **divided attention** (the ability to pay attention to two or more stimuli at the same time).
- *Memory*. Improvements are seen in working memory and long-term memory.
- *Processing Speed.* With maturation, children think more quickly. Processing speed improves sharply between age five and middle adolescence, levels off around age 15, and does not appear to change between late adolescence and adulthood.
- *Organization of Thinking*. As children mature, they are more planful, they approach problems with strategy, and are flexible in using different strategies in different situations.
- *Metacognition.* Older children can think about thinking itself. This often involves monitoring one's own cognitive activity during the thinking process. **Metacognition**provides the ability to plan ahead, see the future consequences of an action, and provide alternative explanations of events.

Attention

Changes in attention have been described by many as the key to changes in human memory (Nelson & Fivush, 2004; Posner & Rothbart, 2007). However, attention is not a unified function; it is comprised of sub-processes. Our ability to focus on a single task or stimulus while ignoring distracting information, called **selective attention**. There is a sharp improvement in selective attention from age six into adolescence (Vakil, Blachstein, Sheinman, & Greenstein, 2009). **Sustained attention** is the ability to stay on task for long periods. The ability to switch our focus between tasks or external stimuli is called **divided attention** or **multitasking, which** also improves into adolescence (Carlson, Zelazo, & Faja, 2013).

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Video 3.8.1. *Attention* explains the ways in which we may attend or fail to attend to stimuli.

Selective Attention

The ability with selective attention tasks improves through childhood and into adolescence. While children's selective attention may be inconsistent during middle childhood, adolescents demonstrate the ability to select and prioritize stimuli for attention reliably. The development of this ability is influenced by the child's

temperament (Rothbart & Rueda, 2005), the complexity of the stimulus or task (Porporino, Shore, Iarocci & Burack, 2004), and may be dependent on whether the stimuli are visual or auditory (Guy, Rogers & Cornish, 2013). Guy et al. (2013) found that children's ability to attend to visual information selectively outpaced that of auditory stimuli. This change may explain why young children are not able to hear the voice of the teacher over the cacophony of sounds in the typical preschool classroom (Jones, Moore & Amitay, 2015). Jones and his colleagues found that 4 to 7 year-olds could not filter out background noise, especially when its frequencies were close in sound to the target sound. In comparison, teens often performed similarly to adults.

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Video 3.8.2. *Theories of Selective Attention* explains how and why we attend to some stimuli and not others.

Sustained Attention

Most measures of sustained attention typically ask individuals to spend several minutes focusing on one task, while waiting for an infrequent event, while there are multiple distractors for several minutes. Young children can retain their visual and auditory attention for approximately 5 minutes if they are 5-years-old, 6 minutes if they are 6-years old, 7 minutes if they are 7-years-old, and so on. If a task is interesting or novel, the child may sustain

attention substantially longer. Sustained attention improves to around age 10, then plateaus with only small improvements to adulthood. Common estimates of the attention span of healthy teenagers and adults range from 10 to 20 minutes. There is some debate as to whether attention is consistently sustained or whether people repeatedly choose to re-focus on the same thing (Raichle, 1999) This ability to renew attention permits people to 'pay attention' to things that last for more than a few minutes.

For time-on-task measurements, the type of activity used in the test affects the results, as people are generally capable of a longer attention span when they are doing something that they find enjoyable or intrinsically motivating (Raichle,1999). Attention is also increased if the person can perform the task fluently, compared to a person who has difficulty performing the task, or to the same person when he or she is just learning the task. Fatigue, hunger, noise, and emotional stress reduce the time focused on the task. After losing attention from a topic, a person may restore it by resting, doing a different kind of activity, changing mental focus, or deliberately choosing to re-focus on the first topic.

Divided Attention

Divided attention can be thought of in a couple of ways. We may look at how well people can multitask, performing two or more tasks simultaneously, or how people can alternate attention between two or more tasks. For example, walking and talking to a friend at the same time is multitasking, where trying to text while driving requires us to alternate attention between two tasks quickly.

Young children (age 3-4) have considerable difficulties in dividing their attention between two tasks and often perform at levels equivalent to our closest relative, the chimpanzee. However, by age five, they have surpassed the chimp (Hermann, Misch, Hernandez-Lloreda & Tomasello, 2015; Hermann & Tomasello, 2015). Despite

these improvements, 5-year-olds continue to perform below the level of school-age children, adolescents, and adults. These skills continue to develop into adolescence.

Regardless of age, we have a limited capacity for attention, and the division of attention is confined to that limitation. Our ability to effectively multitask or alternate attention is dependent on the automaticity or complexity of the task, but are also influenced by conditions like anxiety, arousal, task difficulty, and skills (Sternberg & Sternberg, 2012). Research shows that when dividing attention, people are more apt to make mistakes or perform their tasks more slowly (Matlin, 2013). Attention must be divided among all of the component tasks to perform them.

Classical research on divided attention involved people performing simultaneous tasks, like reading stories while listening and writing something else, or listening to two separate messages through different ears. Subjects were often tested on their ability to learn new information while engaged in multiple tasks. More current research examines the performance of doing two tasks simultaneously (Matlin, 2013), such as driving while performing another task. This research reveals that the human attentional system has limits for what it can process. For examples, driving performance is worse while engaged in other tasks; drivers make more mistakes, brake harder and later, get into more accidents, veer into other lanes, and/or are less aware of their surroundings when engaged in the previously discussed tasks (Collet et al., 2009; Salvucci & Taatgen, 2008; Strayer & Drews, 2007).

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Video 3.8.3. *The Spotlight Model of Attention and Our Ability to Multitask* explains how we divide our attention to attend to different tasks or information.

Memory

Memory is an information processing system; therefore, we often compare it to a computer. **Memory** is the set of processes used to encode, store, and retrieve information over different periods of time.

Figure 3.8.1. Encoding involves the input of information into the memory system. Storage is the retention of encoded information. Retrieval, or getting the information out of memory and back into awareness, is the third function.

Encoding

We get information into our brains through a process called **encoding**, which is the input of information into the memory system. Once we receive sensory information from the environment, our brains label or code it. We organize the

information with other similar information and connect new concepts to existing concepts. Encoding information occurs through automatic processing and effortful processing.

If someone asks you what you ate for lunch today, more than likely, you could recall this information quite easily. This is known as **automatic processing**, or the encoding of details like time, space, frequency, and the meaning of words. Automatic processing is usually done without any conscious awareness. Recalling the last time you studied for a test is another example of automatic processing. However, what about the actual test material that you studied? It probably required a lot of work and attention on your part in order to encode that information. This is known as **effortful processing**.

There are three types of encoding. The encoding of words and their meaning is known as **semantic encoding**. It was first demonstrated by William Bousfield (1935) in an experiment in which he asked people to memorize words. The 60 words were divided into 4 categories of meaning, although the participants did not know this because the words were randomly presented. When they were asked to remember the words, they tended to recall them in categories, showing that they paid attention to the meanings of the words as they learned them.

Visual encoding is the encoding of images, and **acoustic encoding** is the encoding of sounds, words in particular. To see how visual encoding works, read over this list of words: *car*, *level*, *dog*, *truth*, *book*, *value*. If you were asked later to recall the words from this list, which ones do you think you'd most likely remember? You would probably have an easier time recalling the words *car*, *dog*, and *book*, and a more difficult time recalling the words *level*, *truth*, and *value*. Why is this? Because you can recall images (mental pictures) more easily than words alone. When you read the words *car*, *dog*, and *book*, you created images of these things in your mind. These are concrete, high-imagery words. On the other hand, abstract words like *level*, *truth*, and *value* are low-imagery words.

High-imagery words are encoded both visually and semantically (Paivio, 1986), thus building a more reliable memory.

Now let us turn our attention to acoustic encoding. You are driving in your car, and a song comes on the radio that you have not heard in at least ten years, but you sing along, recalling every word. In the United States, children often learn the alphabet through song, and they learn the number of days in each month through rhyme: "Thirty days hath September, / April, June, and November; / All the rest have thirty-one, / Save February, with twenty-eight days clear, / And twenty-nine each leap year." These lessons are easy to remember because of acoustic encoding. We encode the sounds the words make. This is one of the reasons why much of what we teach young children is done through song, rhyme, and rhythm.

Which of the three types of encoding do you think would give you the best memory of verbal information? Some years ago, psychologists Fergus Craik and Endel Tulving (1975) conducted a series of experiments to find out. Participants were given words along with questions about them. The questions required the participants to process the words at one of the three levels. The visual processing questions included such things as asking the participants about the font of the letters. The acoustic processing questions asked the participants about the sound or rhyming of the words, and the semantic processing questions asked the participants about the meaning of the words. After participants were presented with the words and questions, they were given an unexpected recall or recognition task.

Words that had been encoded semantically were better remembered than those encoded visually or acoustically. Semantic encoding involves a deeper level of processing than shallower visual or acoustic encoding. Craik and Tulving concluded that we process verbal information best through semantic encoding, especially if we apply what is called the self-reference effect. The **self-reference effect** is the tendency for an individual to have a better memory for information that relates to oneself in comparison to material that

has less personal relevance (Rogers, Kuiper & Kirker, 1977). Could semantic encoding be beneficial to you as you attempt to memorize the concepts in this chapter?

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Video 3.8.4. *Encoding Strategies* discusses various encoding techniques that help us store information in memory.

Storage

Once the information has been encoded, we have to retain it somehow. Our brains take the encoded information and place it in storage. **Storage** is the creation of a permanent record of information.

In order for a memory to go into storage (i.e., long-term memory), it has to pass through three distinct stages: Sensory Memory, Short-Term Memory, and finally, Long-Term Memory. These stages were first proposed by Richard Atkinson and Richard Shiffrin (1968). Their model of human memory, called Atkinson-Shiffrin (A-S) or three-box model, is based on the belief that we process memories in the same way that a computer processes information.

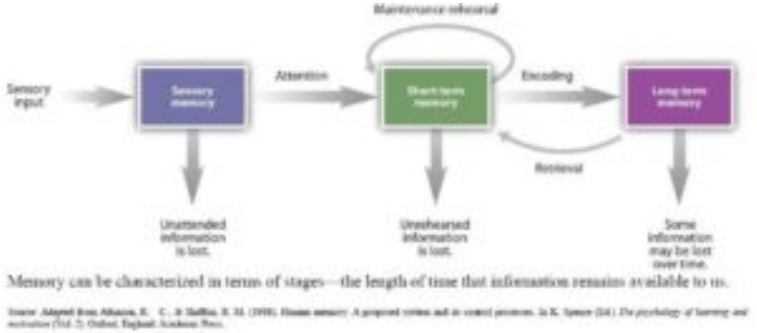

Figure 3.8.2. According to the Atkinson-Shiffrin model of memory, information passes through three distinct stages in order for it to be stored in long-term memory.

The three-box is just one model of memory. Others, such as Baddeley and Hitch (1974), have proposed a model where short-term memory itself has different forms. In this model, storing memories in short-term memory is like opening different files on a computer and adding information. The type of short-term memory (or computer file) depends on the type of information received. There are memories in visual-spatial form, as well as memories of spoken or written material, and they are stored in three short-term systems: a visuospatial sketchpad, an episodic buffer, and a phonological loop. According to Baddeley and Hitch, a central executive part of memory supervises or controls the flow of information to and from the three short-term systems.

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Video 3.8.5. *Information Processing Model: Sensory, Working, and Long Term Memory* explains the three-box model of memory.

Sensory Memory

In the Atkinson-Shiffrin model, stimuli from the environment are processed first in **sensory memory**: storage of brief sensory events, such as sights, sounds, and tastes. It is very brief storage, *essentially long enough for the brain to register and start processing the information.* Sensory memory can hold visual information for about half of a second and auditory information for a few seconds. Unlike other cognitive processes, it seems that sensory memory does not change from infancy (Siegler, 1998). However, without the ability to encode the information, it fades from sensory memory quickly (Papalia et al., 2008). As children and adolescence become more capable of encoding, they can take more advantage of the information available to them in the sensory memory.

We are constantly bombarded with sensory information. We cannot absorb all of it, or even most of it. Moreover, most of it has no impact on our lives. For example, what was your professor wearing the last class period? As long as the professor was dressed appropriately, it does not matter what she was wearing. Sensory information about sights, sounds, smells, and even textures, which we do not view as valuable information, we discard. If we view something as valuable, the information will move into our short-term memory system.

One study of sensory memory researched the significance of valuable information on short-term memory storage. J. R. Stroop discovered a memory phenomenon in the 1930s: you will name a color more easily if it appears printed in that color, which is called the Stroop effect. In other words, the word "red" will be named more quickly, regardless of the color the word appears in, than any word that is colored red. Try an experiment: name the colors of the

words you are given in Figure 3.8.3. Do not read the words, but say the color the word is printed in. For example, upon seeing the word "yellow" in green print, you should say "green," not "yellow." This experiment is fun, but it is not as easy as it seems.

Figure 3.8.3. The Stroop effect describes why it is difficult for us to name a color when the word and the color of the word are different.

Short-Term (Working) Memory

Short-term memory (STM), also called **working memory**, is a temporary storage system that processes incoming sensory memory. Short-term memory is the bridge between information taken in through sensory memory and the more permanent storage of information in long-term memory. Information that is not moved along from short-term memory to long-term memory will be forgotten. Short-term memory is also called working memory because this is the system where the "work" of memory happens. If you are retrieving information from your long-term memory, you

are moving it into your working memory, where you can think about that information.

Think of working memory as the information you have displayed on your computer screen—a document, a spreadsheet, or a web page. Then, the information in this memory system goes to long-term memory (you save it to your hard drive), or it is discarded (you delete a document or close a web browser). This step of **rehearsal**, the conscious repetition of information to be remembered, to move STM into long-term memory is called **memory consolidation**.

You may find yourself asking, "How much information can our memory handle at once?" To explore the capacity and duration of your short-term memory, have a partner read the strings of random numbers (Figure 3.8.4) out loud to you, beginning each string by saying, "Ready?" and ending each by saying, "Recall," at which point you should try to write down the string of numbers from memory.

9754	68259	913825	5316842	86951372	719384273
6419	67148	648327	5963827	51739826	163875942

Figure 3.8.4. Work through this series of numbers using the recall exercise explained above to determine the longest string of digits that you can store.

Note the longest string at which you got the series correct. For most people, this will be close to 7. Recall is somewhat better for random numbers than for random letters (Jacobs, 1887), and also often slightly better for information we hear (acoustic encoding) rather than see (visual encoding) (Anderson, 1969).

Short-term or working memory often requires conscious effort and adequate use of attention to function effectively. As you read earlier, children struggle with many aspects of attention, and this greatly diminishes their ability to juggle several pieces of information in memory consciously. The capacity of working memory is the amount of information someone can hold in

consciousness is smaller in young children than in older children and adults. The typical 5-year-old can hold only a four-digit number active. The typical adult and teenager can hold a seven-digit number active in their short-term memory. The capacity of working memory expands during middle and late childhood, and research has suggested that both an increase in processing speed and the ability to inhibit irrelevant information from entering memory are contributing to the greater efficiency of working memory during this age (de Ribaupierre, 2002). Changes in myelination and synaptic pruning in the cortex are likely behind the increase in processing speed and ability to filter out irrelevant stimuli (Kail, McBride-chang, Ferrer, Cho, & Shu, 2013).

Short-term memory can only hold information for a short period of time, without rehearsal. For a typical adolescent or adult, storage lasts about 20-30 seconds. Older children and adults use mental strategies to aid their memory performance. For instance, simple rote rehearsal may be used to commit information to memory. Young children often do not rehearse unless reminded to do so, and when they do rehearse, they often fail to use clustering rehearsal. In **clustering rehearsal,** the person rehearses previous material while adding in additional information. If a list of words is read out loud to you, you are likely to rehearse each word as you hear it along with any previous words you were given. Young children will repeat each word they hear, but often fail to repeat the prior words in the list. In Schneider, Kron-Sperl, and Hunnerkopf's (2009) longitudinal study of 102 kindergarten children, the majority of children used no strategy to remember information, a finding that was consistent with previous research. As a result, their memory performance was reduced when compared to their abilities as they aged and started to use more effective memory strategies.

Executive Functions

Changes in attention and the working memory system also involve

changes in executive function. **Executive function (ef)** refers to self-regulatory processes, such as the ability to inhibit behavior or cognitive flexibility, that enable adaptive responses to new situations or to reach a specific goal. Executive function skills gradually emerge during early childhood and continue to develop throughout childhood and adolescence. Like many cognitive changes, brain maturation, especially the prefrontal cortex, along with experience, influence the development of executive function skills. A child, whose parents are more warm and responsive, use scaffolding when the child is trying to solve a problem, and who provide cognitively stimulating environments for the child show higher executive function skills (Fay-Stammbach, Hawes & Meredith, 2014). For instance, scaffolding was positively correlated with greater cognitive flexibility at age two and inhibitory control at age four (Bibok, Carpendale & Müller, 2009).

STM and Learning

Individuals differ in their memory abilities, and these differences predict academic performance (Prebler, Krajewski, & Hasselhorn, 2013). Children with learning disabilities in math and reading often have difficulties with working memory (Alloway, 2009). They may struggle with following the directions of an assignment. When a task calls for multiple steps, children with poor working memory may miss steps because they may lose track of where they are in the task. Adults working with such children may need to communicate: using more familiar vocabulary, using shorter sentences, repeating task instructions more frequently, and breaking more complex tasks into smaller, more manageable steps. Some studies have also shown that more intensive training of working memory strategies, such as chunking, aid in improving the capacity of working memory in children with poor working memory (Alloway, Bibile, & Lau, 2013).

Long-term Memory

Long-term memory (LTM) is the continuous storage of information. Unlike short-term memory, the storage capacity of LTM has no real limits. It encompasses all the things you can remember what happened more than just a few minutes ago to all of the things that you can remember what happened days, weeks, and years ago. In keeping with the computer analogy, the information in your LTM would be like the information you have saved on the hard drive. It is not there on your desktop (your short-term memory), but you can pull up this information when you want it, at least most of the time. Not all long-term memories are strong memories. Some memories can only be recalled through prompts. For example, you might easily recall a fact— "What is the capital of the United States?"—or a procedure—"How do you ride a bike?"—but you might struggle to recall the name of the restaurant you had dinner when you were on vacation in France last summer. A prompt, such as that the restaurant was named after its owner, who spoke to you about your shared interest in soccer, may help you recall the name of the restaurant.

Long-term memory is divided into two types: explicit and implicit (Figure 3.8.5). Understanding the different types is important because a person's age or particular types of brain trauma or disorders can leave certain types of LTM intact while having disastrous consequences for other types. **Explicit memories,** also called **declarative memories,** are those we consciously try to remember and recall. For example, if you are studying for your chemistry exam, the material you are learning will be part of your explicit memory. (Note: Sometimes, but not always, the terms explicit memory and declarative memory are used interchangeably.)

Implicit memories, also called **non-declarative memories,** are memories that are not part of our consciousness. They are memories formed from behaviors. Implicit memory is also called non-declarative memory.

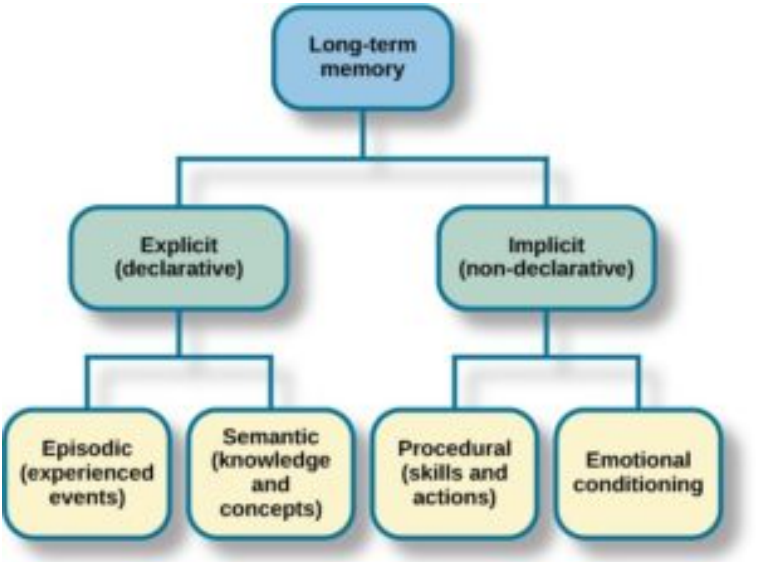

Figure 3.8.5. There are two components of long-term memory: explicit and implicit. Explicit memory includes episodic and semantic memory. Implicit memory includes procedural memory and things learned through conditioning.

Procedural memory is a type of implicit memory: it stores information about how to do things. It is the memory for skilled actions, such as how to brush your teeth, how to drive a car, how to swim the crawl (freestyle) stroke. If you are learning how to swim freestyle, you practice the stroke: how to move your arms, how to turn your head to alternate breathing from side to side, and how to kick your legs. You would practice this many times until you become good at it. Once you learn how to swim freestyle and your body knows how to move through the water, you will never forget how to swim freestyle, even if you do not swim for a couple of decades. Similarly, if you present an accomplished guitarist with a guitar, even if he has not played in a long time, he will still be able to play quite well.

Explicit or declarative memory has to do with the storage of facts and events we personally experienced. Explicit (declarative) memory has two parts: semantic memory and episodic memory. Semantic means having to do with language and knowledge about language. An example would be the question, "what does *argumentative* mean?" Stored in our **semantic memory** is knowledge about words, concepts, and language-based knowledge and facts. For example, answers to the following questions are stored in your semantic memory:

- Who was the first President of the United States?
- What is democracy?
- What is the longest river in the world?

Episodic memory is information about events we have personally experienced. The concept of episodic memory was first proposed about 40 years ago (Tulving, 1972). Since then, Tulving and others have looked at the scientific evidence and reformulated the theory. Currently, scientists believe that episodic memory is memory about happenings in particular places at particular times, the what, where, and when of an event (Tulving, 2002). It involves recollection of visual imagery as well as the feeling of familiarity (Hassabis & Maguire, 2007).

A component of episodic memory is **autobiographical memory,** or our personal narrative. Adolescents and adults rarely remember events from the first few years of life. We refer to this normal experience as infantile amnesia. In other words, we lack autobiographical memories from our experiences as an infant, toddler, and very young preschooler. Several factors contribute to the emergence of autobiographical memory, including brain maturation, improvements in language, opportunities to talk about experiences with parents and others, the development of theory of mind, and a representation of "self" (Nelson & Fivush, 2004). Two-year-olds do remember fragments of personal experiences, but these are rarely coherent accounts of past events (Nelson &

Ross, 1980). Between 2 and 2 ½ years of age, children can provide more information about past experiences. However, these recollections require considerable prodding by adults (Nelson & Fivush, 2004). Over the next few years, children will form more detailed autobiographical memories and engage in more reflection of the past.

Retrieval

So you have worked hard to encode (via effortful processing) and store some important information for your upcoming final exam. How do you get that information back out of storage when you need it? The act of getting information out of memory storage and back into conscious awareness is known as **retrieval**. This process would be similar to finding and opening a paper you had previously saved on your computer's hard drive. Now it is back on your desktop, and you can work with it again. Our ability to retrieve information from long-term memory is vital to our everyday functioning. You must be able to retrieve information from memory in order to do everything from knowing how to brush your hair and teeth, to driving to work, to knowing how to perform your job once you get there.

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Video 3.8.6. *Retrieval Cues* discusses how cues prompt memory retrieval.

There are three ways to retrieve information from long-term

memory storage systems: recall, recognition, and relearning. **Recall** is what we most often think about when we talk about memory retrieval: it means you can access information without cues. For example, you would use recall for an essay test. **Recognition** happens when you identify information that you have previously learned after re-encountering it. It involves a process of comparison. When you take a multiple-choice test, you are relying on recognition to help you choose the correct answer. Here is another example. Let us say you graduated from high school ten years ago, and you have returned to your hometown for your 10-year reunion. You may not be able to recall all of your classmates, but you recognize many of them based on their yearbook photos.

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Video 3.8.7. *Free Recall, Cued Recall, and Recognition* discusses the various ways in which information can be retrieved from long term memory.

The third form of retrieval is **relearning**, and it is just as it sounds. It involves learning information that you previously learned. Whitney took Spanish in high school, but after high school, she did not have the opportunity to speak Spanish. Whitney is now 31, and her company has offered her an opportunity to work in their Mexico City office. In order to prepare herself, she enrolls in a Spanish course at the local community center. She is surprised at how quickly she can pick up the language after not speaking it for 13 years; this is an example of relearning.

Organization of Thinking

During middle childhood and adolescence, young people can learn and remember more due to improvements in the way they attend to and store information. As people learn more about the world, they develop more categories for concepts and learn more efficient strategies for storing and retrieving information. One significant reason is that they continue to have more experiences on which to tie new information. In other words, their **knowledge base**, *knowledge in particular areas that makes learning new information easier*, expands (Berger, 2014).

Cognitive control

As noted earlier, executive functions, such as attention, increases in working memory, and cognitive flexibility, have been steadily improving since early childhood. Studies have found that executive function is very competent in adolescence. However, **self-regulation**, or *the ability to control impulses*, may still fail. A failure in self-regulation is especially true when there is high stress or high demand on mental functions (Luciano & Collins, 2012). While high stress or demand may tax even an adult's self-regulatory abilities, neurological changes in the adolescent brain may make teens particularly prone to more risky decision-making under these conditions.

Inductive and Deductive Reasoning

Inductive reasoning emerges in childhood and is a type of reasoning that is sometimes characterized as "bottom-up-

processing" in which specific observations, or specific comments from those in authority, may be used to draw general conclusions. However, in inductive reasoning, the veracity of the information that created the general conclusion does not guarantee the accuracy of that conclusion. For instance, a child who has only observed thunder on summer days may conclude that it only thunders in the summer. In contrast, **deductive reasoning**, sometimes called "top-down-processing," emerges in adolescence. This type of reasoning starts with some overarching principle and, based on this, propose specific conclusions. Deductive reasoning guarantees an accurate conclusion if the premises on which it is based are accurate.

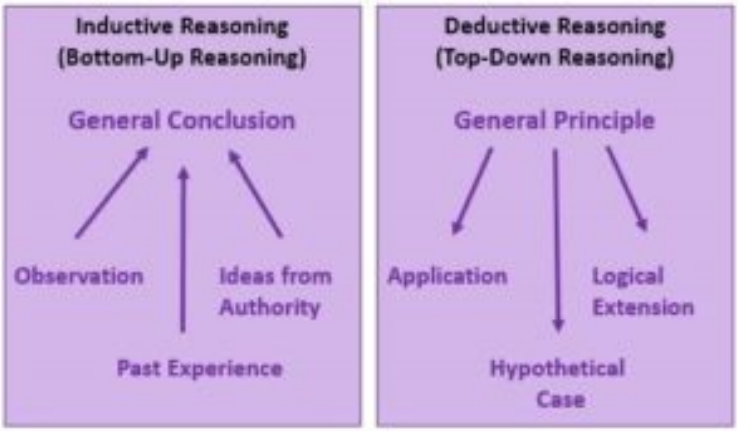

Figure 3.8.6. Models of inductive and deductive reasoning.

Intuitive versus Analytic Thinking

Cognitive psychologists often refer to intuitive and analytic thought as the Dual-Process Model, the notion that humans have two

distinct networks for processing information (Albert & Steinberg, 2011). **Intuitive thought** is automatic, unconscious, and fast (Kahneman, 2011), and it is more experiential and emotional. In contrast, **Analytic thought** is deliberate, conscious, and rational. While these systems interact, they are distinct (Kuhn, 2013). Intuitive thought is easier and more commonly used in everyday life. It is also more commonly used by children and teens than by adults (Klaczynski, 2001). The quickness of adolescent thought, along with the maturation of the limbic system, may make teens more prone to emotional, intuitive thinking than adults.

Critical Thinking

According to Bruning et al. (2004), there is a debate in U.S. education as to whether schools should teach students what to think or how to think. **Critical thinking**, or a detailed examination of beliefs, courses of action, and evidence, involves teaching children how to think. The purpose of critical thinking is to evaluate information in ways that help us make informed decisions. Critical thinking involves better understanding a problem through gathering, evaluating, and selecting information, and also by considering many possible solutions. Ennis (1987) identified several skills useful in critical thinking. These include: Analyzing arguments, clarifying information, judging the credibility of a source, making value judgments, and deciding on an action. Metacognition is essential to critical thinking because it allows us to reflect on the information as we make decisions.

Metacognition

As children mature through middle and late childhood and into

adolescence, they have a better understanding of how well they are performing a task and the level of difficulty of a task. As they become more realistic about their abilities, they can adapt studying strategies to meet those needs. Young children spend as much time on an unimportant aspect of a problem as they do on the main point, while older children start to learn to prioritize and gauge what is significant and what is not. As a result, they develop metacognition. **Metacognition** refers to the knowledge we have about our thinking and our ability to use this awareness to regulate our cognitive processes (Bruning, Schraw, Norby, & Ronning, 2004).

Bjorklund (2005) describes a developmental progression in the acquisition and use of memory strategies. Such strategies are often lacking in younger children but increase in frequency as children progress through elementary school. Examples of memory strategies include rehearsing information you wish to recall, visualizing and organizing information, creating rhymes, such as "i" before "e" except after "c," or inventing acronyms, such as "ROYGBIV" to remember the colors of the rainbow. Schneider, Kron-Sperl, and hünnerkopf (2009) reported a steady increase in the use of memory strategies from ages six to ten in their longitudinal study (see table 3.8.1). Moreover, by age ten, many children were using two or more memory strategies to help them recall information. Schneider and colleagues found that there were considerable individual differences at each age in the use of strategies and that children who utilized more strategies had better memory performance than their same-aged peers.

Table 3.8.1. Percentage of children who did not use any memory strategies by age.

Age	Percentage
6	55
7	44
8	25
9	17
10	13

A person may experience three deficiencies in their use of memory strategies. A **mediation deficiency** occurs when a person does not grasp the strategy being taught, and thus, does not benefit from its use. If you do not understand why using an acronym might be helpful, or how to create an acronym, the strategy is not likely to help you. In a **production deficiency,** the person does not spontaneously use a memory strategy and has to be prompted to do so. In this case, the person knows the strategy and is more than capable of using it, but they fail to "produce" the strategy on their own. For example, a child might know how to make a list but may fail to do this to help them remember what to bring on a family vacation. A **utilization deficiency** refers to a person using an appropriate strategy, but it fails to aid their performance. Utilization deficiency is common in the early stages of learning a new memory strategy (Schneider & Pressley, 1997; miller, 2000). Until the use of the strategy becomes automatic, it may slow down the learning process, as space is taken up in memory by the strategy itself. Initially, children may get frustrated because their memory performance may seem worse when they try to use the new strategy. Once children become more adept at using the strategy, their memory performance will improve. Sodian and Schneider (1999) found that new memory strategies acquired before age 8 often show utilization deficiencies, with there being a gradual improvement in the child's use of the strategy. In contrast,

strategies acquired after this age often followed an "all-or-nothing" principle in which improvement was not gradual, but abrupt.

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Language Development

Language is a system of communication that uses symbols in a regular way to create meaning. Language gives us the ability to communicate our intelligence to others by talking, reading, and writing. Although other species have at least some ability to communicate, none of them have language.

If you've ever tried to learn a new language, you know it's not easy. There are new rules of grammar that come with many exceptions, new sounds that are hard to make, endless lists of vocabulary to commit to memory and so on. And yet, you managed to learn the basics of your very first language around the time you were two years old; no textbooks in sight.

Not only are children able to absorb the complicated rules of grammar without formal teaching, they do so from a limited vocabulary. Regardless of how much a child is spoken to, they will not hear every possible word and sentence by the time they begin speaking. Yet when they do start to talk, children begin to follow grammatical rules and apply them to form new, innovative phrases. This level of information processing is incredibly impressive in anyone, much less someone still figuring out counting and skipping!

Given the remarkable complexity of a language, one might expect that mastering a language would be an especially arduous task; indeed, for those of us trying to learn a second language as adults, this might seem to be true. However, young children master language very quickly with relative ease. B. F. Skinner (1957) proposed that language is learned through reinforcement. Noam Chomsky (1965) criticized this behaviorist approach, asserting instead that the mechanisms underlying language acquisition are biologically determined. The use of language develops in the absence of formal instruction and appears to follow a very similar pattern in children from vastly different cultures and backgrounds.

It would seem, therefore, that we are born with a biological predisposition to acquire a language (Chomsky, 1965; Fernández & Cairns, 2011). Moreover, it appears that there is a critical period for language acquisition, such that this proficiency at acquiring language is maximal early in life; generally, as people age, the ease with which they acquire and master new languages diminishes (Johnson & Newport, 1989; Lenneberg, 1967; Singleton, 1995).

There are many components of language that will now be reviewed.

The Structures of Language

All languages have underlying structural rules that make meaningful communication possible. Every language is different. In English, an adjective comes before a noun ("red house"), whereas in Spanish, the adjective comes after ("casa [house] roja [red]."). In German, you can put noun after noun together to form giant compound words; in Chinese, the pitch of your voice determines the meaning of your words; in American Sign Language, you can convey full, grammatical sentences with tense and aspect by moving your hands and face. But all languages have structural underpinnings that make them logical for the people who speak and understand them.

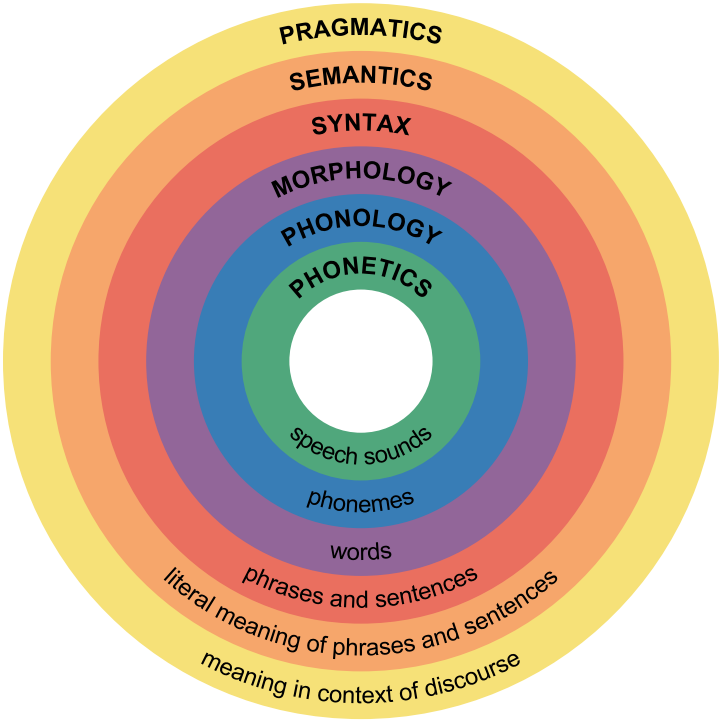

Figure 3.9.1. Major levels of linguistic structure. This diagram outlines the relationship between types of linguistic units. Speech sounds make up phonemes, which make up words. Words make up sentences, which have literal meanings and contextual meanings.

Phoneme

A **phoneme** is *the smallest unit of sound that makes a meaningful difference in a language*. This small sound may cause a change of meaning within a language, but that doesn't have meaning by itself. For example, in the words "bake" and "brake," only one phoneme

has been altered, but a change in meaning has been triggered. The phoneme /r/ has no meaning on its own, but by appearing in the word it has completely changed the word's meaning. In spoken languages, phonemes are produced by the positions and movements of the vocal tract, including our lips, teeth, tongue, vocal cords, and throat, whereas in sign languages phonemes are defined by the shapes and movement of the hands.

Phonemes correspond to the sounds of the alphabet, although there is not always a one-to-one relationship between a letter and a phoneme (the sound made when you say the word). For example, the word "dog" has three phonemes: /d/, /o/, and / g /. However, the word "shape," despite having five letters, has only three phonemes: /sh/, /long-a/, and /p/. There are hundreds of unique phonemes that can be made by human speakers, but most languages only use a small subset of the possibilities. English contains about 45 phonemes, whereas other languages have as few as 15 and others more than 60. The Hawaiian language contains fewer phonemes as it includes only 5 vowels (a, e, i, o, and u) and 7 consonants (h, k, l, m, n, p, and w).

Babies can discriminate among the sounds that make up a language (for example, they can tell the difference between the "s" in vision and the "ss" in fission); early on, they can differentiate between the sounds of all human languages, even those that do not occur in the languages that are used in their environment. However, they lose their ability to do so as they get older; by 10 months of age, they can only discriminate among those phonemes that are used in the language or languages in their environments (Jensen, 2011; Werker & Lalonde, 1988; Werker & Tees, 1984). Phonemes that were initially differentiated come to be treated as equivalent (Werker & Tees, 2002).

Morpheme

Whereas phonemes are the smallest units of sound in language, a **morpheme** is *a string of one or more phonemes that makes up the smallest units of meaning in a language*. Thus, a morpheme is a series of phonemes that has a special meaning. If a morpheme is altered in any way, the entire meaning of the word can be changed. Some morphemes are individual words (such as "eat" or "water"). These are known as free morphemes because they can exist on their own. Other morphemes are prefixes, suffixes, or other linguistic pieces that aren't full words on their own but do affect meaning (such as the "-s" at the end of "cats" or the "re-" at the beginning of "redo.") Because these morphemes must be attached to another word to have meaning, they are called bound morphemes.

Semantics

Semantics refers to *the set of rules we use to obtain meaning from morphemes*. For example, adding "ed" to the end of a verb makes it past tense.

Grammar and Syntax

Because all language obeys a set of combinatory rules, we can communicate an infinite number of concepts. While every language has a different set of rules, all languages do obey rules. These rules are known as grammar. Speakers of a language have internalized the rules and exceptions for that language's grammar. There are rules for every level of language—word formation (for example, native speakers of English have internalized the general rule that -ed is the ending for past-tense verbs, so even when they encounter a brand-

new verb, they automatically know how to put it into past tense); phrase formation (for example, knowing that when you use the verb "buy," it needs a subject and an object; "She buys" is wrong, but "She buys a gift" is okay); and sentence formation.

Syntax is *the set of rules of a language by which we construct sentences*. Each language has a different syntax. The syntax of the English language requires that each sentence have a noun and a verb, each of which may be modified by adjectives and adverbs. Some syntaxes make use of the order in which words appear. For example, in English "The man bites the dog" is different from "The dog bites the man."

Pragmatics

The social side of language is expressed through **pragmatics**, or *how we communicate effectively and appropriately with others*. Examples of pragmatics include turn- taking, staying on topic, volume and tone of voice, and appropriate eye contact. Lastly, words do not possess fixed meanings but change their interpretation as a function of the context in which they are spoken. We use **contextual information**, *the information surrounding language*, to help us interpret it. Examples of contextual information include our knowledge and nonverbal expressions such as facial expressions, postures, and gestures. Misunderstandings can easily arise if people are not attentive to contextual information or if some of it is missing, such as it may be in newspaper headlines or in text messages.

Pre-Linguistic Pragmatics

Video 3.9.1. *Talking Twin Babies* demonstrates how children can learn and use pragmatics even before they can produce language.

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Language Development Progression

Children begin to learn about language from a very early age (Table 3.9.1). In fact, it appears that this is occurring even before we are born. Newborns show a preference for their mother's voice and appear to be able to discriminate between the language spoken by their mother and other languages. Babies are also attuned to the languages being used around them and show preferences for videos of faces that are moving in synchrony with the audio of spoken language versus videos that do not synchronize with the audio (Blossom &

Morgan, 2006; Pickens, 1994; Spelke & Cortelyou, 1981).

Table 3.9.1. Stages of Language and Communication Development

Stage	Age	Developmental Language and Communication
1	0–3 months	Reflexive communication
2	3–8 months	Reflexive communication; interest in others
3	8–12 months	Intentional communication; sociability
4	12–18 months	First words
5	18–24 months	Simple sentences of two words
6	2–3 years	Sentences of three or more words
7	3–5 years	Complex sentences; has conversations

Intentional Vocalizations

In terms of producing spoken language, babies begin to coo almost immediately. **Cooing** *is a one-syllable combination of a consonant and a vowel sound* (e.g., coo or ba). Interestingly, babies replicate sounds from their own languages. A baby whose parents speak French will coo in a different tone than a baby whose parents speak Spanish or Urdu. These gurgling, musical vocalizations can serve as a source of entertainment to an infant who has been laid down for a nap or seated in a carrier on a car ride. Cooing serves as practice for vocalization, as well as the infant hears the sound of his or her own voice and tries to repeat sounds that are entertaining. Infants also begin to learn the pace and pause of conversation as they alternate their vocalization with that of someone else and then take their turn again when the other person's vocalization has stopped.

At about four to six months of age, infants begin making even more elaborate vocalizations that include the sounds required for any language. Guttural sounds, clicks, consonants, and vowel sounds stand ready to equip the child with the ability to repeat whatever sounds are characteristic of the language heard.

Eventually, these sounds will no longer be used as the infant grows more accustomed to a particular language.

At about 7 months, infants begin **Babbling**, engaging in *intentional vocalizations that lack specific meaning and comprise a consonant-vowel repeated sequence, such as ma-ma-ma, da-da- da.* Children babble as practice in creating specific sounds, and by the time they are 1 year old, the babbling uses primarily the sounds of the language that they are learning (de Boysson- Bardies, Sagart, & Durand, 1984). These vocalizations have a conversational tone that sounds meaningful even though it isn't. Babbling also helps children understand the social, communicative function of language. Children who are exposed to sign language babble in sign by making hand movements that represent real language (Petitto & Marentette, 1991).

Gesturing

Children communicate information through gesturing long before they speak, and there is some evidence that gesture usage predicts subsequent language development (Iverson & Goldin-Meadow, 2005). Deaf babies also use gestures to communicate wants, reactions, and feelings. Because gesturing seems to be easier than vocalization for some toddlers, sign language is sometimes taught to enhance one's ability to communicate by making use of the ease of gesturing. The rhythm and pattern of language is used when deaf babies sign just as it is when hearing babies babble.

Baby Sign Lanugage

Video 3.9.2. *Baby Sign Language* demonstrates how infants can be taught sign language to communicate before they can speak. Most infants will begin gesturing on their own around 10 months old, but infants can be taught gestures, like signs, before they are 6 months old.

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Receptive Language

At around ten months of age, the infant *can understand more than he or she can say, which is referred to as* **receptive language**. You may have experienced this phenomenon as well if you have ever tried to learn a second language. You may have been able to follow a conversation more easily than contribute to it. One of the first words that children understand is their own name, usually by about 6 months, followed by commonly used words like "bottle," "mama," and "doggie" by 10 to 12 months (Mandel, Jusczyk, & Pisoni, 1995).

Infants shake their head "no" around 6–9 months, and they respond to verbal requests to do things like "wave bye-bye" or "blow

a kiss" around 9–12 months. Children also use contextual information, particularly the cues that parents provide, to help them learn language. Children learn that people are usually referring to things that they are looking at when they are speaking (Baldwin, 1993), and that that the speaker's emotional expressions are related to the content of their speech.

Productive Language

Children begin using their first words at about 12 or 13 months of age and may use partial words to convey thoughts at even younger ages. *These one-word expressions are referred to as* **holophrasic speech.** For example, the child may say "ju" for the word "juice" and use this sound when referring to a bottle. The listener must interpret the meaning of the holophrase, and when this is someone who has spent time with the child, interpretation is not too difficult. But, someone who has not been around the child will have trouble knowing what is meant. Imagine the parent who to a friend exclaims, "Ezra's talking all the time now!" The friend hears only "ju da ga" to which the parent explains means, "I want some milk when I go with Daddy."

First words and Cultural Influences

First words if the child is using English tend to be nouns. The child labels objects such as cup, ball, or other items that they regularly interact with. In a verb-friendly language such as Chinese, however, children may learn more verbs. This may also be due to the different emphasis given to objects based on culture. Chinese children may be taught to notice action and relationships between objects, while children from the United States may be taught to name an object and its qualities (color, texture, size, etc.). These differences can be

seen when comparing interpretations of art by older students from China and the United States.

Two-word Sentences and Telegraphic Speech

By the time they become toddlers, children have a vocabulary of about 50-200 words and begin putting those words together in telegraphic speech, such as "baby bye-bye" or "doggie pretty". Words needed to convey messages are used, but the articles and other parts of speech necessary for grammatical correctness are not yet used. These expressions sound like a telegraph, or perhaps a better analogy today would be that they read like a text message. **Telegraphic Speech/Text Message Speech** *occurs when unnecessary words are not used.* "Give baby ball" is used rather than "Give the baby the ball."

Language Errors

The early utterances of children contain many errors, for instance, confusing /b/ and /d/, or /c/ and /z/. The words children create are often simplified, in part because they are not yet able to make more complex sounds of the real language (Dobrich & Scarborough, 1992). Children may say "keekee" for kitty, "nana" for banana, and "vesketti" for spaghetti because it is easier. Often these early words are accompanied by gestures that may also be easier to produce than the words themselves. Children's pronunciations become increasingly accurate between 1 and 3 years, but some problems may persist until school age.

A child who learns that a word stands for an object may initially think that the *word can be used for only that particular object*, which is referred to as **Underextension.** Only the family's Irish Setter is a "doggie", for example. More often, however, a child may think that *a*

label applies to all objects that are similar to the original object, which is called **Overextension.** For example, all animals become "doggies".

Link to Learning

Read this article to learn more about common linguistic mistakes that children make and what they mean: 10 Language Mistakes Kids Make That Are Actually Pretty Smart.

Child-Directed Speech

Why is a horse a "horsie"? Have you ever wondered why adults tend to use "baby talk" or that sing-song type of intonation and exaggeration used when talking to children? This represents a universal tendency and is known as **child-directed Speech.** *It involves exaggerating the vowel and consonant sounds, using a high-pitched voice, and delivering the phrase with great facial expression* (Clark, 2009). Why is this done? Infants are frequently more attuned to the tone of voice of the person speaking than to the content of the words themselves, and are aware of the target of speech. Werker, Pegg, and McLeod (1994) found that infants listened longer to a woman who was speaking to a baby than to a woman who was speaking to another adult. It may be in order to clearly articulate the sounds of a word so that the child can hear the sounds involved. It may also be because when this type of speech is used, the infant pays more attention to the speaker and this sets up a pattern of interaction in which the speaker and listener are in tune with one another.

Watch It

Video 3.9.3. This video examines new research on child-directed speech.

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Vocabulary

A child's vocabulary expands between the ages of two to six from about 200 words to over 10,000 words. This "vocabulary spurt" typically involves 10-20 new words per week and is accomplished through a process called **fast-mapping**. *Words are easily learned by making connections between new words and concepts already known.* The parts of speech that are learned depend on the language and what is emphasized. Children speaking verb-friendly languages, such as Chinese and Japanese, learn verbs more readily, while those speaking English tend to learn nouns more readily. However, those learning less verb-friendly languages, such as English, seem to need assistance in grammar to master the use of verbs (Imai et al., 2008).

One of the reasons that children can classify objects in so many ways is that they have acquired a vocabulary to do so. By fifth

grade, a child's vocabulary has grown to 40,000 words. It grows at a rate that exceeds that of those in early childhood. This language explosion, however, differs from that of younger children because it is facilitated by being able to associate new words with those already known, and because it is accompanied by a more sophisticated understanding of the meanings of a word.

Children can repeat words and phrases after having heard them only once or twice, but they do not always understand the meaning of the words or phrases. This is especially true of expressions or figures of speech that are taken literally. For example, a classroom full of preschoolers hears the teacher say, "Wow! That was a piece of cake!" The children began asking "Cake? Where is my cake? I want cake!"

Those in middle and late childhood are also able to think of objects in less literal ways. For example, if asked for the first word that comes to mind when one hears the word "pizza", the younger child is likely to say "eat" or some word that describes what is done with a pizza. However, the older child is more likely to place pizza in the appropriate category and say "food". This sophistication of vocabulary is also evidenced by the fact that older children tell jokes and delight in doing so. They may use jokes that involve plays on words such as "knock- knock" jokes or jokes with punch lines. Young children do not understand play on words and tell "jokes" that are literal or slapstick, such as "A man fell down in the mud! Isn't that funny?"

30 Million Word Gap

To accomplish the tremendous rate of word learning that needs to occur during early childhood, it is important that children are learning new words each day. Research by

Betty Hart and Todd Risley in the late 1990s and early 2000s indicated that children from less advantaged backgrounds are exposed to millions of fewer words in their first three years of life than children who come from more privileged socioeconomic backgrounds. In their research, families were classified by socioeconomic status, (SES) into "high" (professional), "middle" (working class), and "low" (welfare) SES. They found that the average child in a professional family hears 2,153 words per waking hour, the average child in a working-class family hears 1,251 words per hour, and an average child in a welfare family only 616 words per hour. Extrapolating, they stated that, "in four years, an average child in a professional family would accumulate experience with almost 45 million words, an average child in a working-class family 26 million words, and an average child in a welfare family 13 million words." The line of thinking following their study is that children from more affluent households would enter school knowing more words, which would give them advantage in school.

Hart and Risley's research has been criticized by scholars. Critics theorize that the language and achievement gaps are not a result of the number of words a child is exposed to, but rather alternative theories suggest it could reflect the disconnect of linguistic practices between home and school. Thus, judging academic success and linguistic capabilities from socioeconomic status may ignore bigger societal issues. A recent replication of Hart and Risley's study with more participants has found that the "word gap" may be closer to 4 million words, not the oft-cited 30 million words previously proposed. The ongoing word gap research is evidence of the importance of language development in early childhood.

Video 3.9.4. Watch as Dr. John Gabrieli, from the MIT McGovern Institute for Brain Development explains how early language exposure affects language development. His research uses the current technology to correlate home language experiences with brain function. They determined that the number of conversational turns was more important to development in Broca's area (brain region linked to speech production) than the number of words heard or the family's socioeconomic status.

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Grammar and Flexibility

Older children are also able to learn new rules of grammar with more flexibility. While younger children are likely to be reluctant to

give up saying "I goed there", older children will learn this rather quickly along with other rules of grammar.

Bilingualism

Although monolingual speakers often do not realize it, the majority of children around the world are **Bilingual**, *meaning that they understand and use two languages* (Meyers- Sutton, 2005). Even in the United States, which is a relatively monolingual society, more than 47 million people speak a language other than English at home, and about 10 million of these people are children or youths in public schools (United States Department of Commerce, 2003). The large majority of bilingual students (75%) are Hispanic, but the rest represent more than a hundred different language groups from around the world. In larger communities throughout the United States, it is therefore common for a single classroom to contain students from several language backgrounds at once. In classrooms, as in other social settings, bilingualism exists in different forms and degrees. At one extreme are students who speak both English and another language fluently; at the other extreme are those who speak only limited versions of both languages. In between are students who speak their home (or heritage) language much better than English, as well as others who have partially lost their heritage language in the process of learning English (Tse, 2001). Commonly, a student may speak a language satisfactorily but be challenged by reading or writing it. Whatever the case, each bilingual student poses unique challenges to teachers.

The student who speaks both languages fluently has a definite cognitive advantage. As you might suspect and research confirmed, a fully fluent bilingual student is in a better position to express concepts or ideas in more than one way, and to be aware of doing so (Jimenez, Garcia, & Pearson, 1995; Francis, 2006). Unfortunately, the bilingualism of many students is unbalanced in the sense that

they are either still learning English, or else they have lost some earlier ability to use their original, heritage language. Losing one's original language is a concern as research finds that language loss limits students' ability to learn English as well or as quickly as they could do. Having a large vocabulary in a first language has been shown to save time in learning vocabulary in a second language (Hansen, Umeda & McKinney, 2002). Preserving the first language is important if a student has impaired skills in all languages and therefore needs intervention or help from a speech-language specialist. Research has found, in such cases, that the specialist can be more effective if the specialist speaks and uses the first language as well as English (Kohnert, Yim, Nett, Kan, & Duran, 2005).

How Do Babies Become Bilingual?

Video 3.9.5. This video explains some of the research surrounding language acquisition in babies, particularly those learning a second language.

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Theories of Language Development

Psychological theories of language learning differ in terms of the importance they place on nature and nurture. Remember that we are a product of both nature and nurture. Researchers now believe that language acquisition is partially inborn and partially learned through our interactions with our linguistic environment (Gleitman & Newport, 1995; Stork & Widdowson, 1974).

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https://edpsych.pressbooks.sunycreate.cloud/?p=57#oembed-6

Video 3.9.6. *Theories of Language Development* discusses the major theories of how language develops in children.

Learning Theory

Perhaps the most straightforward explanation of language development is that it occurs through the principles of learning, including association and reinforcement (Skinner, 1953). Additionally, Bandura (1977) described the importance of observation and imitation of others in learning language. There must be at least some truth to the idea that language is learned through environmental interactions or nurture. Children learn the language that they hear spoken around them rather than some other language. Also supporting this idea is the gradual improvement of language skills with time. It seems that children modify their language through imitation and reinforcement, such as parental praise and being understood. For example, when a two-

year-old child asks for juice, he might say, "me juice," to which his mother might respond by giving him a cup of apple juice.

However, language cannot be entirely learned. For one, children learn words too fast for them to be learned through reinforcement. Between the ages of 18 months and 5 years, children learn up to 10 new words every day (Anglin, 1993). More importantly, language is more *generative* than it is imitative**.** Language is not a predefined set of ideas and sentences that we choose when we need them, but rather a system of rules and procedures that allows us to create an infinite number of statements, thoughts, and ideas, including those that have never previously occurred. When a child says that she "swimmed" in the pool, for instance, she is showing generativity. No adult speaker of English would ever say "swimmed," yet it is easily generated from the normal system of producing language.

Other evidence that refutes the idea that all language is learned through experience comes from the observation that children may learn languages better than they ever hear them. Deaf children whose parents do not speak ASL very well nevertheless are able to learn it perfectly on their own, and may even make up their own language if they need to (Goldin-Meadow & Mylander, 1998). A group of deaf children in a school in Nicaragua, whose teachers could not sign, invented a way to communicate through made-up signs (Senghas, Senghas, & Pyers, 2005). The development of this new Nicaraguan Sign Language has continued and changed as new generations of students have come to the school and started using the language. Although the original system was not a real language, it is becoming closer and closer every year, showing the development of a new language in modern times.

Nativism

The linguist Noam Chomsky is a believer in the nature approach to language, arguing that human brains contain a **Language**

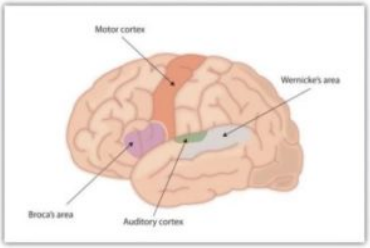
Acquisition Device that includes a *universal grammar* that underlies all human language (Chomsky, 1965, 1972). According to this approach, each of the many languages spoken around the world (there are between 6,000 and 8,000) is an individual example of the same underlying set of procedures that are hardwired into human brains. Chomsky's account proposes that children are born with a knowledge of general rules of syntax that determine how sentences are constructed. Language develops as long as the infant is exposed to it. No teaching, training, or reinforcement is required for language to develop as proposed by Skinner.

Chomsky differentiates between the **deep structure** of an idea; that is, *how the idea is represented in the fundamental universal grammar that is common to all languages*, and the **surface structure** of the idea or *how it is expressed in any one language*. Once we hear or express a thought in surface structure, we generally forget exactly how it happened. At the end of a lecture, you will remember a lot of the deep structure (i.e., the ideas expressed by the instructor), but you cannot reproduce the surface structure (the exact words that the instructor used to communicate the ideas).

Although there is general agreement among psychologists that babies are genetically programmed to learn language, there is still debate about Chomsky's idea that there is a universal grammar that can account for all language learning. Evans and Levinson (2009) surveyed the world's languages and found that none of the presumed underlying features of the language acquisition device were entirely universal. In their search, they found languages that did not have noun or verb phrases, that did not have tenses (e.g., past, present, future), and even some that did not have nouns or verbs at all, even though a basic assumption of a universal grammar is that all languages should share these features.

Anyone who has tried to master a second language as an adult knows the difficulty of language learning. Yet children learn languages easily and naturally. Children who are not exposed to language early in their lives will likely never learn one. Case studies, including Victor the "Wild Child," who was abandoned as a baby in France and not discovered until he was 12, and Genie, a child whose parents kept her locked in a closet from 18 months until 13 years of age, are (fortunately) two of the only known examples of these deprived children. Both of these children made some progress in socialization after they were rescued, but neither of them ever developed language (Rymer, 1993). This is also why it is important to determine quickly if a child is deaf, and to communicate in sign language immediately. Deaf children who are not exposed to sign language during their early years will likely never learn it (Mayberry, Lock, & Kazmi, 2002). The concept of critical periods highlights the importance of both nature and nurture for language development.

Brain Areas for Language



For the 90% of people who are right-handed, language is stored and controlled by the left cerebral cortex, although for some left-handers this pattern is reversed. These differences can easily be seen in the results of neuroimaging studies that show that listening to and producing language creates greater activity in the left hemisphere than in the right. **Broca's area**, *an area in front of the left hemisphere near the motor cortex, is responsible for language production* (Figure 3.21). This area was first localized in the 1860s by the French physician Paul Broca, who studied patients with lesions to various parts of the brain. **Wernicke's area**, *an area of the brain next to the auditory cortex, is responsible for language comprehension.*

Figure 3.9.2. Drawing of Brain Showing Broca's and Wernicke's Areas for most people the left hemisphere is specialized for language. Broca's area, near the motor cortex, is involved in language production, whereas Wernicke's area, near the auditory cortex, is specialized for language comprehension.

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Video 3.9.7. *Language and the Brain* reviews major brain structures and functions involved in language.

Interactionist Approach

The **interactionist approach** (sociocultural theory) combines ideas from psychology and biology to explain how language is developed. According to this theory, children learn language out of a desire to communicate with the world around them. Language emerges from and is dependent upon social interaction. The Interactionist approach claims that if our language ability develops out of a desire to communicate, then language is dependent upon with whom we want to communicate. This means the environment you grow up in will heavily affect how well and how quickly you learn to talk. For example, infants being raised by only their mother are more likely to learn the word "mama", and less likely to develop "dada". Among the first words we learn are ways to demand attention or food. If you've ever tried to learn a new language, you may recognize this theory's influence. Language classes often teach commonly used vocabulary and phrases first, and then focus on building conversations rather than simple rote memorization. Even when we expand our vocabularies in our native language, we remember the words we use the most.

Social pragmatics

Language from this view is not only a cognitive skill but also a social one. Language is a tool humans use to communicate, connect to, influence, and inform others. Most of all, language comes out of a need to cooperate. The social nature of language has been demonstrated by a number of studies that have shown that children use several pre-linguistic skills (such as pointing and other gestures) to communicate not only their own needs but what others may need. So a child watching her mother search for an object may point to the object to help her mother find it.

Eighteen-month to 30-month-olds have been shown to make

linguistic repairs when it is clear that another person does not understand them (Grosse, Behne, Carpenter & Tomasello, 2010). Grosse et al. (2010) found that even when the child was given the desired object, if there had been any misunderstanding along the way (such as a delay in being handed the object, or the experimenter calling the object by the wrong name), children would make linguistic repairs. This would suggest that children are using language not only as a means of achieving some material goal, but to make themselves understood in the mind of another person.

Vygotsky and Language Development

Lev Vygotsky hypothesized that children had a **zone of proximal development (ZPD)**. The ZPD is the range of material that a child is ready to learn if proper support and guidance are given from either a peer who understands the material or by a more knowledgeable adult. We can see the benefit of this sort of guidance when we think about the acquisition of language. Children can be assisted in learning language by others who listen attentively, model more accurate pronunciations, and encourage elaboration. For example, if the child exclaims, "I'm goed there!" then the adult responds, "You went there?"

Children may be hard-wired for language development, as Noam Chomsky suggested in his theory of universal grammar, but active participation is also important for language development. The process of **scaffolding** is one in which the guide provides needed assistance to the child as a new skill is learned. Repeating what a child has said, but in a grammatically correct way, is scaffolding for a child who is struggling with the rules of language production.

Private Speech

Do you ever talk to yourself? Why? Chances are, this occurs when you are struggling with a problem, trying to remember something, or feel very emotional about a situation. Children talk to themselves too. Piaget interpreted this as egocentric speech or a practice engaged in because of a child's inability to see things from other points of view. Vygotsky, however, believed that children talk to themselves in order to solve problems or clarify thoughts. As children learn to think in words, they do so aloud before eventually closing their lips and engaging in **private speech** or inner speech. Thinking out loud eventually becomes thought accompanied by internal speech, and talking to oneself becomes a practice only engaged in when we are trying to learn something or remember something, etc. This inner speech is not as elaborate as the speech we use when communicating with others (Vygotsky, 1962).

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Psychosocial Development

Social development refers to the long-term changes in relationships and interactions involving self, peers, and family. As with cognitive development, each of these areas has broad, well-known theories (and theorists) that provide a framework for thinking about how the area relates to teaching. Educators need to be aware of the development of self, for which we look to theorists like Erikson and Marcia. For many students, play is a foundation for learning and social interactions, for which we look to theorists like For the development of ethical knowledge and moral reasoning, it is the work of Kohlberg and Gilligan. These theories are not the only related to the social development of students, but their accounts do explain much about social development that is relevant to teaching and education.

Erikson's Stages of Psychosocial Development

Like Piaget, Erik Erikson developed a theory of social development that relies on stages, except that Erikson thought of stages as a series of **psychosocial crises**—turning points in a person's relationships and feelings about himself or herself (Erikson, 1963, 1980). Each crisis consists of a dilemma or choice that carries both advantages and risks, but in which one choice or alternative is usually considered more desirable or "healthy." How one crisis is resolved affects how later crises are resolved. The resolution also helps to create an individual's developing personality, sense of self, and relationships. Erikson proposed eight crises that extend from birth through old age; they are summarized in Table 3.6. Four of the stages occur during the school years, so we give these special attention here, but it is also helpful to know what crises are thought to come both before and after those in the school years.

Table 3.10.1. Eight psychosocial crises according to Erikson

Psychosocial crisis	Approximate age	Description
Trust and mistrust	Birth to one year	Development of trust between caregiver and child
Autonomy and shame	Age 1–3	Development of control over bodily functions and activities
Initiative and guilt	Age 3–6	Testing limits of self-assertion and purposefulness
Industry and inferiority	Age 6–12	Develop sense of mastery and competence
Identity and role confusion	Age 12–19	Development of identity and acknowledge of identity by others
Intimacy and isolation	Age 19–25+	Formation of intimate relationships and commitments
Generativity and stagnation	Age 25–50+	Development of creative or productive activities that contribute to future generations
Integrity and despair	Age 50+	Acceptance of personal life history and forgiveness of self and others

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Video 3.10.1 Erikson's Psychosocial Development explains all stages of this theory.

Crises of Infants and Preschoolers: Trust, Autonomy, and Initiative

Almost from the day they are born, infants face a crisis (in Erikson's sense) about **trust and mistrust**. They are happiest if they can eat, sleep, and excrete according to their own physiological schedules, regardless of whether their schedules are convenient for the caregiver (often the mother). Unfortunately, though, a young infant is in no position to control or influence a mother's caregiving or scheduling needs; so the baby faces a dilemma about how much to trust or mistrust the mother's helpfulness. It is as if the baby asks, "If I demand food (or sleep or a clean diaper) now, will my mother actually be able to help me meet this need?" Hopefully, between the two of them, mother and child resolve this choice in favor of the baby's trust: the mother proves herself at least "good enough" in her attentiveness, and the baby risks trusting mother's motivation and skill at caregiving.

Almost as soon as this crisis is resolved, however, a new one develops over the issue of **autonomy and shame**. The child (who is now a toddler) may now trust his or her caregiver (mother), but the very trust contributes to a desire to assert autonomy by taking care of basic personal needs, such as feeding, toileting, or dressing. Given the child's lack of experience in these activities, however, self-care is risky at first—the toddler may feed (or toilet or dress) clumsily and ineffectively. The child's caregiver, for her part, risks overprotecting the child and criticizing his early efforts unnecessarily and thus causing the child to feel shame for even trying. Hopefully, as with the earlier crisis of trust, the new crisis gets resolved in favor of autonomy through the combined efforts of the child to exercise autonomy and of the caregiver to support the child's efforts.

Eventually, about the time a child is of preschool age, the autonomy exercised during the previous period becomes more elaborate, extended, and focused on objects and people other than the child and basic physical needs. The child at a daycare center may

now undertake, for example, to build the "biggest city in the world" out of all available unit blocks—even if other children want some of the blocks for themselves. The child's projects and desires create a new crisis of **initiative and guilt**, because the child soon realizes that acting on impulses or desires can sometimes have negative effects on others—more blocks for the child may mean fewer for someone else. As with the crisis over autonomy, caregivers have to support the child's initiatives where possible, but also not make the child feel guilty just for desiring to have or to do something that affects others' welfare. By limiting behavior where necessary but not limiting internal feelings, the child can develop a lasting ability to take initiative. Expressed in Erikson's terms, the crisis is then resolved in favor of initiative.

Even though only the last of these three crises overlap with the school years, all three relate to issues faced by students of any age, and even by their teachers. A child or youth who is fundamentally mistrustful, for example, has a serious problem in coping with school life. If you are a student, it is essential for your long-term survival to believe that teachers and school officials have your best interests at heart and that they are not imposing assignments or making rules, for example, "just for the heck of it." Even though students are not infants anymore, teachers function like Erikson's caregiving parents in that they need to prove worthy of students' trust through their initial flexibility and attentiveness.

Parallels from the classroom also exist for the crises of autonomy and initiative. To learn effectively, students need to make choices and undertake academic initiatives at least some of the time, even though not every choice or initiative may be practical or desirable. Teachers, for their part, need to make true choices and initiatives possible, and refrain from criticizing, even accidentally, a choice or intention behind an initiative even if the teacher privately believes that it is "bound to fail." Support for choices and initiative should be focused on providing resources and on guiding the student's efforts toward more likely success. In these ways teachers function

like parents of toddlers and preschoolers in Erikson's theory of development, regardless of the age of their students

The Crisis of Childhood: Industry and Inferiority

Once into elementary school, the child is faced for the first time with becoming competent and worthy in the eyes of the world at large, or more precisely in the eyes of classmates and teachers. To achieve their esteem, he or she must develop skills that require effort that is sustained and somewhat focused. The challenge creates the crisis of **industry and inferiority**. To be respected by teachers, for example, the child must learn to read and to behave like a "true student." To be respected by peers, he or she must learn to cooperate and to be friendly, among other things. There are risks involved in working on these skills and qualities because there can be no guarantee of success with them in advance. If the child does succeed, therefore, he or she experiences the satisfaction of a job well done and of skills well learned—a feeling that Eriks0n called industry. If not, however, the child risks feeling lasting inferiority compared to others. Teachers, therefore, have a direct, explicit role in helping students to resolve this crisis in favor of industry or success. They can set realistic academic goals for students—ones that tend to lead to success—and then provide materials and assistance for students to reach their goals. Teachers can also express their confidence that students can in fact meet their goals if and when the students get discouraged, and avoid hinting (even accidentally) that a student is simply a "loser." Paradoxically, these strategies will work best if the teacher is also tolerant of less-than-perfect performance by students. Too much emphasis on perfection can undermine some students' confidence—foster Erikson's inferiority—by making academic goals seem beyond reach.

The Crisis of Adolescence: Identity

As the child develops lasting talents and attitudes as a result of the crisis of industry, he begins to face a new question: what do all the talents and attitudes add up to be? Who is the "me" embedded in this profile of qualities? These questions are the crisis of **identity and role confusion**. Defining identity is riskier than it may appear for a person simply because some talents and attitudes may be poorly developed, and some even may be undesirable in the eyes of others. (If you are poor at math, how do you live with family and friends if they think you should be good at this skill?) Still others may be valuable but fail to be noticed by other people. The result is that who a person wants to be may not be the same as who he or she is in actual fact, nor the same as who other people want the person to be. In Erikson's terms, role confusion is the result.

Teachers can minimize role confusion in a number of ways. One is to offer students lots of diverse role models— by identifying models in students' reading materials, for example, or by inviting diverse guests to school. The point of these strategies would be to express a key idea: that there are many ways to be respected, successful, and satisfied with life. Another way to support students' identity development is to be alert to students' confusion about their futures, and refer them to counselors or other services outside school that can help sort these out. Still another strategy is to tolerate changes in students' goals and priorities—sudden changes in extra-curricular activities or in personal plans after graduation. Since students are still trying roles out, discouraging experimentation may not be in students' best interests.

The Crises of Adulthood: Intimacy, Generativity, and Integrity

Beyond the school years, according to Erikson, individuals continue psychosocial development by facing additional crises. Young adults, for example, face a crisis of **intimacy and isolation**. This crisis is about the risk of establishing close relationships with a select number of others. Whether the relationships are heterosexual, homosexual, or not sexual at all, their defining qualities are depth and sustainability. Without them, an individual risks feeling isolated. Assuming that a person resolves this crisis in favor of intimacy, however, he or she then faces a crisis about **generativity and stagnation**. This crisis is characteristic of most of adulthood, and not surprisingly, therefore, is about caring for or making a contribution to society, and especially to its younger generation. Generativity is about making life productive and creative so that it matters to others. One obvious way for some to achieve this feeling is by raising children, but there are also many other ways to contribute to the welfare of others. The final crisis is about **integrity and despair**, and is characteristically felt during the final years of life. At the end of life, a person is likely to review the past and to ask whether it has been lived as well as possible, even if it was clearly not lived perfectly. Since personal history can no longer be altered at the end of life, it is important to make peace with what actually happened and to forgive oneself and others for mistakes that may have been made. The alternative is *despair*, or depression from believing not only that one's life was lived badly, but also that there is no longer any hope of correcting past mistakes.

Even though Erikson conceives of these crises as primarily concerns of adulthood, there are precursors of them during the school years. Intimacy, for example, is a concern of many children and youth in that they often desire, but do not always find, lasting relationships with others (Beidel, 2005; Zimbardo & Radl, 1999). Personal isolation is a particular risk for students with disabilities,

as well as for students whose cultural or racial backgrounds differ from classmates' or the teacher's. Generativity—feeling helpful to others and to the young—is needed not only by many adults but also by many children and youth; when given the opportunity as part of their school program, they frequently welcome a chance to be of authentic service to others as part of their school programs (Eyler & Giles, 1999; Kay, 2003). Integrity—taking responsibility for your personal past, "warts and all," is often a felt need for anyone, young or old, who has lived long enough to have a past on which to look. Even children and youth have a past in this sense, though their pasts are of course shorter than persons who are older.

Identity development is a stage in the adolescent life cycle. For most, the search for identity begins in the adolescent years. During these years, adolescents are more open to 'trying on' different behaviors and appearances to discover who they are. In an attempt to find their identity and discover who they are, adolescents are likely to cycle through several identities to find one that suits them best. Developing and maintaining identity (in adolescent years) is a difficult task due to multiple factors such as family life, environment, and social status. Empirical studies suggest that this process might be more accurately described as identity development, rather than formation, but confirms a normative process of change in both content and structure of one's thoughts about the self.

Self-Concept

Self-concept is the idea of self-constructed from opinions and beliefs about one's self and is foundational to developing self-identity. These concepts are defined confidently, consistently, and with stability. Cognitive developments result in greater self-awareness, greater awareness of others and their thoughts and judgments, the ability to think about future possibilities, and the

ability to consider multiple possibilities at once. As a result, by adolescence, children experience a significant shift from the simple, concrete, and global self-descriptions typical of young children; as children, they defined themselves by physical traits, whereas adolescents define themselves based on their values, thoughts, and opinions.

Further distinctions in self-concept, called "differentiation," occur as the adolescent recognizes the contextual influences on their behavior and the perceptions of others, and begin to qualify their traits when asked to describe themselves. Differentiation appears fully developed by mid-adolescence. Peaking in the 7th-9th grades, the personality traits adolescents use to describe themselves refer to specific contexts, and therefore may contradict one another. The recognition of inconsistent content in the self-concept is a common source of distress in these years, but this distress may benefit adolescents by encouraging structural development.

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Video 3.10.2. *Self-Concept, Self-Identity, and Social Identity* explains the various types of self and the formation of identity.

Cooley's Looking-Glass Self

Charles Horton Cooley (1964) suggested that our self-concept comes from looking at how others respond to us. This process, known as the looking-glass self involves looking at how others seem

to view us and interpreting this as we make judgments about whether we are good or bad, strong or weak, beautiful or ugly, and so on. Of course, we do not always interpret their responses accurately so our self-concept is not simply a mirror reflection of the views of others. After forming an initial self-concept, we may use our existing self-concept as a mental filter screening out those responses that do not seem to fit our ideas of who we are. So compliments may be negated, for example.

Think of times in your life when you felt more self-conscious. The process of the looking-glass self is pronounced when we are preschoolers. Later in life, we also experience this process when we are in a new school, new job, or are taking on a new role in our personal lives and are trying to gauge our own performance. When we feel more sure of of who we are we focus less on how we appear to others.

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Video 3.10.3. *Charles Cooley–Looking Glass Self* explains more about this theory.

Mead's I and Me

George Herbert Mead (1967) offered an explanation of how we develop a social sense of self by being able to see ourselves through the eyes of others. There are two parts of the self: the "I" which is the part of the self that is spontaneous, creative, innate, and is

not concerned with how others view us and the "me" or the social definition of who we are.

When we are born, we are all "I" and act without concern about how others view us. But the socialized self begins when we are able to consider how one important person views us. This initial stage is called "taking the role of the significant other." For example, a child may pull a cat's tail and be told by his mother, "No! Don't do that, that's bad" while receiving a slight slap on the hand. Later, the child may mimic the same behavior toward the self and say aloud, "No, that's bad" while patting his own hand. What has happened? The child is able to see himself through the eyes of the mother. As the child grows and is exposed to many situations and rules of culture, he begins to view the self in the eyes of many others through these cultural norms or rules. This is referred to as "taking the role of the generalized other" and results in a sense of self with many dimensions. The child comes to have a sense of self as a student, as a friend, as a son, and so on.

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Video 3.10.4. *George Herbert Mead–The I and the Me* explains more about this theory.

Exaggerated Sense of Self

One of the ways to gain a clearer sense of self is to exaggerate those qualities that are to be incorporated into the self. Preschoolers

often like to exaggerate their own qualities or to seek validation as the biggest or smartest or child who can jump the highest. Much of this may be due to the simple fact that the child does not understand their own limits. Young children may really believe that they can beat their parent to the mailbox, or pick up the refrigerator.

This exaggeration tends to be replaced by a more realistic sense of self in middle childhood as children realize that they do have limitations. Part of this process includes having parents who allow children to explore their capabilities and give the child authentic feedback. Another important part of this process involves the child learning that other people have capabilities, too and that the child's capabilities may differ from those of other people. Children learn to compare themselves to others to understand what they are "good at" and what they are not as good at.

Self-Esteem

Another aspect of identity formation is self-esteem. **Self-esteem** is defined as one's thoughts and feelings about one's self-concept and identity. Most theories on self-esteem state that there is a grand desire, across all genders and ages, to maintain, protect, and enhance their self-esteem.

There are several self-concepts and situational factors that tend to impact self-esteem. Children that are close to their parents and their parents are supportive, yet firm, tend to have higher self-esteem. Further, when people are recognized for their successes, have set high vocational aspirations, are athletic, or feel attractive, they have higher self-esteem. Teens tend to have lower self-esteem when entering middle school, feel peer rejection, and experience academic failure. Also, children that have authoritarian or permissive parents, need to relocate, or have low socioeconomic status, are more likely to experience lower self-esteem.

Girls are most likely to enjoy high self-esteem when engaged in supportive relationships with friends; the most important function of friendship to them is having someone who can provide social and moral support. When they fail to win friends' approval or cannot find someone with whom to share common activities and interests, in these cases, girls suffer from low self-esteem.

In contrast, boys are more concerned with establishing and asserting their independence and defining their relation to authority. As such, they are more likely to derive high self-esteem from their ability to influence their friends. On the other hand, the lack of romantic competence, for example, failure to win or maintain the affection of romantic interest is the major contributor to low self-esteem in adolescent boys.

Self Esteem Types

According to Mruk (2003), self-esteem is based on two factors: competence and worthiness. The relationship between competence and worthiness defines one's self-esteem type. As these factors are a spectrum, we can even further differentiate self-esteem types and potential issues associated with each.

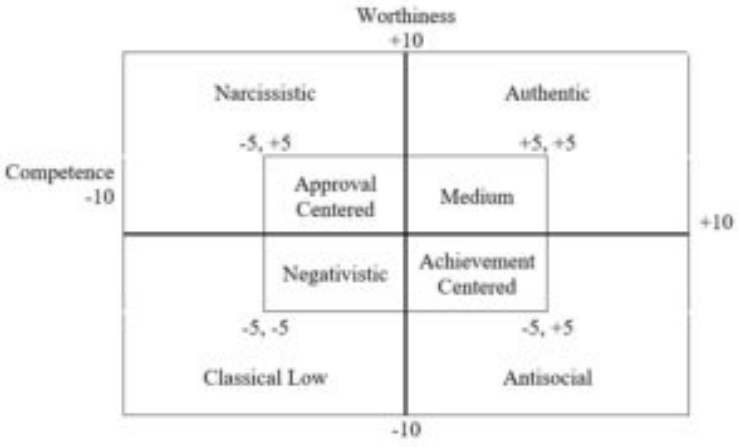

Figure 3.10.1. Self-Esteem meaning matrix with basic types and levels. Adapted from Mruk, 2003.

Those with high levels of competence and those that feel highly worthy will have **high self-esteem**. This self-esteem type tends to be stable and characterized by openness to new experiences and a tendency towards optimism. Those at the medium-high self-esteem type feel adequately competent and worthy. At the authentic level, individuals are realistic about their competence and feel worthy. They will actively pursue a life of positive, intrinsic values.

Individuals with low levels of competence and worthiness will have **low self-esteem**. At the negativistic level, people tend to be cautious and are protective of what little self-esteem that they do possess. Those at the classic low self-esteem level experienced impaired function due to their low feelings of competence and worth and are at risk for depression and giving up.

It is also possible to have high levels of competence but feel unworthy. This combination is a defensive or fragile self-esteem type, called **competence-based self-esteem**, where the person tends to compensate for their low levels of worthiness by focusing on their competence. At the success seeking level, these individuals' self-esteem is contingent on their achievements, and they are often anxious about failure. The Antisocial level includes an exaggerated need for success and power, even as to the point of acting out aggressively to achieve it.

The combination of low competence and high worthiness is **worthiness-based self-esteem**. This type is another defensive or fragile self-esteem where the individual has a low level of competence and compensates by focusing instead on their worthiness. At the approval-seeking level, these individuals are sensitive to criticism and rejection and base their self-esteem on the approval of others. At the narcissistic level, people will have an exaggerated sense of self-worth regardless of the lack of competencies. They also tend to be highly reactive to criticism and are very defensive.

Marcia's Identity Statuses

Expanding on Erikson's theory, Marcia (1966) described identity formation during adolescence as involving both exploration and commitment concerning ideologies and occupations (e.g., religion, politics, career, relationships, gender roles). Identity development begins when individuals identify with role models who provide them with options to explore for whom they can become. As identity development progresses, young people are expected to make choices and commit to options within the confines of their social contexts. In some cases, options are not provided or are limited, and the individual will fail to commit or will commit without the opportunity to explore various options (Marcia, 1980).

Identity confusion/diffusion occurs when individuals neither explore nor commit to any identities. **Foreclosure** occurs when an individual commits to an identity without exploring options. **A moratorium** is a state in which people are actively exploring options but have not yet made commitments. As mentioned earlier, individuals who have explored different options, discovered their purpose, and have made identity commitments are in a state of **identity achievement.**

		Individual has committed to identity	
		Yes	No
Individual has explored identity options	Yes	Identity Achievement	Moratorium
	No	Foreclosure	Identity Diffusion

Figure 3.10.2. Marcia's identity statuses. Adapted from Discovering the Lifespan, by R. S. Feldman, 2009.

The least mature status, and one common in many children, is identity diffusion. **Identity diffusion** is a status that characterizes those who have neither explored the options nor made a commitment to an identity. Marcia (1980) proposed that when individuals enter the identity formation process, they have little awareness or experience with identity exploration or the expectation to commit to an identity. This period of identity diffusion is typical of children and young adolescents, but adolescents are expected to move out of this stage as they are exposed to role models and experiences that present them with identity possibilities. Those who persist in this identity may drift aimlessly with little connection to those around them or have little sense of purpose in life. Characteristics associated with prolonged diffusion include low self-esteem, easily influenced by peers, lack of meaningful friendships, little commitment, or fortitude in activities or relationships, self-absorbed, and self-indulgent.

Those in **identity foreclosure** have committed to an identity without having explored the options. Often, younger adolescence will enter a phase of foreclosure where they may, at least preliminarily, commit to an identity without an investment in the exploration process. This commitment is often a response to anxiety about uncertainty or change during adolescence or pressure from parents, social groups, or cultural expectations. It is expected that most young people will progress beyond the foreclosure phase as they can think independently, and we multiple identity options. However, sometimes foreclosure will persist into late adolescence or even adulthood.

In some cases, parents may make these decisions for their children and do not grant the teen the opportunity to make choices. In other instances, teens may strongly identify with parents and others in their life and wish to follow in their footsteps. Characteristics associated with prolonged foreclosure well-behaved and obedient children with a high need for approval, authoritarian

parenting style, low levels of tolerance or acceptance of change, high levels of conformity, and conventional thinking.

During high school and college years, teens and young adults move from identity diffusion and foreclosure toward moratorium and achievement. The most significant gains in the development of identity are in college, as college students are exposed to a greater variety of career choices, lifestyles, and beliefs. This experience is likely to spur on questions regarding identity. A great deal of the identity work we do in adolescence and young adulthood is about values and goals, as we strive to articulate a personal vision or dream for what we hope to accomplish in the future (McAdams, 2013).

Identity moratorium is a status that describes those who are actively exploring in an attempt to establish an identity but have yet to have made any commitment. This time can be an anxious and emotionally tense period as the adolescent experiments with different roles and explores various beliefs. Nothing is guaranteed, and there are many questions, but few answers. This moratorium phase is the precursor to identity achievement. During the moratorium period, it is normal for adolescents to be rebellious and uncooperative, avoid dealing with problems, procrastinate, experience low self-esteem, feel anxious, and uncertain about decisions.

Identity achievement refers to those who, after exploration, have committed. Identity achievement is a long process and is not often realized by the end of adolescence. Individuals that do reach identity achievement feel self-acceptance, stable self-definition, and are committed to their identity.

While Marcia's statuses help us understand the process of developing identity, there are several criticisms of this theory. First, identity status may not be global; different aspects of your identity may be in different statuses. An individual may be in multiple identity statuses at the same time for different aspects of identity. For example, one could be in the foreclosure status for their

religious identity, but in moratorium for career identity, and achievement for gender identity.

Further, identity statuses do no always develop in the sequence described above, although it is the most common progression. Not all people will reach identity achievement in all aspects of their identity, and not all may remain in identity achievement. There may be a third aspect of identity development, beyond exploration and commitment, and that is the reconsideration of commitment. This addition would create a fifth status, **searching moratorium**. This status is a re-exploring after a commitment has been made (Meesus et al., 2012). It is not usual that commitments to aspects of our identity may change as we gain experiences, and more options become available to explore. This searching moratorium may continue well into adulthood.

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https://edpsych.pressbooks.sunycreate.cloud/?p=58#oembed-4

Video 3.10.5. Macia's Stages of Adolescent Identity Development summarizes the various identity statuses and how an individual may move through them.

Supporting Identity Development

As the process of identity development can be a confusing and challenging period, how can adults support children through this process? First, affirm that the anxiety, doubts, and confusion are reasonable and that most teens do not complete identity

achievement before graduating high school. Exposing young people to various role models can help them imagine different roles or options for their future selves. Role models can come from within the family, schools, or community. Adults should talk with children about their values, goals, and identities to help build awareness. They may be interested to know how others made decisions while developing their own identities. Finally, support the commitments that adolescents have made. Identity commitments can help someone feel grounded and less confused while they engage in identity exploration.

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Peer Relationships

Relationships within the family (parent-child and siblings) are not the only significant relationships in a child's life. Peer relationships are also important. Social interaction with another child who is similar in age, skills, and knowledge provokes the development of many social skills that are valuable for the rest of life (Bukowski, Buhrmester, & Underwood, 2011). In peer relationships, children learn how to initiate and maintain social interactions with other children. They learn skills for managing conflict, such as turn-taking, compromise, and bargaining. Play also involves the mutual, sometimes complex, coordination of goals, actions, and understanding. For example, as preschoolers engage in pretend play they create narratives together, choose roles, and collaborate to act out their stories. Through these experiences, children develop friendships that provide additional sources of security and support to those provided by their parents.

However, peer relationships can be challenging as well as supportive (Rubin, Coplan, Chen, Bowker, & McDonald, 2011). Being accepted by other children is an essential source of affirmation and self-esteem. At the same time, peer rejection can foreshadow later behavior problems (especially when children are rejected due to aggressive behavior). With increasing age, children confront the challenges of bullying, peer victimization, and managing conformity pressures. Social comparison with peers is an important means by which children evaluate their skills, knowledge, and personal qualities, but it may cause them to feel that they do not measure up well against others. For example, a boy who is not athletic may feel unworthy of his football-playing peers and revert to shy behavior, isolating himself, and avoiding conversation. Conversely, an athlete who does not "get" Shakespeare may feel embarrassed and avoid reading altogether. Also, with the approach of adolescence, peer relationships become focused on psychological intimacy, involving

personal disclosure, vulnerability, and loyalty (or its betrayal)—which significantly influences a child's outlook on the world. Each of these aspects of peer relationships requires developing very different social and emotional skills than those that emerge in parent-child relationships. They also illustrate the many ways that peer relationships influence the growth of personality and self-concept.

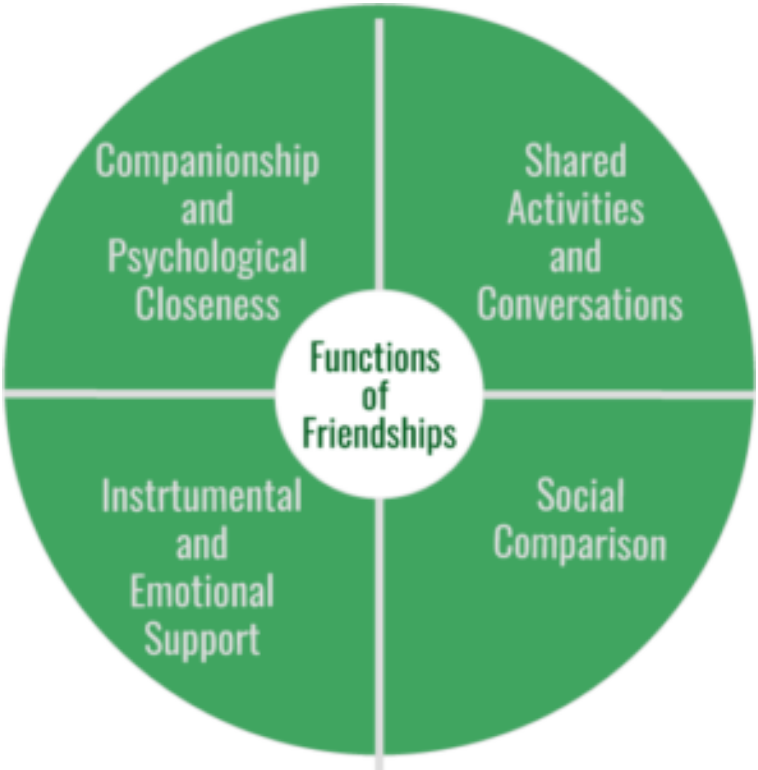

Figure 3.11.1. Functions of friendship. By Florida State College at Jacksonville, licensed under CC-BY 4.0 .

As children become adolescents, they usually begin spending more time with their peers and less time with their families, and

these peer interactions are increasingly unsupervised by adults. Children's notions of friendship often focus on shared activities, whereas adolescents' notions of friendship increasingly focus on intimate exchanges of thoughts and feelings.

During adolescence, peer groups evolve from primarily single-sex to mixed-sex. Adolescents within a peer group tend to be similar to one another in behavior and attitudes, which has been explained as being a function of **homophily** (adolescents who are similar to one another choose to spend time together in a "birds of a feather flock together" way) and influence (adolescents who spend time together shape each other's behavior and attitudes).

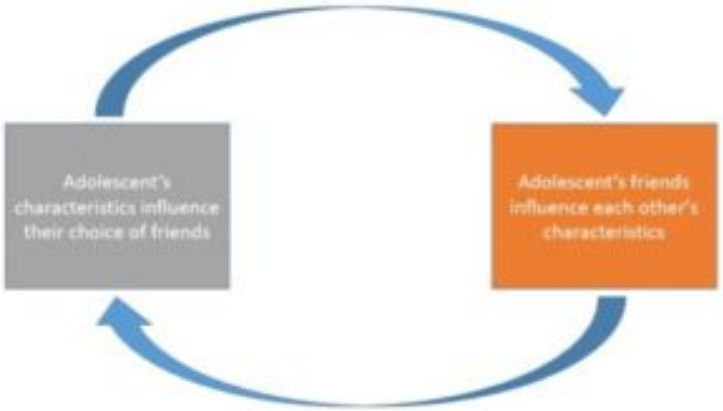

Figure 11.2.1. Reciprocal influences on friend selection and personal characteristics.

Peer pressure is usually depicted as peers pushing a teenager to do something that adults disapprove of, such as breaking laws or using drugs. One of the most widely studied aspects of adolescent peer influence is known as **deviant peer contagion** (Dishion & Tipsord, 2011). This influence is the process by which peers reinforce problem behavior by laughing or showing other signs of approval that then increase the likelihood of future problem behavior. Although deviant peer contagion is more extreme, regular

peer pressure is not always harmful. Peers can serve both positive and negative functions during adolescence. Negative peer pressure can lead adolescents to make riskier decisions or engage in more problematic behavior than they would alone or in the presence of their family. For example, adolescents are much more likely to drink alcohol, use drugs, and commit crimes when they are with their friends than when they are alone or with their family. However, peers also serve as an essential source of social support and companionship during adolescence, and adolescents with positive peer relationships are happier and better adjusted than those who are socially isolated or who have conflictual peer relationships.

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Crowds are an emerging level of peer relationships in adolescence. In contrast to friendships (which are reciprocal dyadic relationships) and **cliques** (which refer to groups of individuals who interact frequently), crowds are characterized more by shared reputations or images than actual interactions (Brown & Larson, 2009)These crowds reflect different prototypic identities (such as jocks or brains) and are often linked with adolescents' social status and peers' perceptions of their values or behaviors. Eventually, these crowds and cliques become less critical to teens as they place more value on close friendships and romantic relationships.

Crowds

Crowds are large groups of adolescents socially connected by a shared image and reputation (Brown, 2004), especially within the setting of a single school. A single person can belong to more than one crowd if their image matches the crowd's criteria (Brown, 2004; Mory, 1994). Because membership in a crowd depends on peers' perceptions, crowds in any given peer group will correspond to the local preconceived "types" of adolescents. Specific stereotypes vary from place to place, but many remain consistent. They are based on peer status, socioeconomic status, residential area, activities, social characteristics, or a combination of attributes (jocks, nerds, populars, and druggies are among the most commonly observed) (Brown, 2004; Mory, 1994; Arnett, 2002). Crowds are very different from cliques: while cliques are relatively small, close-knit groups based on frequent interaction and collectively determined membership, members of a crowd may not even know each other. Crowd membership reflects external assessments and expectations, providing a social context for identity exploration and self-definition as adolescents internalize or reject their crowd identities.

Because crowd membership is initially outwardly imposed, an adolescent's peers can classify them as belonging to a crowd that they do not consider themselves a member. Members of some crowds are more aware of and comfortable with their crowd designation than others; members of stigmatized or low-status groups, in particular, may resist or deny their undesirable categorization (Brown et al., 1992). Usually, however, adolescents embrace their crowd affiliation, using it to define themselves and advertise where they fit in their peer group's social structure (Newman & Newman, 2001; Brown et al., 1990).

Crowds and Identity Development

Crowds serve an essential purpose in adolescent identity development, shaping individual values, behavior, and personal and peer expectations. "[One's group] is often tantamount to one's own provisional identity" (Brown et al., 1994); the individual defines themself by the crowd to which they see themself as belonging. Different crowds expose the individual to different norms. These norms encourage adolescents to interact with some people while avoiding others and reward certain behaviors while discouraging others, a process of normative social influence (Brown et al., 1990; Brown et al., 1994; Brown et al., 1995; Brown & Larson, 2009). For example, a member of a "preppy" crowd might be rewarded for dressing in a fashion for which a member of an "emo" crowd would be teased, and vice versa.

Crowd effects on norms of interaction:

- Norms affect how the individual interacts with others. Members of high-status (preppie, popular) groups often interact with many people, but most of these relationships are superficial and instrumental; interpersonal connections are used to establish and maintain social status (Eder, 1985; Lesko, 1988). By contrast, members of lower-caste groups (e.g., dorks, druggies) generally have fewer friends, mostly from within the crowd; however, these relationships are typically marked by greater loyalty, stability, and honesty (Lesko, 1988).
- Norms affect with whom the individual interacts. Crowds steer the individual toward certain people, attitudes, and behaviors. There are also effects of peer perception and expectations when individuals attempt to interact across crowds. In essence, one may be interested in a cross-crowd friendship, but whether or not the target reciprocates depends on their crowd's norms as well. The adolescent's social options for friendship and romance are limited by their crowd and by

other crowds (Brown et al., 1994).

Often crowds reinforce the behaviors that initially caused an individual to be labeled part of that crowd, which can positively or negatively influence the individual (toward academic achievement or drug use, for example). These pressures are often linked to the stereotypes members of crowds hold about themselves and members of other crowds: unity by the denigration of the outgroup (Brown et al., 1994).

Racial Crowds and Sub-Crowds

Adolescents' perception of crowd differences may depend on how closely related the adolescent observer is to a particular crowd. The primary, recurring crowd divisions (jocks, geeks, partiers) have been most often studied in predominantly white high schools, but they also exist for minority students. In multiracial schools, students seem to divide along ethnic lines first, then into these archetypical crowds within their ethnicity. However, one ethnic group may not notice the further divisions in other ethnic groups after the first, race-based split (Brown & Mounts, 1989). For instance, black students see themselves as divided into jocks, geeks, emos, stoners, popular kids, and so on, but white students may see them as just one crowd defined solely by ethnicity, "the black kids." Sometimes crowd membership transcends race, however, and adolescents are classified as "jocks" or "geeks" regardless of race (Horvat & Lewis, 2003; Tyson et al., 2005). This classification seems to vary and depends heavily on the context of the individual school.

Stereotypes, Stigma, and Cross-Crowd Friendships

While crowds are structured around prototypical caricatures of their members, real adolescents rarely match these extremes. Furthermore, not all adolescents agree on the characteristics typical of a stereotype (Brown et al., 1994). In other words, a regular manifestation of just a few central characteristics of a crowd is a sufficient basis for classification as a member of that crowd. Thus, not all "jocks" neglect their schoolwork, though that is part of the typical jock stereotype, and a person interested in fashion could still be considered a "geek."

Often a crowd is stigmatized by one or more other crowds. This stigmatization can affect adolescents' willingness to associate with members of that crowd, or even other crowds similar to it. For example, people may avoid being seen as a "brain," a middle-status crowd, because of the similarity between brains and "nerds," a lower-status crowd (Brown et al., 1990).

Shared interests form the basis of many friendships, so often adolescents are drawn to members of their own crowds, especially if their crowd is defined by activities rather than more superficial characteristics such as race or socioeconomic status. However, interests can be shared across crowd divisions. Accordingly, while an adolescent's closest friends are almost always part of the same clique (i.e., they interact frequently within the same small friend group), they are not always part of the same crowd, especially if multiple crowds have similar lifestyles (Brown et al., 1994).

Crowd-Hopping

Further emphasizing the flexible nature of crowd membership, some adolescents are not stably linked to one specific crowd—some

individuals are associated with multiple crowds, while others are not stably linked to any crowds and "float" among several. These appear more closely attached to individuals outside the peer group (family, dropout friends, friends from a non-school organization, etc.). Others may consciously work to change crowd affiliations to express different interests or achieve a change in social status. The crowd with which an adolescent desires to be identified is far less stable than the personal attributes by which the adolescent is likely to be categorized by peers. Accordingly, adolescents who change crowd membership (a process known as "crowd-hopping") tend to have lower self-esteem, perhaps because they have not yet found an environment and peer group that supports them. They likely continue changing crowd membership until they find a fulfilling niche (Brown et al., 1992).

The Rise of Crowds

Crowds first emerge in middle or junior high school, when children transition from stable, self-contained classroom peer groups into larger schools, where they interact with a more diverse body of peers with less adult guidance. Crowds emerge to group students by caricature and structure interactions between students of each type (Brown et al., 1994). Early crowds are often based on social status, especially among girls, with a small group of well-known children being "popular" and the rest "unpopular." To maintain their status, popular girls will avoid the overtures of less-popular children, which actually makes them disliked (Eder, 1985). Many children stop attempting to gain entry into the popular crowd and make friends with other children instead, giving rise to new crowds (Brown et al., 1994).

The stereotypes on which crowd definitions are based change over time as adolescents shift from grouping people by abstract characteristics rather than activities ("geeks" rather than "the kids

who read a lot"). With age, adolescents become more conscious of crowd divisions and the social hierarchy (Brown, 2004). Distinctions between crowds also become more nuanced, developing from simple popular/unpopular dichotomies to less hierarchical structures in which there are more than two levels of social acceptability, often with several crowds at each level (Kinney, 1993; Horn, 2003). As seen in cross-crowd friendships, some crowds interact with each other more readily than others. This transition to a more fluid social structure allows adolescents to change their status over time by changing crowds, remaining in a crowd that undergoes a change in status, or gaining the confidence and perspective to reject the assumptions of the social hierarchy (Brown et al., 1994; Kinney, 1993). Willingness to do so reflects a growing sense of personal identity distinct from crowd membership.

The Decline of Crowds

Adolescents' attitudes toward crowds change over time—while ninth-graders are willing to discriminate against members of other crowds, twelfth-graders are less likely to do so (Horn, 2003). Adolescents also develop more multifaceted self-concepts and reject crowd labels as simplistic attempts to describe an entire personality (Brown et al., 1994). Across the high school years, crowd significance as a basis for affiliation wanes (Horn, 2003), as does the influence of crowds on an individual's behavior (Brown, 2004). In fact, some studies indicate the importance of crowds peaks at age 12 or 13 (Brown et al., 1986). By the end of high school, adolescents often feel constrained by impersonal, crowd-derived identities (Larkin, 1979). This constraint, combined with the splintering off of romantic couples from the rest of the crowd, may account for the decline of crowd significance over time(Kuttler & La Greca, 2004).

Cliques

A **clique** is a group of individuals who interact with one another and share similar interests. Interacting with cliques is part of normative social development regardless of gender, ethnicity, or popularity. Although cliques are most commonly studied during adolescence and middle childhood development, they exist in all age groups. They are often bound together by shared social characteristics such as ethnicity and socioeconomic status (Labrum, 2016).

Typically, people in a clique will not have a completely open friend group and can, therefore, "ban" members if they do something considered unacceptable, such as talking to someone disliked. Some cliques tend to isolate themselves as a group and view themselves as superior to others, which can be demonstrated through bullying and other antisocial behaviors.

One person may be part of multiple cliques, each forming and functioning independently from one another. Cliques are relevant in society due to the social influence or peer pressure that results from interactions with individuals who share a common characteristic. The outcomes associated with clique formations may be endless, with varying degrees of influence (Miller, 1958). So, a formal clique, such as a professional organization, would have a different kind of influence as compared to a social clique consisting of close friends.

A clique can also involve a high degree of social commitment to a specific group. A stronger level of commitment results in an individual having a reduced amount of interaction with other social groups. Cliquish behavior often involves repetition with regard to activities, vernacular, preferences, and manner, which can result in

conflict with other cliques, creating "outsiders." Individuals can also experience social isolation within their clique if their values and/or behavior begin to differ from the rest of the group.

Every clique has some form of organization that makes up the network of social interaction (Peay, 1974). Informal clique networks are groups that do not have a legitimate organizational structure in which they can be established and dissolved in a shorter period. An informal clique may consist of a person's friend group or co-workers, while it may also identify other, more informal groups, such as criminal gangs (Krackhardt, 1988). On the other hand, a formal clique is a group with a socially accepted organization that is hierarchical in structure. A formal clique is composed of members who have identifiable roles and interactions with one another and is found in the structure of numerous professional organizations, businesses, and even family structures. Culture is a very influential factor in the organization of clique structures because the boundaries established through differences in cultural aspects are persistent, even when the membership varies from time to time. For example, the differences in language, beliefs, traditions, etc. have always created a distinct separation or boundary between groups of people even though the members of that particular group are continually changing (Barth, 1998).

Development of Cliques

The formation and deformation of clique structures do not end with adolescence, even though the number of interactions with clique groups decreases, and the type of groups may change. As individuals become adults, their social interpretations alter, and the formation of their cliques originates from their immediate environment, rather than from common social characteristics (Carstensen, 2016). A clique should not be confused with a crowd because the smaller size and specific boundaries of a group are what cause the group

formation to be considered a clique. A clique can develop in several different ways and within environments that consist of individuals who interact regularly. The structural cohesion of the clique is the constant face-to-face interaction between members that can either create or dissolve the group, depending upon the level of interaction. If face-to-face interaction is regularly established, then cohesion between individuals will form. However, if the face-to-face interaction depreciates, then the cohesive social bond between said individuals will eventually dissolve (Friedkin, 1984).

Social impact of Cliques

A clique may inhibit external social influence by impacting the emotions, opinions, or behaviors of group members (Hochschild, 1979). There are many ways in which the perception of information between members in a clique can influence other members on a greater level than if they had received the same information from a different source. For example, receiving information from a close friend or family member is interpreted and responded to differently compared to receiving the same information from someone who is not within the clique structure. The satisfaction, interaction, and closeness between the clique groups that we involve ourselves in develops and changes throughout the years. Nevertheless, there is always a constant morphing of both the individual and the group as time goes on.

Homosociality to Hetersociality

Homosociality is the relationship between people of the same-sex, not romantic in nature. In children and young adolescents, more friendships are with peers of the same sex. As adolescents mature,

they become open to **heterosociality**, having relationships with people of the opposite sex, and **bisociality**, having relationships with same- and opposite-sex peers.

This process tends to occur in stages, as children transition from almost exclusive homosociality to heterosociality and eventually to romantic relationships. In stage one of this progression, cliques are same-sex and segregated from the opposite sex. In the second stage, opposite-sex cliques with similar interests start to associate. During the third stage, sex-segregated cliques break down, often with clique leaders pairing off into close friendships and romantic relationships. The fourth stage is when other clique members also leave the homosocial clique for hetero- and bisocial or romantic relationships. By stage five, cliques are less important to teens, and close or romantic relationships are the priority.

Cliques, Crowds, and Conformity

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Video 11.2.1. *Adolescence, Cliques, Crowds, Conformity* discusses the different peer groups and their influence on youth culture.

Romantic Relationships

Adolescence is the developmental period during which romantic relationships typically first emerge. Initially, same-sex peer groups that were common during childhood expand into mixed-sex peer groups that are more characteristic of adolescence. Romantic relationships often form in the context of these mixed-sex peer groups (Connolly, Furman, & Konarski, 2000).

Although romantic relationships during adolescence are often short-lived rather than long-term committed partnerships, their importance should not be minimized. Adolescents spend a great deal of time focused on romantic relationships, and their positive and negative emotions are more tied to romantic relationships (or lack thereof) than to friendships, family relationships, or school (Furman & Shaffer, 2003). Romantic relationships contribute to adolescents' identity formation, changes in family and peer relationships, and adolescents' emotional and behavioral adjustment.

Furthermore, romantic relationships are centrally connected to adolescents' emerging sexuality. Parents, policymakers, and researchers have devoted a great deal of attention to adolescents' sexuality, in large part because of concerns related to sexual intercourse, contraception, and preventing teen pregnancies. However, sexuality involves more than this narrow focus. Romantic relationships are a domain in which adolescents experiment with new behaviors and identities.

Sociometric Status

A child's status among their peers will influence their membership in peer groups and their ability to make friends. **Sociometric status** is a measurement that reflects the degree to which someone

is liked or disliked by their peers as a group. In developmental psychology, this system has been used to examine children's status in peer groups, its stability over time, the characteristics that determine it, and the long-term implications of one's popularity or rejection by peers.

The most commonly used sociometric system, developed by Coie & Dodge (1988), asks children to rate how much they like or dislike each of their classmates and uses these responses to classify them into five groups.

		Number of "least liked" nominations		
		Many		Few
Number of "most liked" nominations	Many	Controversial		Popular
			Average	
	Few	Rejected		Neglected

Figure 3.11.2. Sociometric peer statuses.

Popular children are those liked by many of their peers and disliked by few. These individuals are skilled at social interactions and maintain positive peer relationships. They tend to be cooperative, friendly, sociable, and sensitive to others. They are capable of being assertive without being aggressive, and thus can get what they want without harming others. Among this group, there may be distinct levels of popularity:

- **Accepted** kids are the most common sub-group among the popular. While they are generally well-liked, they are not as magnetic as the very popular kids.
- **Very popular** kids are highly charismatic and draw peers to them.

Rejected children are designated as rejected if they receive many

negative nominations and few positive nominations. These individuals often have poor academic performance and more behavior problems in school. They are also at higher risk for delinquent behaviors and legal problems. These kids are more likely to be diagnosed with ADHD, conduct disorder, and substance abuse. They tend to be isolated, lonely, and at risk for depression. Rejected youth can be categorized into two types:

- **Aggressive-rejected** kids display hostile and threatening behavior, are physically aggressive, and disruptive. They may bully others, withhold friendship, ignore and exclude others. While they are lacking, they tend to overestimate their social competence.
- **Withdrawn-rejected** kids are socially withdrawn, wary, timid, anxious in social situations, and lack confidence. They are at risk of being bullied.

Individuals that are liked by many peers, but also disliked by many are designated as **controversial**. This group may possess characteristics of both the popular and the rejected group. These individuals tend to be aggressive, disruptive, and prone to anger. However, they may also be cooperative and social. They are often socially active and good group leaders. Their peers often view them as arrogant and snobbish.

The **neglected** children are designated as neglected if they receive few positive or negative nominations. These children are not especially liked or disliked by peers and tend to go unnoticed. As a result, they may be isolated and especially avoid confrontation or aggressive interactions. This group does tend to do well academically.

Finally, the **average** kids are designated as such because they receive an average number of both positive and negative nominations. They are liked by a small group of peers, but not disliked by very many.

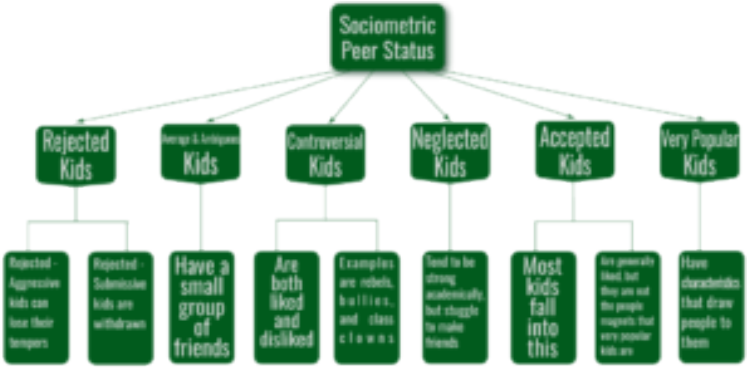

Figure 3.11.3. Sociometric peer statuses and characteristics.

Popularity

What makes a child popular? Several physical, cognitive, and behavioral factors impact popularity. First, adolescents that are perceived to be physically attractive tend to be more popular among their peers. Cognitive traits matter too. Individuals that demonstrate higher intelligence and do well academically tend to be more liked. Also, those that can take another's perspective and demonstrate social problem-solving skills are favored. Kids that can manage their emotions and behave appropriately gain higher status. Finally, kids like peers that are confident without being conceited.

Interventions

What can be done to help those that are not well-liked? For neglected kids, social skills training and encouraging them to join activities can help them become noticed by their peers and make

friends. For rejected kids, they may need support to help with anger management, to overcome anxiety, and cope with depression. This group can also benefit from social skills training to learn social competence and gain confidence.

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Bullying

Bullying is unwanted, aggressive behavior among school-aged children that involves a real or perceived power imbalance. The behavior is repeated, or has the potential to be repeated, over time. Both kids who are bullied and who bully others may have serious, lasting problems.

In order to be considered bullying, the behavior must be aggressive and include:

- An Imbalance of Power: Kids who bully use their power—such as physical strength, access to embarrassing information, or popularity—to control or harm others. Power imbalances can change over time and in different situations, even if they involve the same people.
- Repetition: Bullying behaviors happen more than once or have the potential to happen more than once.

Bullying includes actions, such as making threats, spreading rumors, attacking someone physically or verbally, and excluding someone

from a group on purpose. Bullying is not peer conflict, dating violence, hazing, gang violence, harassment (legal definition), or stalking. While these issues may also be problematic, they do not meet the criteria for bullying behavior.

Types of Bullying

There are several types of bullying, and it is not unusual for a bully to utilize more than one type. **Verbal bullying is** saying, or writing mean things and may include behaviors like teasing or name-calling, inappropriate sexual comments, taunting, and threatening to cause harm. **Social bullying is** sometimes referred to as relational bullying. It involves behaviors such as hurting someone's reputation or relationships by purposely excluding them or getting others to exclude them, spreading rumors about someone, or embarrassing someone in public. **Physical bullying is** hurting a person's body or possessions by hitting, kicking, or pinching, spitting, tripping or pushing, taking or breaking someone's things, or making mean or rude hand gestures.

The Roles in Bullying

There are many roles that individuals may take in bullying situations. Kids can bully others, they can be bullied, or they may witness bullying. Some may play more than one role, sometimes being both bullied and the bully. It is important to understand the multiple roles involved in these situations in order to prevent and respond to bullying effectively.

Importance of Not Labeling Kids

When referring to a bullying situation, it is easy to call the kids who bully others "bullies" and those who are targeted "victims," but this may have unintended consequences. When children are labeled as "bullies" or "victims," it may send the message that the individual's behavior cannot change. It also fails to recognize the multiple roles one might play in different bullying situations. Labeling also disregards other factors contributing to the behavior such as peer influence or school climate.

Instead of labeling the teens involved, focus on the behavior. For instance, instead of calling someone a "bully," refer to them as "the person who bullied." Instead of calling a person a "victim," refer to them as "the person who was bullied."

The Role of Bully

The roles individuals play in bullying are not limited to those who bully others and those who are bullied. Some researchers talk about the "circle of bullying" to define both those directly involved in bullying and those who actively or passively assist the behavior or defend against it. Direct roles include:

- **Those who Bully**: These teens engage in bullying behavior towards their peers. There are many risk factors that may contribute to their involvement in the behavior. Often, these kids require support to change their behavior and address any other challenges that may be influencing their behavior.
- **Those who are Bullied**: These teens are the targets of bullying behavior. Some factors put them at more risk of being bullied, but not all kids with these characteristics will be bullied. Sometimes, these individuals may need help learning how to respond to bullying.

Witnesses to Bullying

Even if a person is not directly involved in bullying, they may be contributing to the behavior. Witnessing the behavior may also affect the situation, so they need to learn what they should do when they see bullying happen. Roles kids play when they witness bullying include:

- **Those who Assist**: These individuals may not start the bullying or lead in the bullying behavior, but serve as an "assistant" to those who are bullying. These kids may encourage bullying behavior and occasionally join in.
- **Those who Reinforce**: These kids are not directly involved in the bullying behavior, but they give the bullying an audience. They will often laugh or provide support for those who are engaging in bullying. This may encourage the bullying to continue.
- **Outsiders**: These individuals remain separate from the bullying situation. They neither reinforce the bullying behavior nor defend the person being bullied. Some may watch what is going on but do not provide feedback about the situation to show they are on anyone's side. Even so, providing an audience may encourage bullying behavior. These witnesses may want to help but do not know-how.
- **Those who Defend**: These witnesses actively comfort the person being bullied and may come to their defense when bullying occurs.

Most participants play more than one role in bullying over time. In some cases, they may be directly involved in bullying as the one bullying others or being bullied. In others, they may witness bullying and play an assisting or defending role. Every situation is different. Some kids are both bullied and bully others. It is important to note the multiple roles kids play, because those who are both bullied and bully others may be at more risk for adverse outcomes, such

as depression or suicidal ideation. Also, it highlights the need to engage all kids in prevention efforts, not just those who are known to be directly involved.

Bystanders: Become an Upstander to Bullying

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Video 11.4.1. *Bystander* discusses the roles of a bullying incident and how bystanders may be key to preventing and stopping bullying.

Who Is at Risk?

No single factor puts a child at risk of being bullied or bullying others. Bullying can happen anywhere—cities, suburbs, or rural towns. Depending on the environment, some groups—such as lesbian, gay, bisexual, transgender, or questioning (LGBTQ) youth, youth with disabilities, and socially isolated youth—may be at an increased risk of being bullied.

Those at Risk of Being Bullied

Generally, those who are bullied have one or more risk factors. Adolescents that are perceived as different from their peers, such as being overweight or underweight, wearing glasses or different clothing, being new to a school, or being unable to afford what kids consider "cool" are at risk for bullying. As are those perceived as weak or unable to defend themselves or are less popular than others and have few friends. Also, at risk for bullying are those that are depressed, anxious, or have low self-esteem. Finally, those that do not get along well with others, are seen as annoying or provoking, or antagonize others for attention are more likely to be bullied. However, even if a child has these risk factors, it does not mean that they will be bullied.

Those More Likely to Bully Others

There are two types of kids who are more likely to bully others. The first is well-connected to their peers, have social power, is overly concerned about their popularity, and likes to dominate or be in charge of others. The others are more isolated from their peers and may be depressed or anxious, have low self-esteem, be less involved in school, be easily pressured by peers, or not identify with the emotions or feelings of others.

There are specific risk factors that make someone more likely to bully others. Those that are aggressive or easily frustrated, have difficulty following rules, and view violence in a positive way are more likely to bully. Also, those that think badly of others and have friends who bully are at higher risk for the same behavior. Finally, kids that have less parental involvement or are having issues at home may display more bullying behaviors.

Remember, those who bully others do not need to be stronger

or bigger than those they bully. The power imbalance can come from several sources—popularity, strength, cognitive ability—and children who bully may have more than one of these characteristics.

Warning Signs of Bullying

There are many warning signs that may indicate that someone is affected by bullying—either being bullied or bullying others. Recognizing the warning signs is an essential first step in taking action against bullying. Not all children who are bullied or are bullying others ask for help.

It is important to talk with children who show signs of being bullied or bullying others. These warning signs can also point to other issues or problems, such as depression or substance abuse. Talking to the child can help identify the root of the problem.

Signs of Being Bullied

Look for changes in the child. However, be aware that not all children who are bullied exhibit warning signs. Some signs that may point to a bullying problem are unexplainable injuries or lost and destroyed clothing, books, electronics, or jewelry. Those being bullied may report frequent headaches or stomach aches, feeling sick, or faking illness. They may have changes in eating habits, like suddenly skipping meals or binge eating. Kids may come home from school hungry because they did not eat lunch. They may also have difficulty sleeping or frequent nightmares.

Signs of Bullying Others

Kids may be bullying others if they get into physical or verbal fights or have friends who bully others. They may demonstrate increasing levels of aggressive behavior and get sent to the principal's office or detention frequently. They may also have unexplained extra money or new belongings.

Why Don't Kids Ask for Help?

Statistics from the 2012 Indicators of School Crime and Safety show that an adult was notified in less than half (40%) of bullying incidents. Kids do not tell adults for many reasons. Fo one, bullying can make a child feel helpless. Kids may want to handle it on their own to feel in control again. They may fear being seen as weak or a tattletale. Kids may fear backlash from the kid who bullied them. Bullying can be a humiliating experience. Kids may not want adults to know what is being said about them, whether true or false. They may also fear that adults will judge them or punish them for being weak. Kids who are bullied may already feel socially isolated. They may feel like no one cares or could understand. Finally, kids may fear being rejected by their peers. Friends can help protect kids from bullying, and kids can fear losing this support.

Effects of Bullying

Bullying can affect everyone—those who are bullied, those who bully, and those who witness bullying. Bullying is linked to many negative outcomes, including impacts on mental health, substance use, and suicide. It is important to talk to kids to determine whether bullying—or something else—is a concern.

Kids Who Are Bullied

Kids who are bullied can experience negative physical, school, and mental health issues. Kids who are bullied are more likely to experience depression and anxiety, increased feelings of sadness and loneliness, changes in sleep and eating patterns, and loss of interest in activities they used to enjoy. These issues may persist into adulthood. They may have more health complaints. Decreased academic achievement and school participation is a common effects of being bullied. They are also more likely to miss, skip, or drop out of school. A very small number of bullied kids might retaliate through extremely violent measures. In 12 of 15 school shooting cases in the 1990s, the shooters had a history of being bullied.

Kids Who Bully Others

Kids who bully others can also engage in violent and other risky behaviors into adulthood. Kids who bully are more likely to abuse alcohol and other drugs in adolescence and as adults. They are also more likely to get into fights, vandalize property, and drop out of school. They have criminal convictions and traffic citations as adults. They may engage in early sexual activity. They are also more likely to be abusive toward their romantic partners, spouses, or children as adults.

Bystanders

Kids who witness bullying are more likely to miss or skip school. They are also more like to use tobacco, alcohol, or other drugs. Bystanders are at increased risk of developing mental health problems, including depression and anxiety.

The Relationship Between Bullying and Suicide

Media reports often link bullying with suicide. However, most youth who are bullied do not have thoughts of suicide or engage in suicidal behaviors. Although kids who are bullied are at risk of suicide, bullying alone is not the cause. Many issues contribute to suicide risk, including depression, problems at home, and trauma history. Additionally, specific groups have an increased risk of suicide, including American Indian and Alaskan Native, Asian American, lesbian, gay, bisexual, and transgender youth. This risk can be increased further when these kids are not supported by parents, peers, and schools. Bullying can make an unsupportive situation worse.

Special Concern: Cyberbullying

Cyberbullying is bullying that takes place over digital devices like cell phones, computers, and tablets. Cyberbullying can occur through SMS, Text, and apps, or online in social media, forums, or gaming where people can view, participate in, or share content. Cyberbullying includes sending, posting, or sharing negative, harmful, false, or mean content about someone else. It can include sharing personal or private information about someone else, causing embarrassment or humiliation. Some cyberbullying crosses the line into unlawful or criminal behavior.

With the prevalence of social media and digital forums, comments, photos, posts, and content shared by individuals can often be viewed by strangers, as well as acquaintances. The content an individual shares online — both their personal content as well as any negative, mean, or hurtful content — creates a kind of permanent public record of their views, activities, and behavior. This public record can be thought of as an online reputation, which

may be accessible to schools, employers, colleges, clubs, and others who may be researching an individual now or in the future. Cyberbullying can harm the online reputations of everyone involved – not just the person being bullied, but those doing the bullying or participating in it. Cyberbullying has unique concerns in that it can be:

- **Persistent**: Digital devices offer the ability to immediately and continuously communicate 24 hours a day, so it can be difficult for children experiencing cyberbullying to find relief.
- **Permanent**: Most information communicated electronically is permanent and public, if not reported and removed. A negative online reputation, including for those who bully, can impact college admissions, employment, and other areas of life.
- **Hard to Notice**: Because teachers and parents may not overhear or see cyberbullying taking place, it is harder to recognize.

Cyberbullying and Online Gaming

Playing video games is a popular activity, with 72 percent of teens gaming online. Many video games — whether they are console, web, or computer-based — allow users to play with friends they know in person and others they have met only online. While gaming can have positive benefits like making new friends, socializing, and learning how to strategize and problem solve, it is also another place where cyberbullying occurs.

The anonymity of players and the use of avatars allow users to create alter-egos or fictional versions of themselves, which is part of the fun of gaming. However, it also allows users to harass, bully, and sometimes gang up on other players, sending or posting negative or hurtful messages and using the game as a tool of harassment. If someone is not performing well, other children may curse or make

negative remarks that turn into bullying, or they might exclude the person from playing together.

Because players are anonymous, they cannot necessarily be held accountable for their behavior, and their harassment can cause some players to leave games. Some anonymous users use the game as a means to harass strangers or to get their personal information, like user names and passwords.

There are things adults can do to prevent cyberbullying of children who are gaming. Parents should play the game or observe when the gaming happens to understand how it works and what a child is exposed to in the game. Check in periodically with children about who is online, and playing the game with them. Teach children about safe online behavior, including not clicking on links from strangers, not sharing personal information, not participating in bullying behavior of other players, and what to do if they observe or experience bullying. Establish rules about how much time a child can spend playing video games.

Warning Signs of Cyberbullying

Many of the warning signs that cyberbullying is occurring happen around a child's use of their device. Some of the warning signs that a kid may be involved in cyberbullying include noticeable increases or decreases in device use. Kids may exhibit unusual emotional responses (laughter, anger, upset) to what is happening on their devices. A teen hides their screen or device when others are near, and avoids discussion about what they are doing on their device. There may be sudden changes to social media accounts, with accounts being shut down or new ones appearing. If a teen starts to avoid social situations, even those that were enjoyed in the past. Alternatively, if they become withdrawn or depressed, or lose interest in people and activities.

What to Do When Cyberbullying Happens

When warning signs that a child may be involved in cyberbullying, adults should take steps to investigate that kid's digital behavior. Cyberbullying is a form of bullying, and adults should take the same approach to address it: support the person being bullied, address the bullying behavior of a participant, and show all involved that cyberbullying is taken seriously. Because cyberbullying happens online, responding to it requires different approaches. If an adult thinks that cyberbullying is occurring, several things can be done. First, *recognize* if there has been a change in mood or behavior and explore what the cause might be. Try to determine if these changes happen around a child's use of their digital devices. *Ask* questions to learn what is happening, how it started, and who is involved. *Document* what is happening and where. Take screenshots of harmful posts or content, if possible. Most laws and policies note that bullying is a repeated behavior, so records help to document it. *Report* issues to social media platforms and refer to the school's reporting policies. If a child has received physical threats, or if a potential crime or illegal behavior is occurring, report it to the police. *Provide support*. Peers, mentors, and trusted adults can sometimes intervene publicly to positively influence a situation where negative or hurtful content posts about a child. Public Intervention can include posting positive comments about the person targeted with bullying to try to shift the conversation in a positive direction. It can also help to reach out to the child who is bullying and the target of the bullying to express concern. If possible, try to determine if more professional support is needed for those involved, such as speaking with a guidance counselor or mental health professional.

Ways to Stop Bullying

Video #. *Ways to Stop Bullying.*

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Play

While play is often seen as something children do for leisure and recreation, play is actually a crucial part of a children's development. Play is a self-chosen and self-directed activity that is focused on the process of play and not the product of it. Play is individually constructed to meet the child's desires and needs. Finally, play is imaginative and active (Gray, 2013). Play is children's work. Through play, children develop cognitive skills and learn new information. They learn and practice social skills, like effective communication, self-regulation, conflict resolution, problem-solving, and cooperation. Furthermore, they learn about themselves by exploring roles, interests, skills, and relationships. Play is how children explore their world.

Types of Play

According to Piaget, children engage in types of play that reflect their level of cognitive development. Originally proposing three levels of play: functional play, symbolic play, and games with rules. Smilansky expanded on Piaget's model to add a fourth level: constructive play. Each type of play emerges at different ages and stages of cognitive development, and the prominence of the level of play changes with maturation, as well (Johnson, Christie & Wardle 2005).

Functional Play

Functional play is the first type of play activity in which children engage. Functional play involves repetitive, physical actions, language, and manipulation of objects. Beginning in infancy, children learn that they have control of their bodies and objects, and they can act upon those objects. Infants play through repetitive actions, like shaking a rattle, splashing in the bath, or repeatedly dropping toys from their high chair. These basic actions become play when the child deliberately engages in the activity for pleasure (Frost, 1992). Eventually, as children become more cognitively sophisticated, simple, repetitive actions are replaced by more complex, coordinated actions. Functional play is enjoyed by children throughout their childhood, particularly as they discover and practice new motor skills, such as sliding, climbing, stacking, jumping, and bouncing.

Constructive Play

By the age of two, children progress from simple, repetitive functional play to goal-directed, creative activities. When children manipulate objects to create something, they are engaging in **constructive play.** They use objects like blocks, clay, and craft supplies in an organized way to achieve a goal. Constructive play is a form of hand-on inquiry where children gain knowledge by posing questions, testing ideas, and gathering information (Drew et al., 2008) through experimentation with basic materials to create

something more complex. This type of play encourages planning, exploration, and discovery (Child Development Institute, 2010).

Constructive play facilitates the development of imagination, problem-solving skills, fine motor skills, and self-esteem. Build with blocks help children learn spatial relationships. Manipulating objects can translate into comfort with manipulating words, ideas, and concepts. This type of play prepares children for later academic, social, and emotional successes (Leong & Bodrova, 2015) and to be flexible thinking (Bruner 1972). Creating encourages the development of positive self-esteem by offering children power over their environment and a sense of accomplishment (Chaille, 2008). Constructive play also helps children develop character virtues, such as tenacity, flexibility, creativity, courage, enthusiasm, persistence, and adaptability (Child Development Institute, 2010).

Young children tend to prefer constructive play. When given a choice of play activities, preschool children choose constructive play more than 50% of the time (Rubin, Fein, & Vandenberg 1983). Further, constructive play is a way to scaffold play as children transition from function to symbolic play. Children should be encouraged to engage in constructive play by providing children with playtime and play materials for exploration. Providing inspiring materials is key to promoting constructive play.

Symbolic Play

Symbolic play is the ability of children to use objects, actions, or ideas to represent other objects, actions, or ideas in play. These activities may include role-playing or make-believe play, such as

pretending to be a baby, firefighter, or monster, and make-believe actions, such as driving a car by moving a pretend steering wheel, or using a banana as a telephone. This level of play is widely considered the most sophisticated play activity during the preschool and kindergarten years. Symbolic play encourages the development of social skills, academic abilities, early literacy concepts, and behavioral self-regulation (Leong & Bodrova 2015).

At around 18-months-old, toddlers begin to engage in pretend play, and type of symbolic play. They use objects to represent something else, like drinking from an empty cup or pretending to feed a doll. As children advance cognitive, linguistically, and socially, their play begins to include fantasy, drama, and imitation. Preschoolers are more capable of playing roles and incorporating social norms in their pretend play. Their role-plays and imagination become more sophisticated, and socialization becomes an important aspect of their play activities. Children assign roles to themselves and others, and their interactions often involve sequenced steps and a predetermined plan. Pretend play allows children to explore various roles and expectations and do participate in activities that they may not otherwise be allowed to explore in the real world. Through pretend play, children learn skills in negotiation, listening, sharing, taking turns, and respecting others' feelings, thoughts, ideas, and physical space.

The sophistication of symbolic play progresses through several substages. The substages include either the child acting a role, the child using an agent to act a role (such as a doll), or a group of children with different roles. These stages also include different types of objects in the play activity. Children may use objects that resemble the real-life object that this represents, such as using toy food to represent real food. Alternatively, the child may use

nonrealistic objects to represent real-life objects, such as using a stick as a for a horse.

Tabel 3.12.1. Substages of symbolic play development

Single pretend transformation toward self with realistic objects	Child takes role and uses object that resembles the real object, such as the child pretending to eat toy food.
Object is pretend agent with realistic objects	Child uses object that resembles real objects and that object is treated as if it acts, such as the child has a doll and act as if it is eating.
Single pretend transformation with nonrealistic object	Child uses object that has no resemblance to real objects, such as the child forms a pancake from molding clay.
Pretend role with realistic object	Child uses objects associated with a role that resembles real objects, such as the child pretends to be a cook with toy food.
Multiple pretend role transformations with realistic object	Child uses objects that resemble real-world objects while the child takes roles, such as doctor, patient, and nurse while playing with dolls or toy animals.
Pretend role with nonrealistic object	Child uses objects that have no resemblance to real objects, such as using molding clay to construct a farm.
Multiple pretend roles with realistic object	Children use objects that resemble real objects, such as a group of children use a toy doctor's kit and play the roles as doctor, patient, and nurse.
Multiple pretend roles with nonrealistic object	Children use objects that have no resemblance to real objects, such as molding clay to create the pretend setting and designate roles to enact.
Source: Frost et al., 2001	

> "In play a child is always above his average age, above his daily behavior; in play it is as though he were a head taller than himself. As in
> the focus of a magnifying glass, play contains all developmental tendencies in a condensed form; in play it is

> as though the child were trying to jump above the level of his normal behavior" (Vygotsk,1967, p.16).

While Piaget and others believed different types of play activities were essential to development, Vygotsky's definition of play was limited to pretend play. He believed that play must include the creation of an imaginary situation, assigning and acting out of roles, and following a set of rules specific to those roles (Bodrova & Leong, 2007). Play is a way for children to learn about symbols and separate thoughts from objects. Vygotsky saw play as a means to help children self-gratify. Through play, children can create fantasy situations to get their needs met, regulate emotions, and delay gratification. This level of play also aids children in learning self-regulation by following the rules and adhering to the roles of the play activity. Vygotsky believed that play provided scaffolding for learning to assist children in operating at the upper-end of their zone of proximal development.

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https://edpsych.pressbooks.sunycreate.cloud/?p=60#oembed-1

Video 3.12.1. *Play*: A *Vygotskian Approach* explains Vygotsky's beliefs about the functions of play.

Smilansky also emphasized the importance of symbolic and pretend play. Her research in this area found that children that did not engage in this level of play displayed cognitive and emotional delays. This effect was especially present in underprivileged children. In response, Smilansky proposed that to facilitate children's development of pretend play, adults should encourage:

1. Imitative role play. The child pretends to play a role and

expresses it in an imitates that role. For example, "I am the teacher, and you are my students."

2. Make-believe with objects. Use nonrealistic objects to represent real objects and actions. For example, pretending a stick is a horse and riding it.
3. Verbal make-believe. Incorporate verbal dialog and descriptions in place of actions. For example, "Let's pretend I cooked the dinner, and now I am setting the table" when only the last activity is actually imitated.
4. Persistence in role play. The pretend play episode lasts for at least 10 minutes.
5. Interaction. Two or more players interact within the context of a play episode.
6. Verbal communication. There is some verbal interaction with other players related to the play episode (Frost, 1992).

Games with Rules

The final type of play is **games with rules.** At this level, the play activity has imposed rules that must be followed by the players. To successfully participate at this level of play, children must have the cognitive ability to understand and remember the rules. These games also require the children to self-regulation, curbing their own desires and needs to adhere to the rules of the game. Games with rules are often characterized by logic and order, and as children mature they can develop method and planning in their game playing (Frost et al., 2004).

Through games with rules, school-age children develop an understanding of cooperation and competition. By initiating their own games with rules, children learn the need for rules, how to negotiate with each other, and fairness so that the game is enjoyable for everyone. Team sports and board games are games that have very specific rules and encourage the development of strategy. Electronic games are designed to target children at different stages of development and often encourage the practice and mastery of new skills through challenging tasks and fantasy (Frost et al., 2001).

Parten's Stages of Social Play

As we consider how play develops through childhood, we must also examine changes in socialization during playing. As children mature, they progress through several stages of non-social and social play. Parten's stages of social play is a theory that categorizes the ways in which children may socialize while participating in play during different periods of development. Parten observed American children at free play and recognized six different types of play. Three types she labeled as non-social (unoccupied, solitary, and onlooker) and three types were categorized as social play (parallel, associative, and cooperative). Parten also found that once a child has developed the ability to participate in a particular stage of social play, they will use combinations of that stage and earlier stages while playing. However, we find that younger children engage in non-social play more than those older and, by age five, associative and cooperative play are the most common forms of play (Dyer & Moneta, 2006).

Unoccupied

The earliest and least common style of play throughout childhood is the **unoccupied** stage. This is a non-social stage that starts in infancy and may appear as random behavior without a specific goal. During this time, the child is not playing. Sitting or standing still, random movements or movements without purpose that do not meet the above definition of play can all be considered unoccupied time. Infants and toddlers may spend significant parts of their day disengaged from any play, but the amount of time spent unoccupied should decrease as children age.

Solitary Play

Another non-social stage is **solitary play**. Common in children 2-3 years of age, this style of play involves a child playing alone and maintaining focus on their activity. They do not interact with others, nor are they interested in what others are doing. They also are not engaging in similar activities as the children around them. No matter the play activity, whether functional, constructive, symbolic, or game play, if the child is playing alone then it is solitary play.

Onlooker Play

Onlooker play is the final type of non-social play. During this style of play, children are observing others playing. The child may socialize with the other children, such as commenting on the activities and even make suggestions, but they will not directly join the play. Onlooker play is different from unoccupied play because, while the child is not participating in the play activity, they are engaged in social interaction and active observation. Children can still benefit from play activities that they observe, possibly learning behavior and rules before attempting participation.

Parallel Play

Sometimes seen as a transitory stage from immature non-social types to the more socially mature types of play, **parallel play** is when a child plays adjacent to, but not with, others. The child plays separately from others, engaged in their own play with their own goals; however, the children are close enough to observe and mimicking other's behaviors.

Associative Play

Around the age of 3, children will interact with each other and share toys; however, they are not yet working toward a common play goal. This more sophisticated social contact is **associative play**. The children will engage in the same play activity and show interest in what others are doing, but not in coordinating their activities with those people. There is a substantial amount of interaction involved, but the activities are not in sync.

Cooperative Play

When children are interacting to achieve a common goal, this is **cooperative play**. The child is interested both in the people playing and in coordinating their activities. In cooperative play, the activity is organized, participants have assigned roles, and children may take on different tasks to reach their shared goal. There is also increased self-identification with a group, and a group identity may emerge. This style of play is more common toward the end of the early childhood stage. Examples would be dramatic play activities with roles, like playing school, or a game with rules, such as freeze tag.

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Video 3.12.2. *The 6 Types of Play* provides an overview of Parten's stages of social play.

Imaginary Companions

An intriguing occurrence in early childhood is the emergence of imaginary companions. Researchers differ in how they define what qualifies as an imaginary companion. Some studies include only invisible characters that the child refers to in conversation, or plays with for an extended period. Other researchers also include objects that the child personifies, such as a stuffed toy or doll, or characters the child impersonates every day. Estimates of the number of children who have imaginary companions vary greatly (from as little as 6% to as high as 65%) depending on what is included in the definition (Gleason, Sebanc, & Hartup, 2000).

Little is known about why children create imaginary companions, and more than half of all companions have no obvious trigger in the child's life (Masih, 1978). Imaginary companions are sometimes based on real

people, characters from stories, or simply names the child has heard (Gleason et al., 2000). Imaginary companions often change over time. In their study, Gleason et al. (2000) found that 40% of the imaginary companions of the children they studied changed, such as developing superpowers, switching age, gender, or even dying, and 68% of the characteristics of the companion were acquired over time. This could reflect greater complexity in the child's "creation" over time and/or a greater willingness to talk about their imaginary playmates.

In addition, research suggests that contrary to the assumption that children with imaginary companions are compensating for poor social skills, several studies have found that these children are very sociable (Mauro, 1991; Singer & Singer, 1990; Gleason, 2002). However, studies have reported that children with imaginary companions are more likely to be first-borns or only-children (Masih, 1978; Gleason et al., 2000; Gleason, 2002). Although not all research has found a link between birth

order and the incidence of imaginary playmates (Manosevitz, Prentice, & Wilson, 1973). Moreover, some studies have found little or no difference in the presence of imaginary companions and parental divorce (Gleason et al., 2000), the number of people in the home, or the amount of time children are spending with real playmates (Masih, 1978; Gleason & Hohmann, 2006).

Do children treat real friends differently? The answer appears to be not really. Young children view their relationship with their imaginary companion to be as supportive and nurturing as with their real friends. Gleason has suggested that this might suggest that children form a schema of what is a friend, and use this same schema in their interactions with both types of friends (Gleason et al., 2000; Gleason, 2002; Gleason & Hohmann, 2006).

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Moral Development

The founder of psychoanalysis, Freud (1962), proposed the existence of a tension between the needs of society and the individual. According to Freud, moral development proceeds when the individual's selfish desires are repressed and replaced by the values of important socializing agents in one's life (for instance, one's parents). A proponent of behaviorism, Skinner (1972) similarly focused on socialization as the primary force behind moral development. In contrast to Freud's notion of a struggle between internal and external forces, Skinner focused on the power of external forces (reinforcement contingencies) to shape an individual's development. While both Freud and Skinner focused on the external forces that bear on morality (parents in the case of Freud, and behavioral contingencies in the case of Skinner), Piaget (1965) focused on the individual's construction, construal, and interpretation of morality from a social-cognitive and social-emotional perspective.

Kohlberg (1963) expanded upon Piagetian notions of moral development. While they both viewed moral development as a result of a deliberate attempt to increase the coordination and integration of one's orientation to the world, Kohlberg provided a systematic 3-level, 6-stage sequence reflecting changes in moral judgment throughout the lifespan. Specifically, Kohlberg argued that development proceeds from a selfish desire to avoid punishment (personal), to a concern for group functioning (societal), to a concern for the consistent application of universal ethical principles (moral).

Turiel (1983) argued for a social domain approach to social cognition, delineating how individuals differentiate moral (fairness, equality, justice), societal (conventions, group functioning, traditions), and psychological (personal, individual prerogative) concepts from early in development throughout the lifespan. Over

the past 40 years, research findings have supported this model, demonstrating how children, adolescents, and adults differentiate moral rules from conventional rules, identify the personal domain as a nonregulated domain, and evaluate multifaceted (or complex) situations that involve more than one domain.

For the past 20 years, researchers have expanded the field of moral development, applying moral judgment, reasoning, and emotion attribution to topics such as prejudice, aggression, theory of mind, emotions, empathy, peer relationships, and parent-child interactions.

Piaget's Theory of Moral Development

To understand adult morality, Piaget believed that it was necessary to study both how morality manifests in the child's world as well as the factors that contribute to the emergence of central moral concepts such as welfare, justice, and rights. By interviewing children, Piaget (1965) found that young children were focused on authority mandates and that with age, children become autonomous, evaluating actions from a set of independent principles of morality.

He developed two phases of moral development, one common among children and the other common among adults.

Heteronomous Phase

The first is the Heteronomous Phase. This phase, more common among children, is characterized by **morality of constraint**, the idea that rules come from authority figures in one's life, such as parents, teachers, and God. It also involves the idea that rules are permanent no matter what. Thirdly, this phase of moral development includes

the belief of **immanent justice**, that "naughty" behavior must always be immediately punished and that the punishment will be proportional. This absolutism in moral development is seen in children's play from the age of 5, where they exhibit a blind belief in the rules and ideas of right and wrong passed to them by their elders.

Autonomous Phase

The second phase in Piaget's theory of moral development is referred to as the Autonomous Phase. This phase is more common after one has matured and is no longer a child. In this phase, people begin to view the intentions behind actions as more important than their consequences, **subjective judgments**. For instance, if a person who is driving swerves in order to not hit a dog and then knocks over a road sign, adults are likely to be less angry at the person than if he or she had done it on purpose just for fun. Even though the outcome is the same, people are more forgiving because of the good intention of saving the dog. This phase also includes the idea that people have different morals and that morality is not necessarily universal. People in the Autonomous Phase also believe rules may be broken under certain circumstances. For instance, Rosa Parks broke the law by refusing to give up her seat on a bus, which was against the law but something many people consider moral nonetheless. In this phase, people also stop believing in the idea of immanent justice.

Kohlberg's Theory of Moral Development

Psychologist Lawrence Kohlberg (1927–1987) extended upon the foundation that Piaget built regarding moral and cognitive

development. Kohlberg, like Piaget, was interested in moral reasoning. Moral reasoning does not necessarily equate to moral behavior. Holding a particular belief does not mean that our behavior will always be consistent with the belief. To develop this theory, Kohlberg posed moral dilemmas to people of all ages, and then he analyzed their answers to find evidence of their particular stage of moral development. After presenting people with this and various dilemmas, Kohlberg reviewed people's responses and placed them in different stages of moral reasoning. According to Kohlberg, an individual progresses from the capacity for pre-conventional morality (before age 9) to the capacity for conventional morality (early adolescence), and toward attaining post-conventional morality (once formal operational thought is attained), which only a few fully achieve.

Moral Stages According to Kohlberg

Using a stage model similar to Piaget's, Kohlberg proposed three levels, with six stages, of moral development. Individuals experience the stages universally and in sequence as they form beliefs about justice. He named the levels simply preconventional, conventional, and postconventional.

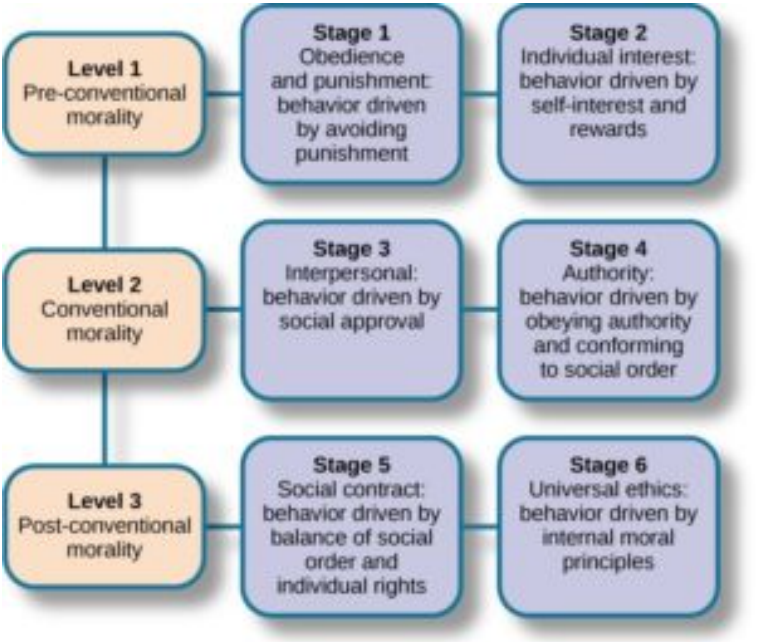

Figure 3.13.1. Kohlberg identified three levels of moral reasoning: pre-conventional, conventional, and post-conventional: Each level is associated with increasingly complex stages of moral development.

Preconventional: Obedience and Mutual Advantage

The preconventional level of moral development coincides approximately with the preschool period of life and with Piaget's preoperational period of thinking. At this age, the child is still relatively self-centered and insensitive to the moral effects of actions on others. The result is a somewhat short-sighted orientation to morality. Initially (Kohlberg's Stage 1), the child adopts **ethics of obedience and punishment**—a sort of "morality of

keeping out of trouble." The rightness and wrongness of actions are determined by whether actions are rewarded or punished by authorities, such as parents or teachers. If helping yourself to a cookie brings affectionate smiles from adults, then taking the cookie is considered morally "good." If it brings scolding instead, then it is morally "bad." The child does not think about why action might be praised or scolded; in fact, says Kohlberg, he would be incapable, at Stage 1, of considering the reasons even if adults offered them.

Eventually, the child learns not only to respond to positive consequences but also learns how to **produce** them by exchanging favors with others. The new ability creates Stage 2, **ethics of market exchange**. At this stage, the morally "good" action is one that favors not only the child but another person directly involved. A "bad" action is one that lacks this reciprocity. If trading the sandwich from your lunch for the cookies in your friend's lunch is mutually agreeable, then the trade is morally good; otherwise, it is not. This perspective introduces a type of fairness into the child's thinking for the first time. However, it still ignores the larger context of actions—the effects on people not present or directly involved. In Stage 2, for example, it would also be considered morally "good" to pay a classmate to do another student's homework—or even to avoid bullying—provided that both parties regard the arrangement as being fair.

Conventional: Conformity to Peers and Society

As children move into the school years, their lives expand to include a larger number and range of peers and (eventually) of the community as a whole. The change leads to **conventional morality**, which are beliefs based on what this larger array of people agrees on—hence Kohlberg's use of the term "conventional." At first, in Stage 3, the child's reference group are immediate peers, so Stage 3 is sometimes called the **ethics of peer opinion**. If peers believe, for example, that it is morally good to behave politely with as many

people as possible, then the child is likely to agree with the group and to regard politeness as not merely an arbitrary social convention, but a moral "good." This approach to moral belief is a bit more stable than the approach in Stage 2 because the child is taking into account the reactions not just of one other person, but of many. But it can still lead astray if the group settles on beliefs that adults consider morally wrong, like "Shoplifting for candy bars is fun and desirable."

Eventually, as the child becomes a youth and the social world expands, even more, he or she acquires even larger numbers of peers and friends. He or she is, therefore, more likely to encounter disagreements about ethical issues and beliefs. Resolving the complexities leads to Stage 4, the **ethics of law and order**, in which the young person increasingly frames moral beliefs in terms of what the majority of society believes. Now, an action is morally good if it is legal or at least customarily approved by most people, including people whom the youth does not know personally. This attitude leads to an even more stable set of principles than in the previous stage, though it is still not immune from ethical mistakes. A community or society may agree, for example, that people of a certain race should be treated with deliberate disrespect, or that a factory owner is entitled to dump wastewater into a commonly shared lake or river. Developing ethical principles that reliably avoid mistakes like these requires further stages of moral development.

Postconventional: Social Contract and Universal Principles

As a person becomes able to think abstractly (or "formally," in Piaget's sense), ethical beliefs shift from acceptance of what the community **does** believe to the **process** by which community beliefs are formed. The new focus constitutes Stage 5, the **ethics of social contract**. Now an action, belief, or practice is morally good if it has been created through fair, democratic processes that respect the rights of the people affected. Consider, for example, the laws

in some areas that require motorcyclists to wear helmets. In what sense are the laws about this behavior ethical? Was it created by consulting with and gaining the consent of the relevant people? Were cyclists consulted, and did they give consent? Or how about doctors or the cyclists' families? Reasonable, thoughtful individuals disagree about how thoroughly and fairly these **consultation** processes should be. In focusing on the processes by which the law was created; however, individuals are thinking according to Stage 5, the ethics of social contract, regardless of the position they take about wearing helmets. In this sense, beliefs on both sides of a debate about an issue can sometimes be morally sound, even if they contradict each other.

Paying attention to due process certainly seems like it should help to avoid mindless conformity to conventional moral beliefs. As an ethical strategy, though, it too can sometimes fail. The problem is that an ethics of social contract places more faith in the democratic process than the process sometimes deserves, and does not pay enough attention to the content of what gets decided. In principle (and occasionally in practice), a society could decide democratically to kill off every member of a racial minority, but would deciding this by due process make it ethical? The realization that ethical means can sometimes serve unethical ends leads some individuals toward Stage 6, the **ethics of self-chosen, universal principles**. At this final stage, the morally good action is based on personally held principles that apply both to the person's immediate life as well as to the larger community and society. The universal principles may include a belief in democratic due process (Stage 5 ethics), but also other principles, such as a belief in the dignity of all human life or the sacredness of the natural environment. At Stage 6, the universal principles will guide a person's beliefs even if the principles mean occasionally disagreeing with what is customary (Stage 4) or even with what is legal (Stage 5).

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Video 3.13.1. *Kohlberg's Six Stages of Moral Development* explains the stages of moral reasoning and applies it to an example scenario.

Kohlberg and the Heinz Dilemma

The Heinz dilemma is a frequently used example to help us understand Kohlberg's stages of moral development. How would you answer this dilemma? Kohlberg was not interested in whether you answer yes or no to the dilemma: Instead, he was interested in the reasoning behind your answer.

Kohlberg's Moral Dilema: Heinz

In Europe, a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman's

husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said: "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife. Should the husband have done that? (Kohlberg, 1969, p. 379)

From a theoretical point of view, it is not important what the participant thinks one should do. Kohlberg's theory holds that the justification the participant offers is what is significant, the form of their response. Below are some of many examples of possible arguments that belong to the six stages:

- Stage one (obedience): Heinz should not steal the medicine because he will consequently be put in prison, which will mean he is a bad person. OR Heinz should steal the medicine because it is only worth $200 and not how much the druggist wanted for it; Heinz had even offered to pay for it and was not stealing anything else.
- Stage two (self-interest): Heinz should steal the medicine because he will be much happier if he saves his wife, even if he will have to serve a prison sentence. OR Heinz should not steal the medicine because prison is an awful place, and he would more likely languish in a jail cell than over his wife's death.
- Stage three (conformity): Heinz should steal the medicine because his wife expects it; he wants to be a good husband. OR Heinz should not steal the drug because stealing is bad, and he is not a criminal; he has tried to do everything he can without breaking the law, you cannot blame him.
- Stage four (law-and-order): Heinz should not steal the medicine because the law prohibits stealing, making it illegal.

OR Heinz should steal the drug for his wife but also take the prescribed punishment for the crime as well as paying the druggist what he is owed. Criminals cannot just run around without regard for the law; actions have consequences.

- Stage five (social contract orientation): Heinz should steal the medicine because everyone has a right to choose life, regardless of the law. OR Heinz should not steal the medicine because the scientist has a right to fair compensation. Even if his wife is sick, it does not make his actions right.
- Stage six (universal human ethics): Heinz should steal the medicine because saving a human life is a more fundamental value than the property rights of another person. OR Heinz should not steal the medicine because others may need medicine just as badly, and their lives are equally significant.

Think It Over

Consider your decision-making processes. What guides your decisions? Are you primarily concerned with your personal well-being? Do you make choices based on what other people will think about your decision? Or are you guided by other principles? To what extent is this approach guided by your culture?

Kohlberg continued to explore his theory after he published his research. He postulated that there could be other stages and that there could be transitions into each stage. One thing that Kohlberg never fully addressed was his use of nearly all-male samples. Men and women tend to have very different styles of moral decision making; men tend to be very justice-oriented, while women tend to be more compassion oriented. In terms of Kohlberg's stages, women

tend to be in lower stages than men because of their compassion orientation.

Carol Gilligan was one of Kohlberg's research assistants. She believed that Kohlberg's theory was inherently biased against women. Gilligan suggests that the biggest reason that there is a gender bias in Kohlberg's theory is that males tend to focus on logic and rules. In contrast, women focus on caring for others and relationships. She suggests, then, that in order to truly measure women's moral development, it was necessary to create a measure specifically for women. Gilligan was clear that she did not believe neither male nor female moral development was better, but rather that they were equally important.

Gilligan's Morality of Care

As logical as they sound, Kohlberg's stages of moral justice are not sufficient for understanding the development of moral beliefs. To see why, suppose that you have a student who asks for an extension of the deadline for an assignment. The justice orientation of Kohlberg's theory would prompt you to consider issues of whether granting the request is fair. Would the late student be able to put more effort into the assignment than other students? Would the extension place a difficult demand on you, since you would have less time to mark the assignments? These are important considerations related to the rights of the students and the teacher. In addition to these, however, are considerations having to do with the responsibilities that you and the requesting student have for each other and others. Does the student have a valid personal reason (illness, death in the family, etc.) for the assignment being late? Will the assignment lose its educational value if the student has to turn it in prematurely? These latter questions have less to do with fairness and rights and more to do with taking care of and responsibility for

students. They require a framework different from Kohlberg's to be understood fully.

One such framework has been developed by Carol Gilligan, whose ideas center on a **morality of care**, or system of beliefs about human responsibilities, care, and consideration for others. Gilligan proposed three moral positions that represent different extents or breadth of ethical care. Unlike Kohlberg or Piaget, she does not claim that the positions form a strictly developmental sequence, but only that they can be ranked hierarchically according to their depth or subtlety. In this respect, her theory is "semi-developmental" in a way similar to Maslow's theory of motivation (Brown & Gilligan, 1992; Taylor, Gilligan, & Sullivan, 1995). Table 9.1 summarizes the three moral positions from Gilligan's theory.

Table 3.13.1. Positions of moral development according to Gilligan

Moral position	Definition of what is morally good
Position 1: Survival orientation	Action that considers one's personal needs only
Position 2: Conventional care	Action that considers others' needs or preferences, but not one's own
Position 3: Integrated care	Action that attempts to coordinate one's own personal needs with those of others

Position 1: Caring as Survival

The most basic kind of caring is a **survival orientation**, in which a person is concerned primarily with his or her welfare. If a teenage girl with this ethical position is wondering whether to get an abortion, for example, she will be concerned entirely with the effects of the abortion on herself. The morally good choice will be whatever creates the least stress for herself, and that disrupts her own life the least. Responsibilities to others (the baby, the father, or her family) play little or no part in her thinking.

As a moral position, a survival orientation is obviously not satisfactory for classrooms on a widespread scale. If every student only looked out for himself or herself, classroom life might become rather unpleasant! Nonetheless, there are situations in which focusing primarily on yourself is both a sign of good mental health and relevant to teachers. For a child who has been bullied at school or sexually abused at home, for example, it is both healthy and morally desirable to speak out about how bullying or abuse has affected the victim. Doing so means essentially looking out for the victim's own needs at the expense of others' needs, including the bully's or abuser's. Speaking out, in this case, requires a survival orientation and is healthy because the child is taking care of herself.

Position 2: Conventional Caring

A more subtle moral position is **caring for others**, in which a person is concerned about others' happiness and welfare, and about reconciling or integrating others' needs where they conflict with each other. In considering an abortion, for example, the teenager at this position would think primarily about what other people prefer. Do the father, her parents, and/or her doctor want her to keep the child? The morally good choice becomes whatever will please others the best. This position is more demanding than Position 1, ethically, and intellectually, because it requires coordinating several persons' needs and values. Nevertheless, it is often morally insufficient because it ignores one crucial person: the self.

In classrooms, students who operate from Position 2 can be very desirable in some ways; they can be eager to please, considerate, and good at fitting in and at working cooperatively with others. Because these qualities are usually welcome in a busy classroom, teachers can be tempted to reward students for developing and using them. The problem with rewarding Position 2 ethics, however, is that doing so neglects the student's development—his or her own

academic and personal goals or values. Sooner or later, personal goals, values, and identity need attention and care, and educators have a responsibility for assisting students in discovering and clarifying them.

Position 3: Integrated Caring

The most developed form of moral caring in Gilligan's model is **integrated caring**, the coordination of personal needs and values with those of others. Now the morally good choice takes account of everyone, *including* yourself, not everyone *except* yourself. In considering an abortion, a woman at Position 3 would think not only about the consequences for the father, the unborn child, and her family but also about the consequences for herself. How would bearing a child affect her own needs, values, and plans? This perspective leads to moral beliefs that are more comprehensive but ironically are also more prone to dilemmas because the widest possible range of individuals is being considered.

In classrooms, integrated caring is most likely to surface whenever teachers give students wide, sustained freedom to make choices. If students have little flexibility in their actions, there is little room for considering *anyone*'s needs or values, whether their own or others'. If the teacher says simply: "Do the homework on page 50 and turn it in tomorrow morning," then the main issue becomes compliance, not a moral choice. Suppose instead that she says something like this: "Over the next two months, figure out an inquiry project about the use of water resources in our town. Organize it any way you want—talk to people, read widely about it, and share it with the class in a way that all of us, including yourself, will find meaningful." An assignment like this poses moral challenges that are not only educational but also moral since it requires students to make value judgments. Why? For one thing, students must decide what aspect of the topic matters to them.

Such a decision is partly a matter of personal values. For another thing, students have to consider how to make the topic meaningful or important to *others* in the class. Third, because the timeline for completion is relatively far in the future, students may have to weigh personal priorities (like spending time with friends or family) against educational priorities (working on the assignment a bit more on the weekend). As you might suspect, some students might have trouble making good choices when given this sort of freedom—and their teachers might, therefore, be cautious about giving such an assignment. Nevertheless, the difficulties in making choices are part of Gilligan's point: integrated caring is indeed more demanding than the caring based only on survival or on consideration of others. Not all students may be ready for it.

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Video 3.13.2. *Carol Gilligan's Theory of Moral Development* explains the difference in moral development from the care perspective that females often take in society.

Forming a Sense of Rights and Responsibilities

When it comes to schooling and teaching, moral choices are not restricted to occasional dramatic incidents but are woven into almost every aspect of classroom life. Imagine this simple example. Suppose that you are teaching, reading to a small group of second-graders, and the students are taking turns reading a story out loud.

Should you give every student the same amount of time to read, even though some might benefit from having additional time? Or should you give more time to the students who need extra help, even if doing so bores classmates and deprives others of equal shares of "floor time"? Which option is fairer, and which is more considerate? Simple dilemmas like this happen every day at all grade levels simply because students are diverse, and because class time and a teacher's energy are finite.

Embedded in this rather ordinary example are moral themes about fairness or justice, on the one hand, and about consideration or care on the other. It is important to keep both themes in mind when thinking about how students develop beliefs about right or wrong. A **morality of justice** is about human rights—or, more specifically, about respect for fairness, impartiality, equality, and individuals' independence. A **morality of care**, on the other hand, is about human responsibilities—more specifically, about caring for others, showing consideration for individuals' needs, and interdependence among individuals. Students and teachers need both forms of morality. In the next sections, therefore, we explain a major example of each type of developmental theory, beginning with the morality of justice.

Character Development: Integrating Ethical Understanding, Care, and Action

The theories described so far all offer frameworks for understanding how children grow into youth and adults. Those by Maslow, Kohlberg, and Gilligan are more specific than the ones by Erikson in that they focus on the development of an understanding of ethics. From a teacher's point of view, though, the theories are all limited in two ways. One problem is that they focus primarily on cognition—on what children *think* about ethical issues—more than on emotions and actions. The other is that they say little about

how to encourage ethical development. Encouragement is part of teachers' jobs, and doing it well requires understanding not only what students know about ethics, but also how they feel about it and what ethical actions they are prepared to take.

Many educators have recognized the need for children to be guided in the development of ethics and morals, and a number of them have, therefore, developed practical programs that integrate ethical understanding, care, and action. As a group, the programs are often called **character education**. However, individual programs have a variety of specific names (for example, moral dilemma education, integrative ethical education, social competence education, and many more). Details of the programs vary, but they all combine a focus on ethical knowledge with attention to ethical feelings and actions (Elkind & Sweet, 2004; Berkowitz & Bier, 2006; Narvaez, 2010). Character education programs go well beyond just teaching students to obey ethical rules, such as "Always tell the whole truth" or "Always do what the teacher tells you to do." Such rules require very little thinking on the part of the student, and there are usually occasions in which a rule that is supposedly universal needs to be modified, "bent," or even disobeyed. (For example, if telling the whole truth might hurt someone's feelings, it might sometimes be more considerate—and thus more ethical—to soften the truth a bit, or even to say nothing at all.)

Instead, character education is about inviting students to think about the broad questions of their life, such as "What kind of person should I be?" or "How should I live my life?" Thoughtful answers to such broad questions help to answer a host of more specific questions that have ethical implications. For example, "Should I listen to the teacher right now, even if she is a bit boring, or just tune out?" or "Should I offer to help my friend with the homework she is struggling with, or hold back, so that learns to do it herself?" Most of the time, there is not enough time to reason about questions like these deliberately or consciously. Responses have to become intuitive, automatic, and **embodied** —meaning that they have to be based on fairly immediate emotional responses (Narvaez, 2009).

The goal of character education is to develop students' capacities to respond to daily ethical choices not only consciously and cognitively, but also intuitively and emotionally. To the extent that this goal is met, students can indeed live a good, ethically responsible life.

Schoolwide Programs of Character Education

In the most comprehensive approaches to character education, an entire school commits itself to developing students' ethical character, despite the immense diversity among students (Minow, Schweder, & Markus, 2008). All members of the staff—not just teachers and administrators, but also custodians and educational assistants—focus on developing positive relationships with students. The underlying theme that develops is one of cooperation and mutual care, not competition. Fairness, respect, and honesty pervade class and school activities; discipline, for example, focuses on solving conflicts between students and between students and teachers, rather than on rewarding obedience or punishing wrongdoers. The approach requires significant reliance on democratic meetings and discussions, both in classrooms and wherever else groups work together in school.

Building a Culture of Kindness

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Video 3.13.3. *Building a Culture of Kindness* with a Day of Services discusses ways that schools are building character education into their programs and the impact it is having on students.

Classroom Programs of Character Education

Even if a teacher is teaching character education simply within her classroom, there are many strategies available. The goal, in this case, is to establish the classroom as a place where everyone feels included, and where everyone treats everyone else with civility and respect. Conflicts and disagreements may still occur, but in a caring community, they can be resolved without undue anger or hostility. Here are a few ways to work toward this sort of classroom:

- Use class meetings to decide on as many important matters as possible—such as the expected rules of behavior, important classroom activities, or ongoing disagreements.
- Try arranging for students to collaborate on significant projects and tasks.
- Arrange a "Buddies" program in which students of different grade levels work together on a significant task. Older students

can sometimes assist younger students by reading to them, by listening to them read, or both. If an older student is having trouble with reading himself or herself, furthermore, a reading buddies program can sometimes also be helpful to the older student.

- Familiarize students with conflict resolution strategies and practice using them when needed.
- Many areas of curriculum lend themselves to discussions about ethical issues. Obvious examples are certain novels, short stories, and historical events. However, ethical issues lurk elsewhere as well. Teaching nutrition, for example, can raise issues about the humane treatment of animals that will be slaughtered for food, and about the ethical acceptability of using a large number of grains to feed animals even though many people in the world do not have enough to eat.
- Service-learning projects can be very helpful in highlighting issues of social justice. Planning, working at, and reflecting about a local soup kitchen, tutoring students from low-income families, performing simple repairs on homes in need: projects like these broaden knowledge of society and the needs of its citizens.

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Chapter Summary: The Developing Learner

Understanding development, or the long-term changes in growth, behavior, and knowledge, helps teachers to hold appropriate expectations for students as well as to keep students' individual diversity in perspective. From kindergarten through the end of high school, students double their height, triple their weight, experience the social and hormonal effects of puberty, and improve basic motor skills. Their health is generally good, though illnesses are affected significantly by students' economic and social circumstances.

Cognitively, students develop major new abilities to think logically and abstractly, based on a foundation of sensory and motor experiences with the objects and people around them. Jean Piaget has one well-known theory detailing how these changes unfold.

Socially, students face and resolve a number of issues—especially the issue of industry (dedicated, sustained work) during childhood and the issue of identity during adolescence. Erik Erikson has described these crises in detail, as well as social crises that precede and follow the school years. Students are motivated both by basic human needs (food, safety, belonging, esteem) and by needs to enhance themselves psychologically (self-actualization). Abraham Maslow has described these motivations and how they relate to each other.

Morally, students develop both a sense of justice and of care for others, and their thinking in each of these realms undergoes important changes as they mature. Lawrence Kohlberg has described changes in children and youth's beliefs about justice, and Carol Gilligan has described changes in their beliefs about care. Character education goes beyond describing students' beliefs about ethics; it is a group of educational programs and teaching strategies

that combines attention to moral belief with attention to students' ethical feelings and ethical actions.

Glossary

analytic thought:

thought that results from analysis, such as a systematic ranking of pros and cons, risks and consequences, possibilities and facts. Analytic thought depends on logic and rationality

behavioral decision-making theory:

proposes that adolescents and adults both weigh the potential rewards and consequences of an action. However, research has shown that adolescents seem to give more weight to rewards, particularly social rewards, than do adults

constructivist perspective:

based on the work of Piaget, a quantitative, stage-theory approach. This view hypothesizes that adolescents' cognitive improvement is relatively sudden and drastic, as adolescents learn by acting on their environment and they actively construct knowledge

deductive reasoning:

reasoning from a general statement, premise, or principle, though logical steps to figure out (deduce) specifics. Also called top-down processing

divided attention:

the ability to pay attention to two or more stimuli at the same time; this ability improves during adolescence

dual process model/dual processing:

the notion that two networks exist within the human brain, one for emotional processing of stimuli and one for analytic reasoning

formal operational thought:

the fourth and final stage of Piaget's theory of cognitive development, characterized by more systematic logical thinking and by the ability to understand and systematically manipulate abstract concepts

hypothetical thought:

reasoning that includes propositions and possibilities that may not reflect reality

-information-processing perspective:

derives from the study of artificial intelligence and explains cognitive development in terms of the growth of specific components of the overall process of thinking

intuitive thought:

thoughts that arise from an emotion or a hunch, beyond rational explanation, and are influenced by past experiences and cultural assumptions

metacognition:

refers to "thinking about thinking" and it is relevant in social cognition and results in increased introspection, self-consciousness, and intellectualization during adolescence

mnemonic devices:

mental strategies to help learn and remember information more efficiently; improves during adolescence

relativistic thinking:

thinking that understands the relative or situational nature of circumstances

selective attention:

the process by which one focuses on one stimulus while tuning out another; this ability improves during adolescence

classification:

the arrangement of information into categories or classes

concrete operational stage of cognitive development:

Piaget's stage of development during middle childhood that emphasizes the use of logical thought, especially as applied to concrete, or physical objects

fast-mapping:

a word learning process in which children are able to learn words quickly because they associate new words to words that they already know

identity:

the understanding that objects have an identity or qualities that do not change even if the object is altered in some way

long-term memory:

the third component of the memory system where information is stored for long periods of time

reciprocity:

the understanding that changing one quality of an object can be compensated for by changes in another quality of that object

reversibility:

the understanding that some things that have been changed can be returned to their original state

sensory memory:

the first component of the memory system where information comes in through the 5 senses and is processed if the mind believes that the information is important

working memory:

the second component of the memory system where information that has been processed in sensory memory goes. Working memory includes all the information that you are consciously aware of

accommodation:

when we restructure or modify what we already know so that new information can fit in better

assimilation:

when we modify or change new information to fit into our schemas (what we already know)

a single word that is used to express a complete, meaningful thought

infantile or childhood amnesia:

the idea that people forget everything that happened to them before the age of 3

object permanence:

the realization that objects (including people) still exist even if they can no longer be seen, touched, or heard

primary circular reactions:

the first two stages of Piaget's sensorimotor intelligence which involve the infant's responses to its own body

schema:

a set of linked mental representations of the world, which we use both to understand and to respond to situations

secondary circular reactions:

stages 3 and 4 of Piaget's sensorimotor intelligence which involves the infant's responses to objects and people

sensorimotor intelligence:

Piaget's term for the way infants think (by using their senses and motor skills) during the first stage of cognitive development

tertiary circular reactions:

consist of actions (stage 5) and ideas (stage 6) where infants become more creative in their thinking

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axons:

fibers that extend from the neurons and transmit electrochemical impulses from that neuron to the dendrites of other neurons

bed-sharing:

when two or more people sleep in the same bed

cephalocaudal:

refers to growth and development that occurs from the head down

circumcision:

the surgical removal of the foreskin of the penis

colostrum:

the first secretion from the mammary glands after giving birth, rich in antibodies

cortex:

the outer layers of the brain in humans and other mammals. Most thinking, feeling, and sensing involves the cortex

co-sleeping:

a custom in which parents and their children (usually infants) sleep together in the same room

dendrites:

fibers that extend from neurons and receive electrochemical impulses transmitted from other neurons via their axons

failure to thrive:

decelerated or arrested physical growth (height and weight measurements fall below the third or fifth percentile or a downward change in growth across two major growth percentiles) and is associated with abnormal growth and development

fine motor skills:

physical abilities involving small body movements, especially of the hands and fingers, such as drawing and picking up a coin. The word "fine" in this context means "small"

gross motor skills:

physical abilities involving large body movements, such as walking and jumping. The word "gross" in this context means "big"

immunization:

a process that stimulates the body's immune system by causing the production of antibodies to defend against attack by a specific contagious disease

infantile marasmus:

starvation due to a lack of calories and protein

kwashiorkor:

also known as the "disease of the displaced child," results in a loss of appetite and swelling of the abdomen as the body begins to break down the vital organs as a source of protein

malnutrition:

a condition that results from eating a diet in which one or more nutrients are deficient

milk anemia:

an iron deficiency in infants who have been maintained on a milk diet for too long

motor skills:

the word "motor" refers to the movement of the muscles. Motor skills refer to our ability to move our bodies and manipulate objects

myelin:

a coating of fatty tissues around the axon of the neuron

neurons:

nerve cells in the central nervous system, especially in the brain

neurotransmitters:

brain chemicals that carry information from the axon of a sending neuron to the dendrites of a receiving neuron

percentile:

a point on a ranking scale of 0 to 100. The 50th percentile is the midpoint; half of the infants in the population being studied rank higher and half rank lower

perception:

the process of interpreting what is sensed

pincer grasp:

a developmental milestone that typically occurs at 9 to 12 months of age; the coordination of the index finger and thumb to hold smaller objects; represents a further development of fine motor skills

prefrontal cortex:

the area of the cortex at the very front of the brain that specializes in anticipation, planning, and impulse control

proximodistal:

development that occurs from the center or core of the body in an outward direction

pruning:

the process by which unused connections in the brain atrophy and die

reflexes:

the inborn, behavioral patterns that develop during uterine life and are fully present at birth. These are involuntary movements (not learned) or actions that are essential for a newborn's survival immediately after birth and include: sucking, swallowing, blinking, urinating, hiccuping, and defecating

sensation:

the interaction of information with the sensory receptors

sudden infant death syndrome (SIDS):

a situation in which a seemingly healthy infant, usually between 2 and 6 months old, suddenly stops breathing and dies unexpectedly while asleep

synapses:

the intersection between the axon of one neuron to the dendrites of another neuron

transient exuberance:

the great, but temporary increase in the number of dendrites that develop in an infant's brain during the first two years of life

fine motor skills:

precise movements of the wrists, hands, fingers, feet, or toes, such as the ability to reach and grasp an object

gross motor skills:

voluntary movements including the use of large muscle groups such as the arms and legs

myelination:

an aspect of brain maturation in which more myelin is formed around the axons of neurons, thereby increasing neural transmission

synaptic pruning:

the selective elimination of non-essential synapses and the strengthening of important neural connections

adolescent growth spurt:

rapid increase in the individual's height and weight during puberty resulting from simultaneous release of growth hormones, thyroid hormones, and androgens. Males experience their growth spurt about two years later, on average, than females

adrenarche:

an increase in the production of androgens by the adrenal cortex that usually occurs during the eighth or ninth year of life and typically peaks at around 10 to 14 years of age and is eventually involved in the development of pubic hair, body odor, skin oiliness, and acne

amygdala:

part of the limbic system in the brain, which is involved with emotions and emotional responses and is particularly active during puberty

anorexia nervosa:

an eating disorder characterized by self-starvation. Affected individuals voluntarily undereat and often overexercise, depriving their vital organs of nutrition. Anorexia can be fatal

binge-eating disorder:

an eating disorder characterized by recurrent episodes of eating large quantities of food (often very quickly and to the point of discomfort); a feeling of a loss of control during the binge; experiencing shame, distress or guilt afterwards; and not regularly using unhealthy compensatory measures (e.g., purging) to counter

the binge eating. It is the most common eating disorder in the United States

body dissatisfaction:

negative subjective evaluation of the weight and shape of one's own body, which may predict the onset, severity, and treatment outcomes of eating disorders

body image:

a person's idea of how his or her body looks

bulimia nervosa:

an eating disorder characterized by binge eating and subsequent purging, usually by induced vomiting and/or use of laxatives

dopamine:

a neurotransmitter in the brain that plays a role in pleasure and the reward system; increases in the limbic system and later in the prefrontal cortex during adolescence

estrogen:

primary female sex hormone that is responsible for the development and regulation of the female reproductive system and secondary sex characteristics

frontal lobes:

the parts of the brain involved in impulse control, planning, and higher order thinking; still developing in adolescence

gonad:

a sex organ that produces gametes; specifically, a testicle or ovary

gonadarche:

refers to the earliest gonadal changes of puberty. In response to pituitary gonadotropins, the ovaries in girls and the testes in boys begin to grow and increase the production of the sex steroids, especially estradiol and testosterone

limbic system:

structures in the brain (including the amygdala) that involve processing emotional experience and social information and determining rewards and punishments; develops years before the prefrontal cortex

masturbation:

sexual self-stimulation, usually achieved by touching, stroking, or massaging the male or female genitals until this triggers an orgasm

melatonin:

sleep hormone whose levels rise later at night and decrease later in the morning for teens, compared to children and adults

menarche:

a girl's first menstrual period, signaling that she has begun ovulation. Pregnancy is biologically possible, but ovulation and menstruation are often irregular for years after menarche

muscle dysmorphia:

sometimes called "reverse anorexia" this is an obsession with being small and underdeveloped; extreme concern with becoming more muscular

myelination:

insulation of neurons' axons with fatty substance (myelin sheath) that helps speed up the processing of information; myelination starts to increase in the prefrontal cortex during adolescence

primary sex characteristics:

the parts of the body that are directly involved in reproduction, including the vagina, uterus, ovaries, testicles, and penis

prefrontal cortex:

part of the frontal lobes, involved with decision making, cognitive control, and other higher order functions; prefrontal cortex develops further during adolescence

puberty:

the period of rapid growth and sexual development that begins in adolescence

secondary sex characteristics:

physical traits that are not directly involved in reproduction but that indicate sexual maturity, such as a man's beard or a woman's breasts

serotonin:

"calming chemical," a neurotransmitter in the brain involved with the regulation of mood and behavior; serotonin levels increase in the limbic system during adolescence

sexually transmitted infections (STIs):

diseases that are spread by sexual contact, including syphilis, gonorrhea, genital herpes, chlamydia, and HIV/AIDS

spermarche:

a boy's first ejaculation of sperm. Erections can occur as early as infancy, but ejaculation signals sperm production. Spermarche may occur during sleep (nocturnal emission or "wet dream") or via direct stimulation

synaptic pruning:

connections in the brain that are not used much are lost so that other connections can be strengthened; this pruning happens with prefrontal cortex connections in adolescence

testosterone:

the primary male sex hormone that plays a key role in the development of male reproductive tissues such as testes and prostate, as well as promoting secondary sexual characteristics such as increased muscle and bone mass, and the growth of body hair. Females also produce testosterone, but at lower level than males

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180.

THE LEARNING PROCESS

Theme: *How Students Learn*

Overview of Content:

- Behavioral Learning Theories
- Social Cognitive Theory
- Constructivism in the Classroom
- Information Processing Approach in the Classroom

Learning Objectives:

- Explain classical conditioning
- Explain operant conditioning
- Describe social cognitive theory
- Describe how constructivism is used in the classroom
- Describe how information processing approach is used in the classroom
- Contrast the effectiveness of rehearsal and encoding

Teacher's Perspectives on Learning

For teachers, learning usually refers to things that happen in schools or classrooms, even though every teacher can, of course, describe examples of learning that happens outside of these places. Learning has a more specific meaning than for many people less involved in schools. In particular, teachers' perspectives on learning often emphasize three ideas, and sometimes even take them for granted: (1) curriculum content and academic achievement, (2) sequencing and readiness, and (3) the importance of transferring learning to new or future situations.

Viewing Learning as Dependent on Curriculum

When teachers speak of learning, they tend to emphasize whatever is taught in schools deliberately, including both the official curriculum and the various behaviors and routines that make classrooms run smoothly. In practice, defining learning in this way often means that teachers equate learning with the major forms of academic achievement—especially language and mathematics—and to a lesser extent musical skill, physical coordination, or social sensitivity (Gardner, 1999, 2006). The imbalance occurs not because the goals of public education make teachers responsible for certain content and activities (like books and reading) and the skills which these activities require (like answering teachers' questions and writing essays). It does happen not (thankfully!) because teachers are biased, insensitive, or unaware that students often learn a lot outside of school.

A side effect of thinking of learning as related only to curriculum

or academics is that classroom social interactions and behaviors become issues for teachers—become things that they need to manage. In particular, having dozens of students in one room makes it more likely that I, as a teacher, think of "learning" as something that either takes concentration (to avoid being distracted by others) or that benefits from collaboration (to take advantage of their presence). In the small space of a classroom, no other viewpoint about social interaction makes sense. Yet in the wider world outside of school, learning often does happen incidentally, "accidentally" and without conscious interference or input from others: I "learn" what a friend's personality is like, for example, without either of us deliberately trying to make this happen. As teachers, we sometimes see incidental learning in classrooms as well, and often welcome it; but our responsibility for curriculum goals more often focuses our efforts on what students can learn through conscious, deliberate effort. In a classroom, unlike in many other human settings, it is always necessary to ask whether classmates are helping or hindering individual students' learning.

Focusing learning on changes in classrooms has several other effects. One, for example, is that it can tempt teachers to think that what is taught is equivalent to what is learned—even though most teachers know that doing so is a mistake, and that teaching and learning can be quite different. If a teacher assigns a reading to students about the Russian Revolution, it would be nice to assume not only that they have read the same words, but also learned the same content. But that assumption is not usually the reality. Some students may have read and learned all of what was assigned; others may have read everything but misunderstood the material or remembered only some of it; and still others, unfortunately, may have neither read nor learned much of anything. Chances are that the students would confirm this picture, if asked confidentially. There are ways, of course, to deal helpfully with such a diversity of outcomes. But whatever instructional strategies we adopt, they cannot include assuming that what we teach is the same as what students understand or retain.

Viewing Learning as Dependent on Sequencing and Readiness

The distinction between teaching and learning creates a secondary issue for teachers, that of educational **readiness**. Traditionally the concept referred to students' preparedness to cope with or profit from the activities and expectations of school. A kindergarten child was "ready" to start school, for example, if he or she was in good health, showed moderately good social skills, could take care of personal physical needs (like eating lunch or going to the bathroom unsupervised), could use a pencil to make simple drawings, and so on. The table below shows a similar set of criteria for determining whether a child is "ready" to learn to read (Copple & Bredekamp, 2006). At older ages (such as in high school or university), the term readiness is often replaced by a more specific term, prerequisites. To take a course in physics, for example, a student must first have certain prerequisite experiences, such as studying advanced algebra or calculus. To begin work as a public school teacher, a person must first engage in practice teaching for a period of time (not to mention also studying educational psychology!).

Table 4.1.1. Reading readiness in students vs in teachers

Signs of readiness in the child or student	Signs of readiness to teach reading
productive (speaking) vocabulary of 5,000- 8,000 words	teacher answers children's questions when possible
child understands and uses complete sentences	teacher encourages child to find out more through other means in addition to asking teacher
child's questions tend to be relevant to the task at hand	teacher asks questions designed to elaborate or expand child's thinking
child's correctly using most common grammatical constructions	teacher highlights letters and sounds in the classroom
child can match some letters to some sounds	teacher provides lots of paper and marking tools
child can string a few letters together to make a few simple words	teacher assists child with initial writing of letters
child can tell and retell stories, poems, and songs	teacher encourages children to enact stories, poems, and songs

Source: Copple & Bredekamp, 2006.

Note that this traditional meaning, of readiness as preparedness, focuses attention on students' adjustment to school and away from the reverse: the possibility that schools and teachers also have a responsibility for adjusting to students. But the latter idea is, in fact, a legitimate, second meaning for **readiness**: If 5-year-old children normally need to play a lot and keep active, then it is fair to say that their kindergarten teacher needs to be "ready" for this behavior by planning for a program that allows a lot of play and physical activity. If she cannot or will not do so (whatever the reason may be), then in a very real sense this failure is not the children's responsibility. Among older students, the second, teacher-oriented meaning of readiness makes sense as well. If a teacher has a student with a disability (for example, the student is visually impaired), then the teacher has to adjust her approach in appropriate ways—not simply

expect a visually impaired child to "sink or swim." As you might expect, this sense of readiness is very important for special education, but the issue of readiness also figures importantly whenever students are diverse (which is most of the time).

Viewing Transfer as a Crucial Outcome of Learning

Still another result of focusing on the concept of learning in classrooms is that it raises issues of usefulness or transfer, which is the ability to use knowledge or skill in situations beyond the ones in which they are acquired. Learning to read and learning to solve arithmetic problems, for example, are major goals of the elementary school curriculum because those skills are meant to be used not only inside the classroom but outside as well. We, teachers, intend, that is, for reading and arithmetic skills to "transfer," even though we also do our best to make the skills enjoyable while they are still being learned. In the world inhabited by teachers, even more than in other worlds, making learning fun is certainly a good thing to do, but making learning useful as well as fun is even better. Combining enjoyment and usefulness, in fact, is a "gold standard" of teaching: we generally seek it for students, even though we may not succeed at providing it all of the time.

Transfer of learning is usually described as the process and the effective extent to which past experiences (also referred to as the *transfer source*) affect learning and performance in a new situation (the *transfer target*) (Ellis, Transfer occurs when people apply information, strategies, and skills they have learned to a new situation or context. It is not a discrete activity, but is rather an integral part of the learning process. Researchers attempt

to identify when and how transfer occurs and to offer strategies to improve transfer.

People store *propositions*, or basic units of knowledge, in long-term memory. When new information enters the working memory, long-term memory is searched for associations that combine with the new information in working memory. The associations reinforce the new information and help assign meaning to it (Souza, 2016). Learning that takes place in varying contexts can create more links and encourage the generalization of the skill or knowledge (Schunk, 2004). Connections between past learning and new learning can provide a context or framework for the new information, helping students to determine sense and meaning, and encouraging retention of the new information. These connections can build up a framework of associative networks that students can call upon for future problem-solving (Souza, 2016). Information stored in memory is "flexible, interpretive, generically altered, and its recall and transfer are largely context-dependent" (Helfenstein, 2005).

Factors that can affect transfer include (Souza, 2016):

- Context and degree of original learning: how well the learner acquired the knowledge.
- Similarity: commonalities between original learning and new, such as environment and other memory cues.
- Critical attributes: characteristics that make something unique.
- Association: connections between multiple events, actions, bits of information, and so on; as well as the conditions and emotions connected to it by the learner.

Learners can increase transfer through effective practice and by mindfully abstracting knowledge. Abstraction is the process of examining our experiences for similarities. Methods for abstracting knowledge include seeking the underlying principles in what is learned, creating models, and identifying analogies and metaphors,

all of which assist with creating associations and encouraging transfer.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=66#oembed-1

Video 4.1.1. *What is 'Transfer of Learning' and How Does It Help Students?* explains the difference between near (or low-road) transfer and far (or high-road transfer), as well as strategies for helping students transfer.

Transfer Taxonomies

The following table presents different types of transfer (Schhunk, 2004).

Table 4.1.2.	Transfer taxonomies
Type	**Characteristics**
Positive	Positive transfer occurs when prior learning assists new learning.
Negative	Negative transfer occurs when prior learning hinders or interferes with new learning.
Zero	Zero transfer occurs when prior learning has no influence on new learning.
Near	Near transfer occurs when many elements overlap between the conditions in which the learner obtained the knowledge or skill and the new situation.
Far	Far transfer occurs when the new situation is very different from that in which learning occurred.
Literal	Literal transfer occurs when performing the skill exactly as learned but in a new situation.
Figural	Figural transfer occurs when applying general knowledge to a new situation, often making use of analogies or metaphors.
Low road	Low-road transfer occurs when well-established skills transfer spontaneously, even automatically.
High road	High-road transfer occurs when the learner consciously and deliberately ("mindfully") evaluates the new situation and applies previous learning to it.
Forward reaching	High-road transfer that is forward reaching occurs when learners think about possible other uses while learning.
Backward reaching	High-road transfer that is backward reaching occurs when learners in a new situation think about previous situations that might apply.

Teaching for Transfer

Transfer is less a deliberate activity by the learner than it is a result of the environment at the time of learning. Teachers, being part of the learning environment, can be an instrument of transfer (both positive and negative) (Souza, 2016). Recommendations for teaching for transfer include the *hugging* and *bridging* strategies; providing

an authentic environment and activities within a conceptual framework; encouraging problem-based learning; community of practice; cognitive apprenticeship; and game-based learning.

Hugging and Bridging

Hugging and bridging as techniques for positive transfer were suggested by the research of Perkins and Salomon. Hugging is when the teacher encourages transfer by incorporating similarities between the learning situation and the future situations in which the learning might be used. Some methods for hugging include simulation games, mental practice, and contingency learning (Souza, 2016).

Bridging is when the teacher encourages transfer by helping students to find connections between learning and to abstract their existing knowledge to new concepts. Some methods for bridging include brainstorming, developing analogies, and metacognition (Souza, 2016).

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Major Theoretical Approaches of Learning

Several ideas and priorities, then, affect how we teachers think about learning, including the curriculum, the difference between teaching and learning, sequencing, readiness, and transfer. The ideas form a "screen" through which to understand and evaluate whatever psychology has to offer education. As it turns out, many theories, concepts, and ideas from educational psychology do make it through the "screen" of education, meaning that they are consistent with the professional priorities of teachers and helpful in solving important problems of classroom teaching. In the case of issues about classroom learning, for example, educational psychologists have developed a number of theories and concepts that are relevant to classrooms, in that they describe at least *some* of what usually happens there and offer guidance for assisting learning.

Various perspectives on learning are represented in the diverse views and theories that form the four pillars for teaching: behavioral, social cognitive, constructivist, and information processing. It is helpful to group the theories according to whether they focus on changes in behavior or in thinking. The distinction is rough and inexact, but a good place to begin. Behaviorism considers learning as changes in overt behavior and focuses on means of influencing behavior without much consideration of the cognition involved. Social cognitive theories are also interested in the behavioral outcomes but do consider the cognitive processes involved in behavior. Meanwhile, constructivism considers learning as changes in thinking and can be further divided into psychological constructivism (changes in thinking resulting from individual experiences), and social constructivism, (changes in thinking due to assistance from others). The last pillar, information processing,

considers the processes involved in thinking in learning. The rest of this chapter discusses these four concepts as they apply to education. Each perspective suggests things that *you* might do in *your* classroom to make students' learning more productive.

Behaviorism

Behaviorism is a perspective on learning that focuses on changes in individuals' observable behaviors— changes in what people say or do. At some point we all use this perspective, whether we call it "behaviorism" or something else. The first time that I drove a car, for example, I was concerned primarily with whether I could actually do the driving, not with whether I could describe or explain how to drive. For another example: when I reached the point in life where I began cooking meals for myself, I was more focused on whether I could actually produce edible food in a kitchen than with whether I could explain my recipes and cooking procedures to others. And still another example—one often relevant to new teachers: when I began my first year of teaching, I was more focused on doing the job of teaching—on day-to-day survival—than on pausing to reflect on what I was doing.

Note that in all of these examples, focusing attention on behavior instead of on "thoughts" may have been desirable at that moment, but not necessarily desirable indefinitely or all of the time. Even as a beginner, there are times when it is more important to be able to describe how to drive or to cook than to actually do these things. And there definitely are many times when reflecting on and thinking about teaching can improve teaching itself. (As a teacher-friend once said to me: "Don't just *do* something; *stand* there!") But neither is focusing on behavior which is not necessarily less desirable than focusing on students' "inner" changes, such as gains in their knowledge or their personal attitudes. If you are teaching, you will need to attend to all forms of learning in students, whether inner or outward.

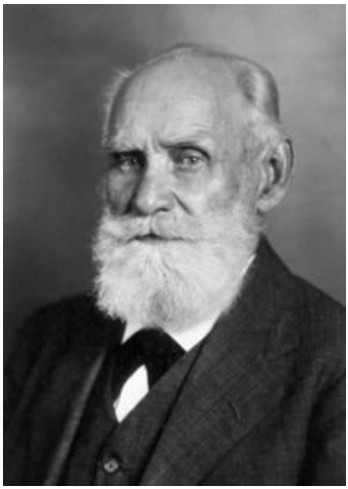
In classrooms, behaviorism is most useful for identifying relationships between specific actions by a student and the immediate precursors and consequences of the actions. It is less useful for understanding changes in students' thinking; for this

purpose, we need theories that are more *cognitive* (or thinking-oriented) or social, like the ones described later in this chapter. This fact is not a criticism of behaviorism as a perspective, but just a clarification of its particular strength or usefulness, which is to highlight observable relationships among actions, precursors, and consequences. Behaviorists use particular terms (or "lingo," some might say) for these relationships. One variety of behaviorism that has proved especially useful to educators is operant conditioning, described in the next section.

Classical Conditioning

Have you ever had the experience of taking a shower when suddenly someone in the apartment above you, or in a nearby bathroom, flushes the toilet? The shower's relaxing warmth turns to scalding heat! You flinch, tense up, maybe even scream in pain. But soon the water returns to its former temperature, and you relax once again—but this time your ears are alert to the sound. When you hear the flush again, you anticipate the burning water and jump back even before the temperature changes. You have learned an important lesson—that there is a predictable relationship or association between two events, a sound and a change in water temperature. It has learned this association through a process called **classical conditioning**.

Pavlov's Experiment



Ivan Pavlov, a Russian physiologist, discovered the phenomenon of classical conditioning nearly a century ago. He did this by demonstrating that dogs could "learn" to salivate at the sound of a bell that was rung before they were fed, even before they could see or smell the food.

Before a dog undergoes the conditioning process, the bell is a **neutral stimulus (NS)**. In other words, a bell does not automatically elicit a physiological response from a dog. Food, on the other hand, automatically causes a dog to salivate. The food, therefore, is an **unconditioned stimulus (UCS)**, meaning "naturally conditioned" or "conditioned by nature." Salivation is an **unconditioned response (UCR)**, a reaction that automatically follows an unconditioned stimulus.

Figure 4.3.1. Ivan Pavlov (1849–1936).

In Pavlov's experiments, the dogs salivated each time food was presented to them. Before conditioning, think of the dogs' stimulus and response like this:

Food (UCS) → Salivatin (UCR)

In classical conditioning, a neutral stimulus is presented immediately before an unconditioned stimulus. Pavlov would sound a tone (like ringing a bell) and then give the dogs the food. The bell was the neutral stimulus (NS), which is a stimulus that does not naturally elicit a response. Prior to conditioning, the dogs did not

salivate when they just heard the bell because the bell had no association for the dogs.

Bell (UCS) + Food (CS) → Salivation (UCS)

When Pavlov paired the tone with the meat powder over and over again, the previously neutral stimulus (the tone) also began to elicit salivation from the dogs. Thus, the neutral stimulus became the conditioned stimulus (CS), which is a stimulus that elicits a response after repeatedly being paired with an unconditioned stimulus. Eventually, the dogs began to salivate to the tone alone, just as they previously had salivated at the sound of the assistants' footsteps. The behavior caused by the conditioned stimulus is called the conditioned response (CR). In the case of Pavlov's dogs, they had learned to associate the tone (CS) with being fed, and they began to salivate (CR) in anticipation of food.

Bell (CS) → Salivation (CR)

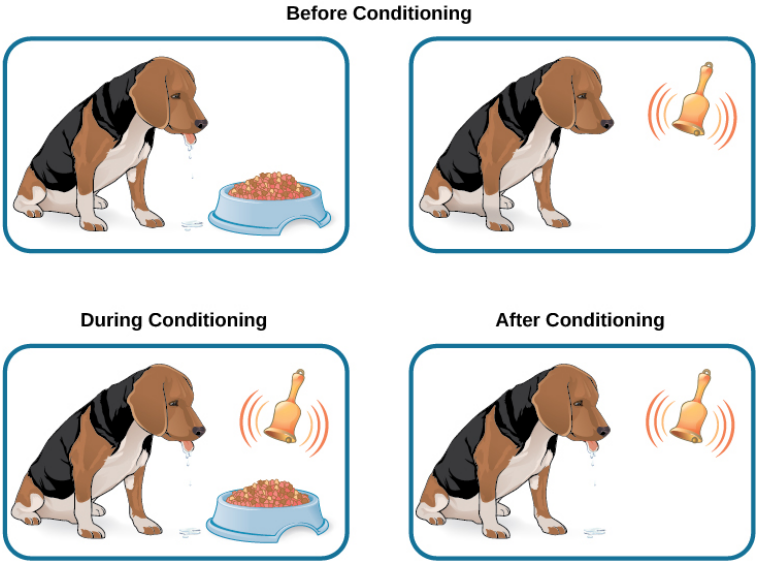


Figure 4.3.2 Before conditioning, an unconditioned stimulus (food) produces an unconditioned response (salivation), and a neutral stimulus (bell) does not produce a response. During conditioning, the unconditioned stimulus (food) is presented repeatedly just after the presentation of the neutral stimulus (bell). After conditioning, the neutral stimulus alone produces a conditioned response (salivation), thus becoming a conditioned stimulus.

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https://edpsych.pressbooks.sunycreate.cloud/?p=68#oembed-2

Video 4.3.1. *Classical Conditioning* explains the process used in creating an association between stimuli and response.

Many learning theorists use the classical conditioning paradigm to explain how we learn relationships between environmental stimuli and behavioral, cognitive, and emotional responses. For example, how do we account for the following phenomena?

- The smell of a certain perfume reminds you of a close friend or loved one.
- You recoil at the sight of a snake when you've never encountered one before except in pictures or stories.
- As a first-grader, you became anxious at the sound of the school bell.
- Your professor utters the word "exam" and you get a funny feeling in your stomach.
- A familiar song on the radio creates mental images that change your mood.

What these events have in common is that a neutral stimulus (an

odor, the sight of an animal, a sound, a spoken word, a song) has developed the power to evoke an emotional (affective), physiological (a muscle contraction), behavioral (running away), psychological (a shiver), or cognitive (an image) response. Thus, classical conditioning theorists propose that many of our behavioral, emotional, and cognitive responses to people, places, and things have been acquired through a process of classical conditioning.

For example, how might a learner develop a fear of math? Math, in and of itself, is a neutral stimulus. There is no natural connection between it and the emotional responses associated with fear (increased adrenalin flow, constriction of blood vessels, increased blood pressure, rapid breathing). However, there is a natural (unconditioned) association between being reprimanded (UCS) by a teacher or parent and the fear (UCR) that might immediately follow answering a question incorrectly or receiving a failing test grade. Such events, repeated over time, can condition a learner to respond with intense fear at the sight of a math test—or even the announcement that one is forthcoming.

Relevance for Teachers

As a teacher, you will want your learners to acquire positive attitudes toward you and your subject. Initially, you and your learning activities will be neutral stimuli, but over time you and how you teach can become conditioned stimuli that elicit emotions (or conditioned responses) of interest and joy, evoke approach behaviors such as studying and asking questions, and even arouse physiological responses of comfort and naturalness.

Learning theorists remind us that classical conditioning processes go on in classrooms all the time. Your role is to be aware of the classical conditioning paradigm and use it to build positive associations between your teaching activities and learning. We will offer some specific recommendations to help you achieve this goal.

While the classical conditioning paradigm can explain how children learn certain emotional, behavioral, and cognitive responses to neutral stimuli, it is not as successful in explaining how children learn to be successful in the classroom: to read and solve problems, follow directions, and work productively with others. Let's look at a second learning paradigm, which can explain how learners develop these skills in their learners.

Operant Conditioning

Operant conditioning focuses on how the consequences of a behavior affect the behavior over time. It begins with the idea that certain consequences tend to make certain behaviors happen more frequently. If I compliment a student for a good comment made during discussion, there is more of a chance that I will hear further comments from the student in the future. If a student tells a joke to classmates and they laugh at it, then the student is likely to tell more jokes in the future and so on.

Psychologist B. F. Skinner saw that classical conditioning is limited to existing behaviors that are reflexively elicited, and it doesn't account for new behaviors such as riding a bike. He proposed a theory about how such behaviors come about. Skinner believed that behavior is motivated by the consequences we receive for the behavior: the reinforcements and punishments. His idea that learning is the result of consequences is based on the law of effect, which was first proposed by psychologist Edward Thorndike. According to the law of effect, behaviors that are followed by consequences that are satisfying to the organism are more likely to be repeated, and behaviors that are followed by unpleasant consequences are less likely to be repeated (Thorndike, 1911). Essentially, if an organism does something that brings about a desired result, the organism is more likely to do it again. If an organism does something that does not bring about the desired

result, the organism is less likely to do it again. An example of the law of effect is in employment. One of the reasons (and often the main reason) we show up for work is because we get paid to do so. If we stop getting paid, we will likely stop showing up—even if we love our job.

Working with Thorndike's law of effect as his foundation, Skinner began conducting scientific experiments on animals (mainly rats and pigeons) to determine how organisms learn through operant conditioning (Skinner, 1938). He placed these animals inside an operant conditioning chamber, which has come to be known as a "Skinner box." A Skinner box contains a lever (for rats) or disk (for pigeons) that the animal can press or peck for a food reward via the dispenser. Speakers and lights can be associated with certain behaviors. A recorder counts the number of responses made by the animal.

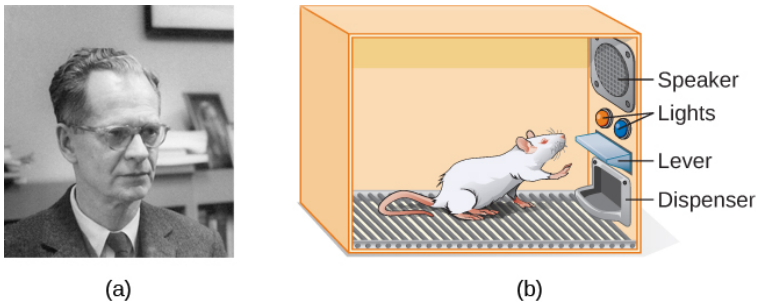

Figure 4.3.3. (a) B. F. Skinner developed operant conditioning for the systematic study of how behaviors are strengthened or weakened according to their consequences. (b) In a Skinner box, a rat presses a lever in an operant conditioning chamber to receive a food reward. (credit a: modification of work by "Silly rabbit"/Wikimedia Commons)

In discussing operant conditioning, we use several everyday words—positive, negative, reinforcement, and punishment—in a specialized manner. In operant conditioning, positive and negative do not mean good and bad. Instead,

positive means you are adding something, and *negative* means you are taking something away. *Reinforcement* means you are increasing a behavior, and *punishment* means you are decreasing a behavior. Reinforcement can be positive or negative, and punishment can also be positive or negative. All reinforcers (positive or negative) *increase* the likelihood of a behavioral response. All punishers (positive or negative) *decrease* the likelihood of a behavioral response. Now let's combine these four terms: positive reinforcement, negative reinforcement, positive punishment, and negative punishment.

Table 4.3.1. Positive and Negative Reinforcement and Punishment

	Reinforcement	**Punishment**
Positive	Something is *added* to *increase* the likelihood of a behavior.	Something is *added* to *decrease* the likelihood of a behavior.
Negative	Something is *removed* to *increase* the likelihood of a behavior.	Something is *removed* to *decrease* the likelihood of a behavior.

Reinforcement

The most effective way to teach a person or animal a new behavior is with positive reinforcement. In positive reinforcement, a desirable stimulus is added to increase a behavior.

For example, you tell your five-year-old son, Jerome, that if he cleans his room, he will get a toy. Jerome quickly cleans his room because he wants a new art set. Let's pause for a moment. Some people might say, "Why should I reward my child for doing what is expected?" But in fact we are constantly and consistently rewarded

in our lives. Our paychecks are rewards, as are high grades and acceptance into our preferred school. Being praised for doing a good job and for passing a driver's test is also a reward. Positive reinforcement as a learning tool is extremely effective. It has been found that one of the most effective ways to increase achievement in school districts with below-average reading scores was to pay the children to read. Specifically, second-grade students in Dallas were paid $2 each time they read a book and passed a short quiz about the book. The result was a significant increase in reading comprehension (Fryer, 2010). What do you think about this program? If Skinner were alive today, he would probably think this was a great idea. He was a strong proponent of using operant conditioning principles to influence students' behavior at school. In fact, in addition to the Skinner box, he also invented what he called a teaching machine that was designed to reward small steps in learning (Skinner, 1961)—an early forerunner of computer-assisted learning. His teaching machine tested students' knowledge as they worked through various school subjects. If students answered questions correctly, they received immediate positive reinforcement and could continue; if they answered incorrectly, they did not receive any reinforcement. The idea was that students would spend additional time studying the material to increase their chance of being reinforced the next time (Skinner, 1961).

In negative reinforcement, an undesirable stimulus is removed to increase a behavior. For example, car manufacturers use the principles of negative reinforcement in their seatbelt systems, which go "beep, beep, beep" until you fasten your seatbelt. The annoying sound stops when you exhibit the desired behavior, increasing the likelihood that you will buckle up in the future. Negative reinforcement is also used frequently in horse training. Riders apply pressure—by pulling the reins or squeezing their legs—and then remove the pressure when the horse performs the desired behavior, such as turning or speeding up. The pressure is the negative stimulus that the horse wants to remove.

Punishment

Many people confuse negative reinforcement with punishment in operant conditioning, but they are two very different mechanisms. Remember that reinforcement, even when it is negative, always increases a behavior. In contrast, punishment always decreases a behavior. In positive punishment, you add an undesirable stimulus to decrease a behavior. An example of positive punishment is scolding a student to get the student to stop texting in class. In this case, a stimulus (the reprimand) is added in order to decrease the behavior (texting in class). In negative punishment, you remove a pleasant stimulus to decrease behavior. For example, when a child misbehaves, a parent can take away a favorite toy. In this case, a stimulus (the toy) is removed in order to decrease the behavior.

Punishment, especially when it is immediate, is one way to decrease undesirable behavior. For example, imagine your four-year-old son, Brandon, hitting his younger brother. You have Brandon write 100 times "I will not hit my brother" (positive punishment). Chances are he won't repeat this behavior. While strategies like this are common today, in the past children were often subject to physical punishment, such as spanking. It's important to be aware of some of the drawbacks in using physical punishment on children. First, punishment may teach fear. Brandon may become fearful of the street, but he also may become fearful of the person who delivered the punishment—you, his parent. Similarly, children who are punished by teachers may come to fear the teacher and try to avoid school (Gershoff et al., 2010). Consequently, most schools in the United States have banned corporal punishment. Second, punishment may cause children to become more aggressive and prone to antisocial behavior and delinquency (Gershoff, 2002). They see their parents resort to spanking when they become angry and frustrated, so, in turn, they may act out this same behavior when they become angry and frustrated. For example, because you spank Brenda when you are

angry with her for her misbehavior, she might start hitting her friends when they won't share their toys.

While positive punishment can be effective in some cases, Skinner suggested that the use of punishment should be weighed against the possible negative effects. Today's psychologists and parenting experts favor reinforcement over punishment—they recommend that you catch your child doing something good and reward her for it.

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Video 4.3.2. *Operant Conditioning* explains the processes of positive and negative reinforcement and punishment.

Key Concepts of Conditioning

Operant conditioning is made more complicated, but also more realistic, by several additional ideas. They can be confusing because the ideas have names that sound rather ordinary, but that have special meanings within the framework of operant theory. Among the most important concepts to understand are the following:

- shaping
- extinction
- generalization
- discrimination
- intermittent schedules

- cues

The paragraphs below explain each of these briefly, as well as their relevance to classroom teaching and learning.

Shaping

In his operant conditioning experiments, Skinner often used an approach called shaping. Instead of rewarding only the target behavior, in shaping, we reward successive approximations of a target behavior. Why is shaping needed? Remember that in order for reinforcement to work, the organism must first display the behavior. Shaping is needed because it is extremely unlikely that an organism will display anything but the simplest of behaviors spontaneously. In shaping, behaviors are broken down into many small, achievable steps. The specific steps used in the process are the following:

1. Reinforce any response that resembles the desired behavior.
2. Then reinforce the response that more closely resembles the desired behavior. You will no longer reinforce the previously reinforced response.
3. Next, begin to reinforce the response that even more closely resembles the desired behavior.
4. Continue to reinforce closer and closer approximations of the desired behavior.
5. Finally, only reinforce the desired behavior.

Shaping is often used in teaching a complex behavior or chain of behaviors. Skinner used shaping to teach pigeons not only such relatively simple behaviors as pecking a disk in a Skinner box, but also many unusual and entertaining behaviors, such as turning in circles, walking in figure eights, and even playing ping pong; the technique is commonly used by animal trainers today. An important part of shaping is stimulus discrimination. Recall Pavlov's dogs—he

trained them to respond to the tone of a bell, and not to similar tones or sounds. This discrimination is also important in operant conditioning and in shaping behavior.

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Video 4.3.3. *Shaping* explains the process of using shaping to help condition more complex behaviors.

It's easy to see how shaping is effective in teaching behaviors to animals, but how does shaping work with humans? Let's consider parents whose goal is to have their child learn to clean his room. They use shaping to help him master steps toward the goal. Instead of performing the entire task, they set up these steps and reinforce each step. First, he cleans up one toy. Second, he cleans up five toys. Third, he chooses whether to pick up ten toys or put his books and clothes away. Fourth, he cleans up everything except two toys. Finally, he cleans his entire room.

Extinction

Extinction refers to the disappearance of an *operant behavior* because of a lack of reinforcement. A student who stops receiving gold stars or compliments for prolific reading of library books, for example, may extinguish (i.e. decrease or stop) book-reading behavior. A student who used to be reinforced for acting like a clown in class may stop clowning once classmates stop paying attention to the antics.

Generalization and Discrimination

Generalization refers to the incidental conditioning of behaviors similar to an original *operant*. If a student gets gold stars for reading library books, then we may find her reading more other material as well—newspapers, comics, etc.–even if the activity is not reinforced directly. The "spread" of the new behavior to similar behaviors is called generalization. Generalization is a lot like the concept of transfer discussed early in this chapter, in that it is about extending prior learning to new situations or contexts. From the perspective of operant conditioning, though, what is being extended (or "transferred" or generalized) is a behavior, not knowledge or skill.

Discrimination means learning *not* to generalize. In operant conditioning, what is *not* overgeneralized (i.e. what is discriminated against) is the operant behavior. If I am a student who is being complimented (reinforced) for contributing to discussions, I must also learn to discriminate when to make verbal contributions from when not to make them—such as when classmates or the teacher are busy with other tasks. Discrimination learning usually results from the combined effects of reinforcement of the target behavior and extinction of similar generalized behaviors. In a classroom, for example, a teacher might praise a student for speaking during discussion, but ignore him for making very similar remarks out of turn. In operant conditioning, the **schedule of reinforcement** refers to the pattern or frequency by which reinforcement is linked with the operant. If a teacher praises me for my work, does she do it every time, or only sometimes? Frequently or only once in a while? In respondent conditioning, however, the schedule in question is the pattern by which the conditioned stimulus is paired with the unconditioned stimulus. If I am a student with Mr. Horrible as my teacher, does he scowl every time he is in the classroom, or only sometimes? Frequently or rarely?

Intermittent Schedules

Behavioral psychologists have studied intermittent schedules extensively (for example, Ferster, et al., 1997; Mazur, 2005), and found a number of interesting effects of different schedules. For teachers, however, the most important finding may be this: partial or intermittent schedules of reinforcement generally cause learning to take longer, but also cause the extinction of learning to take longer. This dual principle is important for teachers because so much of the reinforcement we give is partial or intermittent. Typically, if I am teaching, I can compliment a student a lot of the time, for example, but there will inevitably be occasions when I cannot do so because I am busy elsewhere in the classroom. For teachers concerned both about motivating students and minimizing inappropriate behaviors, this is both good news and bad. The good news is that the benefits of my praising students' constructive behavior will be more lasting because they will not extinguish their constructive behaviors immediately if I fail to support them every single time they happen. The bad news is that students' negative behaviors may take longer to extinguish as well, because those too may have developed through partial reinforcement. A student who clowns around inappropriately in class, for example, may not be "supported" by classmates' laughter every time it happens, but only some of the time. Once the inappropriate behavior is learned, though, it will take somewhat longer to disappear even if everyone—both teacher and classmates—makes a concerted effort to ignore (or extinguish) it.

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Video 4.3.4. *Schedules of Reinforcement* explains the various intermittent schedules.

Cues

Finally, behavioral psychologists have studied the effects of **cues**. In operant conditioning, a cue is a stimulus that happens just prior to the operant behavior and that signals that performing the behavior may lead to reinforcement. In the original conditioning experiments, Skinner's rats were sometimes cued by the presence or absence of a small electric light in their cage. Reinforcement was associated with pressing a lever when, and only when, the light was on. In classrooms, cues are sometimes provided by the teacher deliberately, and sometimes simply by the established routines of the class. Calling on a student to speak, for example, can be a cue that *if* the student *does* say something at that moment, then he or she *may* be reinforced with praise or acknowledgment. But if that cue does *not* occur—if the student is *not* called on—speaking may *not* be rewarded. In more every day, non-behaviorist terms, the cue allows the student to learn when it is acceptable to speak, and when it is not.

Primary and Secondary Reinforcers

Rewards such as stickers, praise, money, toys, and more can be used to reinforce learning. Let's go back to Skinner's rats again. How did the rats learn to press the lever in the Skinner box? They were rewarded with food each time they pressed the lever. For animals, food would be an obvious reinforcer.

What would be a good reinforcer for humans? For your child Chris, it was the promise of a toy when they cleaned their room. How about Sydney, the soccer player? If you gave Sydney a piece

of candy every time Sydney scored a goal, you would be using a primary reinforcer. Primary reinforcers are reinforcers that have innate reinforcing qualities. These kinds of reinforcers are not learned. Water, food, sleep, shelter, sex, and touch, among others, are primary reinforcers. Pleasure is also a primary reinforcer. Organisms do not lose their drive for these things. For most people, jumping in a cool lake on a very hot day would be reinforcing and the cool lake would be innately reinforcing—the water would cool the person off (a physical need), as well as provide pleasure.

A secondary reinforcer has no inherent value and only has reinforcing qualities when linked with a primary reinforcer. Praise, linked to affection, is one example of a secondary reinforcer, as when you called out "Great shot!" every time Sydney made a goal. Another example, money, is only worth something when you can use it to buy other things—either things that satisfy basic needs (food, water, shelter—all primary reinforcers) or other secondary reinforcers. If you were on a remote island in the middle of the Pacific Ocean and you had stacks of money, the money would not be useful if you could not spend it. What about the stickers on the behavior chart? They also are secondary reinforcers.

Sometimes, instead of stickers on a sticker chart, a token is used. Tokens, which are also secondary reinforcers, can then be traded in for rewards and prizes. Entire behavior management systems, known as token economies, are built around the use of these kinds of token reinforcers. Token economies have been found to be very effective at modifying behavior in a variety of settings such as schools, prisons, and mental hospitals. For example, a study by Cangi and Daly (2013) found that the use of a token economy increased appropriate social behaviors and reduced inappropriate behaviors in a group of autistic school children. Autistic children tend to exhibit disruptive behaviors such as pinching and hitting. When the children in the study exhibited appropriate behavior (not hitting or pinching), they received a "quiet hands" token. When they hit or pinched, they lost a token. The children could then exchange specified amounts of tokens for minutes of playtime.

Skinner and other behavioral psychologists experimented with using various reinforcers and operants. They also experimented with various patterns of intermittent reinforcement, as well as with various **cues** or signals to the animal about when reinforcement was available. It turned out that all of these factors—the operant, the reinforcement, the schedule, and the cues—affected how easily and thoroughly operant conditioning occurred. For example, reinforcement was more effective if it came immediately after the crucial operant behavior, rather than being delayed, and reinforcements that happened intermittently (only part of the time) caused learning to take longer, but also caused it to last longer.

Relevance for Teaching

Since the original research about operant conditioning used animals, it is important to ask whether operant conditioning also describes learning in human beings, especially in students in classrooms. On this point, the answer seems to be clearly "yes." There are countless classroom examples of consequences affecting students' behavior in ways that resemble operant conditioning, although the process certainly does not account for all forms of student learning (Alberto & Troutman, 2005). Consider the following examples. In most of them the operant behavior tends to become more frequent on repeated occasions:

- A seventh-grade boy makes a silly face (the operant) at the girl sitting next to him. Classmates sitting around them giggle in response (the reinforcement).
- A kindergarten child raises her hand in response to the teacher's question about a story (the operant). The teacher calls on her and she makes her comment (the reinforcement).
- Another kindergarten child blurts out her comment without being called on (the operant). The teacher frowns, and ignores

this behavior, but before the teacher calls on a different student, classmates are listening attentively (the reinforcement) to the student even though he did not raise his hand as he should have.
- A twelfth-grade student—a member of the track team—runs one mile during practice (the operant). He notes the time it takes him as well as his increase in speed since joining the team (the reinforcement).
- A child who is usually very restless sits for five minutes doing an assignment (the operant). The teaching assistant compliments him for working hard (the reinforcement).
- A sixth-grader takes home a book from the classroom library to read overnight (the operant). When she returns the book the next morning, her teacher puts a gold star by her name on a chart posted in the room (the reinforcement).

These examples are enough to make several points about operant conditioning. First, the process is widespread in classrooms—probably more widespread than teachers realize. This fact makes sense, given the nature of public education: to a large extent, teaching is about making certain consequences (like praise or marks) depend on students' engaging in certain activities (like reading certain material or doing assignments). Second, learning by operant conditioning is not confined to any particular grade, subject area, or style of teaching, but by nature happens in every imaginable classroom. Third, teachers are not the only persons controlling reinforcements. Sometimes they are controlled by the activity itself (as in the track team example), or by classmates (as in the "giggling" example). This leads to the fourth point: multiple examples of operant conditioning often happen at the same time.

Because operant conditioning happens so widely, its effects on motivation are a bit complex. Operant conditioning can encourage **intrinsic motivation**, to the extent that the reinforcement for an activity is the activity itself. When a student reads a book for the sheer enjoyment of reading, for example, he is

reinforced by the reading itself, and we can say that his reading is "intrinsically motivated." More often, however, operant conditioning stimulates *both* intrinsic *and* extrinsic motivation at the same time. The combining of both is noticeable in the examples in the previous paragraph. In each example, it is reasonable to assume that the student felt intrinsically motivated to some partial extent, even when the reward came from outside the student as well. This was because *part* of what reinforced their behavior was the behavior itself—whether it was making faces, running a mile, or contributing to a discussion. At the same time, though, note that each student probably was also **extrinsically motivated**, meaning that another part of the reinforcement came from consequences or experiences *not* inherently part of the activity or behavior itself. The boy who made a face was reinforced not only by the pleasure of making a face, for example, but *also* by the giggles of classmates. The track student was reinforced not only by the pleasure of running itself but *also* by knowledge of his improved times and speeds. Even the usually restless child sitting still for five minutes may have been reinforced partly by this brief experience of unusually focused activity, even if he was *also* reinforced by the teacher aide's compliment. Note that the extrinsic part of the reinforcement may sometimes be more easily observed or noticed than the intrinsic part, which by definition may sometimes only be experienced within the individual and not also displayed outwardly. This latter fact may contribute to an impression that sometimes occurs, that operant conditioning is really just "bribery in disguise," and that only the *external* reinforcements operate on students' behavior. It is true that external reinforcement may sometimes alter the nature or strength of internal (or intrinsic) reinforcement, but this is not the same as saying that it destroys or replaces intrinsic reinforcement. But more about this issue later!

Behavior Modification in Children

Parents and teachers often use behavior modification to change a child's behavior. Behavior modification uses the principles of operant conditioning to accomplish behavior change so that undesirable behaviors are switched to more socially acceptable ones. Some teachers and parents create a sticker chart, in which several behaviors are listed. Sticker charts are a form of token economies, as described in the text. Each time children perform the behavior, they get a sticker, and after a certain number of stickers, they get a prize, or reinforcer. The goal is to increase acceptable behaviors and decrease misbehavior. Remember, it is best to reinforce desired behaviors, rather than to use punishment. In the classroom, the teacher can reinforce a wide range of behaviors, from students raising their hands, to walking quietly in the hall, to turning in their homework. At home, parents might create a behavior chart that rewards children for things such as putting away toys, brushing their teeth, and helping with dinner. In order for behavior modification to be effective, the reinforcement needs to be connected with the behavior; the reinforcement must matter to the child and be done consistently.

Figure 4.3.4. Sticker charts are a form of positive reinforcement and a tool for behavior modification. Once this child earns a certain number of stickers for demonstrating the desired behavior, she will be rewarded with a trip to the ice cream parlor. (credit: Abigail Batchelder)

Time-out is another popular technique used in behavior modification with children. It operates on the principle of negative punishment. When a child demonstrates an undesirable behavior, she is removed from the desirable activity at hand. For example, say that Sophia and her brother Mario are playing with building blocks. Sophia throws

some blocks at her brother, so you give her a warning that she will go to time-out if she does it again. A few minutes later, she throws more blocks at Mario. You remove Sophia from the room for a few minutes. When she comes back, she doesn't throw blocks.

There are several important points that you should know if you plan to implement time-out as a behavior modification technique. First, make sure the child is being removed from a desirable activity and placed in a less desirable location. If the activity is something undesirable for the child, this technique will backfire because it is more enjoyable for the child to be removed from the activity. Second, the length of the time-out is important. The general rule of thumb is one minute for each year of the child's age. Sophia is five; therefore, she sits in a time-out for five minutes. Setting a timer helps children know how long they have to sit in time-out. Finally, as a caregiver, keep several guidelines in mind over the course of a time-out: remain calm when directing your child to time-out; ignore your child during time-out (because caregiver attention may reinforce misbehavior); and give the child a hug or a kind word when time-out is over.

Figure 4.3.5. Time-out is a popular form of negative punishment used by caregivers. When a child misbehaves, he or she is removed from a desirable activity in an effort to decrease unwanted behavior. For example, (a) a child might be playing on the playground with friends and push another child; (b) the child who misbehaved would then be removed from the activity for a short period of time. (credit a: modification of work by Simone Ramella; credit b: modification of work by "Spring Dew"/Flickr)

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Behaviorism in the Classroom

"What does a classroom teacher need to know about learning?" According to the behavioral science approach, the teacher must be able to:

1. Focus instruction on observable learner performance.
2. Assure that learners can perform the skills that are prerequisites to that performance.
3. Elicit a rapidly paced, correct performance.
4. Use appropriate consequences following performance.

Focus on Learner Performance

Behavioral scientists have traditionally defined learning as a stable change in behavior brought about by the environment. Cognitive theorists have expanded this traditional definition of learning to include such topics as cognitive changes in memory capacity, thinking, and mental processing. Behavioral scientists are opposed to this definition. Their opposition stems less from a denial that changes in cognitive (mental) activity occur than from a concern about the difficulty of measuring them.

Behaviorists believe that in order to establish a true science of instruction we must be able to explain how what teachers do affects what learners do—not what or how they think. Cognitive activity is something we cannot measure directly. We can only infer it from observing performance—and inferences about cognitive activity can be wrong. Behaviorists believe that a focus on observable performance avoids incorrect inferences about learning and allows us to build a science of instruction on a firm foundation.

Distinctions between learning and performance and between

cognitive and observable changes are important for teaching. By their strong advocacy of observable outcomes and performance objectives, behavioral scientists challenge teachers not to take learning for granted. This means that you should plan lessons with a clear vision of the important outcomes you want learners to achieve, and end your instruction with an assessment of those outcomes. Both of these recommendations are consistent with the behavioral science approach to learning. This premise of behavioral science—that the only valid measure of learning is observable performance—has been criticized by some educators and psychologists (Pasch, Sparks-Langer, Gardner, Starks, & Moody, 1991), who believe that this emphasis encourages teachers to write only those objectives that are easy to measure and thus to ignore educational outcomes involving complex intellectual skills.

Behavioral scientists, on the other hand, believe that a concern for performance will have the opposite effect—that it will persuade teachers to give more serious thought to what they want their learners to accomplish. This, in turn, will help teachers devise authentic ways to assess learning in terms of performance and thinking skills, not just the acquisition of facts. As we will discuss in later chapters, you can write clear, detailed instructional goals and objectives that can be measured reliably in the context of classroom performance and performance on real-world assessment tasks.

Ensure the Learning of Prerequisite Skills

You may be wondering how someone's intelligence, abilities, aptitudes, or learning style enters into a behavioral scientist's theory of learning. After all, if someone lacks an aptitude for math or writing, or possesses little musical or painting ability, doesn't that affect his or her learning?

What characteristics of learners should classroom teachers be

concerned about when planning their lessons? Behavioral scientists have a straightforward and (given their concern for observable performance) predictable answer to these questions: Other than a learner's physical capabilities to perform the learning task, the only characteristic that is relevant to a student's learning a skill is whether the learner possesses the prerequisites for it. In other words, if you expect your students to learn how to write a paragraph, you must first ask yourself whether they can write a complete sentence, a topic sentence, and transitions between sentences. At an even more basic level, can they spell words and form letters correctly? If some of your learners cannot learn to write a paragraph skillfully and effortlessly, behavioral scientists would attribute this to a lack of prerequisite skills (or poorly designed instruction)—not to a lack of ability, aptitude, or intelligence.

Behavioral scientists believe that the source of almost all learning failures can be identified if teachers analyze both the *internal conditions* (prerequisite skills) and the *external conditions* (instructional events) of learning. For example, if one of your learners can't seem to master long division, is it because he hasn't learned how to subtract? If he is having difficulty learning subtraction skills, has he learned how to regroup? If he hasn't learned to regroup, can he identify which of two numbers is larger? At no point would the behavioral scientist conclude that the learner lacks ability or intelligence. If the teacher analyzes and probes deeply enough, eventually she can identify the source of the problem and teach or reteach the skills necessary for learning to continue.

The idea of breaking complex behaviors into smaller component behaviors originated with Skinner (1954). As we saw earlier, Skinner's experiments on shaping the behavior of rats demonstrated the usefulness of this method. Gagné (1970), however, more so than any other behavioral scientist, demonstrated the importance of classroom learning of such an analysis.

Task Analysis

The process of analyzing the internal conditions necessary for learning is called task analysis. The outcome of a task analysis is an arrangement of prerequisite skills into a *learning hierarchy*. You begin a task analysis by identifying what task you want your learners to perform at the end of a lesson or unit of instruction. Then ask, "In order to perform this task, what prerequisite skills must my learners already have mastered?" The answer should be the most complex, highest-level prerequisite skills.

Next, for each of these skills, identify further prerequisites. Eventually, a learning hierarchy emerges. The questioning process you might follow for an individual learner is illustrated in this figure.

If you have trouble conducting a task analysis using the logical questioning process described above, do the task yourself and write down what you did, or observe someone doing the task and write down what you saw. Some curriculum guides are sufficiently detailed to provide a task analysis for you.

Sequencing

Constructing a learning hierarchy is dependent on identifying the prerequisite skills in the correct sequence: you can't teach subtraction with regrouping before you teach place value. Behavioral scientists consider the sequence in which skills are taught to be especially important. They place a premium on correct responses, rapid responding, and efficiency. Therefore, incorrectly sequenced instruction results in errors, frustration, and inefficiency. Englemann (1991) cautions that the sequence of skills presented in the published curriculum you use may create problems for your learners. Thus, it will be worth your while to examine this sequence and adjust it when necessary.

Also, solving complex problems in math, writing compositions, and interpreting difficult reading passages are all tasks that require learners to perform prerequisite skills automatically and effortlessly (Mayer, 1987). Imagine the difficulty your learners would have writing an essay if they could not form letters, spell, punctuate, and construct grammatical sentences. Learners who cannot perform prerequisite skills effortlessly and with minimal errors find it difficult to transfer new learning to unfamiliar problem contexts. One of the key ingredients for transfer of new learning is the mastery of prerequisite skills.

Elicit Rapidly Paced, Correct Performance

As we saw in our study of operant conditioning, Skinner was able to elicit rapid correct performance by the skilled use of reinforcement and stimulus control. As you will recall, the basic elements of operant conditioning are (a) a response or behavior that you want to teach or shape, (b) an effective reinforcer, and (c) the delivery of that reinforcer immediately after the performance of the desired response. The challenge—both to psychologists in the lab and to teachers in the classroom—is to elicit a correct response. Let's analyze this challenge and explore further the topic of rapidly-paced, correct performance.

The skilled teacher gets learners to respond correctly by bringing correct responses under stimulus control. Exactly how is this done? How does a teacher deliver instruction in a manner that minimizes the likelihood that learners will make mistakes? Four important factors are involved.

1. Assure the learning of prerequisite skills.
2. Present instructional material effectively.
3. Use prompts.
4. Use reinforcement.

We have already discussed the first of these factors. In this section, we explain the remaining three.

Effective Presentation

Behavioral scientists point out three areas for you to consider as you decide how to present instructional material: specific directions, opportunities for learner responses, and the pacing of response opportunities (Cooper, Heron, & Heward, 1987; Englemann, 1991).

Specific Directions

Let's say that you want to teach some sight words to your learners. You want them to look at a word and pronounce it correctly. Here are two examples of possible directions:

- Example 1: This is the word "rabbit." Say "rabbit" and point to the word.
- Example 2: This is the word "rabbit." A rabbit is a small, furry animal with big ears. It likes to eat carrots. Point to the word "rabbit" and say it.

Example 1 is a better set of directions if your objective is to bring the response "saying and pointing to the word 'rabbit'" under the stimulus control of the word "rabbit." Example 2 contains information that may distract the learner from making the correct response.

Whether you are teaching word recognition to first-graders, subtraction to second-graders, paragraph construction to sixth-graders, or problem-solving in physics to eleventh-graders,

instructional directions should be specific to the behavior you want your learners to acquire. So think carefully about what you want learners to do and how you will direct them to do it. Discard information and explanations that are extraneous and serve only to distract the learner.

Opportunities for Learner Response

Behavioral scientists have conducted extensive research on the idea of the opportunity to respond (Delguardi, Greenwood, & Hall, 1979; Hall, Delguardi, Greenwood, & Thurston, 1982; Lindsley, 1992b). They make a useful distinction between active and passive responding. **Active responding** requires the learner to do something: write sentences, calculate answers, focus a microscope, balance a scale, weigh rocks, and record observations. **Passive responding**, on the other hand, includes such activities as listening to lectures, paying attention to peers while they are reading, watching television, and waiting for teacher assistance.

Greenwood, Delguardi, and Hall (1984) report that nearly half of a learner's day is involved in passive responding. This is unfortunate because their research also demonstrates a strong relationship between learner achievement and active responding. Behavioral scientists, therefore, urge you to plan your lessons so that learners spend at least 75 percent of their time engaged in active responding.

Research on the opportunity to respond has also found that correct responses are more likely to come under stimulus control when you design your practice material (worksheets, seatwork drills, homework assignments, and so forth) to elicit correct responses 70 to 90 percent of the time (Borich, 1996; Stephens, 1976). Many teachers purposely design materials for learner practice to be challenging—in other words, they design it so there is a strong likelihood that the learners will make mistakes. Behavioral scientists have demonstrated that learners acquire basic facts and skills faster

when their opportunities for practice result in success most of the time.

The Pacing of Response Opportunities

Recall Ogden Lindsley's description of the ideal classroom from the beginning of this chapter. In it, Lindsley drew our attention to the rapidity with which the learners were responding—they were "shouting correct answers as fast as they can at 200 words per minute." It is a cardinal principle of behavioral science that when instruction is focused on basic academic skills, stimulus control of correct responses is more likely to occur when learners are encouraged to respond rapidly.

Although you might predict that more errors would result from fast-paced lessons, research indicates just the opposite for the acquisition of facts and action sequences. In a series of studies on the pace of reading instruction, Carnine found that rapid presentations by teachers produced greater achievement, fewer errors, and more sustained attention by learners during letter and word identification tasks than did slower presentations (Carnine, 1976; Carnine & Fink, 1978).

In summary, the behavioral science approach to learning suggests that you deliver instruction in the following ways:

- Give directions that focus only on the response you want learners to make.
- Allow learners to engage in active responding during the majority of class time.
- Design instructional material for both initial learning and practice so that learners can produce correct answers 70 to 90 percent of the time.

Use of Prompts

During instruction teachers often provide **prompts**—hints and other types of supplementary instructional stimuli to help learners make the correct responses. Because, as we have seen, the behavioral science approach is concerned with minimizing mistakes, it places a high value on the use of prompts that increase the likelihood that learners will respond correctly.

Behavioral scientists identify three categories of prompts used by teachers to shape the correct performance of their learners: verbal prompts, gestural prompts, and physical prompts. We will discuss the use of all three kinds in the following sections.

Verbal Prompts

Verbal prompts can be cues, reminders, or instructions to learners that help them perform correctly the skill you are teaching. For example, saying "Leave a space between words" to a first-grader as he is writing reminds him of what you previously said about neat handwriting. Or saying "First adjust the object lens" to a learner as she is looking at a microscope slide prompts her as she is learning how to use a microscope. Verbal prompts help guide the learner to correct performance and prevent mistakes and frustration.

Gestural Prompts

Gestural prompts model or demonstrate for learners a particular skill you want them to perform. For example, if you were to point to the fine adjustment knob on the microscope and make a turning gesture with your hand, you would be prompting the student to perform this step of the process. Gestural prompts are particularly helpful when you anticipate that the learner may make a mistake.

Teachers use gestural prompts routinely to remind learners how to fold a piece of paper, grasp a pair of scissors, raise a hand before asking a question, or hold a pen properly when writing.

Physical Prompts

Some learners lack the fine muscle control needed to follow a demonstration and imitate the action that is being modeled. For example, the teacher might verbally describe how to form the letter "A" and demonstrate this to the learner, and the learner may still be unable to write "A" correctly. In such a case, the teacher might use her hand to guide the learner's hand as he writes. This is called a physical prompt. With a physical prompt, you use hand-over-hand assistance to guide the learner to the correct performance. Teachers routinely use physical prompts to assist learners with handwriting, cutting out shapes, tying shoelaces, correctly holding a dissecting tool, or performing a complex dance routine.

Least-to-Most Prompting

Behavioral scientists generally recommend that you use the least intrusive prompt first when guiding a learner's performance. This is referred to as least-to-most prompting. Verbal prompts are considered the least intrusive, while physical prompts are considered the most intrusive (Cooper et al., 1987). Thus it would be more appropriate to first say to a learner "Don't forget the fine adjustment!" when guiding her in the use of a microscope than to take her hand and physically assist her. The reasoning behind using a least-to-most order of prompts to assist learners is that verbal prompts are easier to remove or fade than physical prompts. Learners who are dependent on physical prompts to perform

correctly will find it more difficult to demonstrate a skill independently of the teacher.

At this point, let's summarize what we've learned about stimulus control and its relationship to correct responses. So far, we have learned that behavioral scientists view the eliciting of a correct response as one of the four basic elements of learning. Correct responses followed by reinforcement result in more permanent learning than correct responses intermixed with incorrect responses. Mistakes slow down the learning process and often lead to frustration and attempts by learners to avoid, or passively respond to, a learning activity.

Establishing stimulus control over learner performance is the key to errorless learning. In order to elicit rapidly paced, correct performance, you must pay particular attention to four important factors when planning your lessons:

1. Make sure your learners have mastered prerequisite skills.
2. Present your lessons in a way that will give learners frequent opportunities to make correct responses.
3. Use prompts to ensure a correct response.
4. Reinforce correct responses immediately.

Let's turn now to the fourth basic element of the behavioral science approach, which tells us how to deliver consequences to learners following their performance.

Use Appropriate Consequences Following Performance

Picture the following situation: You have just begun a unit on converting fractions to decimals with your fifth-graders. After demonstrating how to perform this skill, you pass out a worksheet with 20 problems. You give your learners 10 minutes to complete

the task. As the students work, you move from desk to desk checking on their answers. You notice several students getting answers wrong. What should you do? Here are some alternatives.

1. Circle the incorrect answers, show them what they did wrong, and encourage them to do better.
2. Circle just the correct answers, point out what they did right, and encourage them to do better.
3. Circle the correct answers, and praise the students for their good work.
4. Circle the incorrect answers, admonish the students, and have them do the problems again.
5. 1 and 4.
6. 2 and 3.
7. All of the above.

Educational psychologists using the behavioral science approach have researched the issue of how best to respond to the correct and incorrect responses of learners. They have arranged the possible consequences into three general categories: (1) informational feedback, (2) positive consequences, and (3) negative consequences. Let's examine each and see what behavioral scientists have learned about their effectiveness in promoting learning.

Informational Feedback

Correct Responses

If a learner correctly recalls the major historical events leading up to the Civil War, legibly forms a lowercase cursive letter, or accurately solves an algebra equation with two unknowns showing her work,

you should do two things immediately: (1) tell the learner the answer is correct, and (2) briefly describe what she did to obtain the correct answer. For example:

- "That's right. You listed the five major events."
- "Those letters are slanted correctly and you wrote them on the line."
- "The answer is right and you showed all the required steps."

Behavioral scientists remind us that better learning results when you tell learners not only what they got right, but also why they got it right (Cooper et al., 1987).

Incorrect Answers

Learners give incorrect answers for several different reasons: carelessness, lack of knowledge, or lack of understanding. In the first case, some teachers scold or use some form of verbal punishment. Behavioral scientists and many educators strongly advise against these consequences for careless performance. Instead, they recommend that you use the following types of feedback whenever students give incorrect answers, regardless of the reason:

1. If the problem involves only knowledge of factual information, simply give the correct response.
2. If the problem involves more complex intellectual skills, point out the rules, procedures, or steps to follow.
3. Ask the learner to correct the answer.
4. Ask the learner to practice some extra problems.

Here is an example of each:

- "The correct spelling is t-h-e-i-r."

- "End every sentence with a period, question mark, or exclamation point."
- "First draw the base. Then, draw the altitude. Now, retrace your steps."
- "Ask yourself: 'Who are the more talked-about people in this story?' Then
  answer the next set of questions."

Note that these examples do not include preaching, scolding, or focusing extensively on the student's error—even if the learner was being careless. Such responses often create feelings of anxiety and distaste for schoolwork, which encourage disengagement from the learning activity. Learning will occur more quickly if you simply tell your students what to do, have them try again, and provide practice with additional problems when an incorrect response is given (Rodgers & Iwata, 1991).

Cautions for Correcting Mistakes

Research on feedback and error correction has shown that the recommendations given above improve learning for most students. However, there are two groups of learners for whom these procedures may not be beneficial: (1) those who make a lot of mistakes and (2) those who are excessively dependent on adult guidance.

When given material that is too difficult, low-achieving learners make many errors. Such learners experience low rates of positive consequences and high rates of negative ones. Consequently, they are likely to ignore corrective feedback and simply stop working. Research on low achievers affirms that when error rates are high, little is learned from informational feedback (Kulik & Kulik, 1988; McKeachie, 1990). This finding underscores the importance of designing your instruction to produce as few errors as possible in all learners.

In the second case, learners who depend greatly on adult guidance may involve attention-seeking behavior. In other words, some learners may persist in making mistakes because of the attention they receive after doing so. Hasazi and Hasazi (1972) and Stromer (1975) speculated that when a teacher's response focuses on the mistake itself rather than on the correct answer (for example, circling reversals of letters when the learner writes b for d, or circling digits when the learner writes 32 for 23), it may inadvertently reinforce incorrect responses.

These researchers carried out experiments in which teachers circled only correct responses and drew no attention to those that were incorrect. They found dramatic improvements in the learners' ability to write digits and letters correctly after teachers made this change alone. This surprising finding reminds us that focusing on mistakes may actually reinforce the wrong response. This may be especially true in classrooms where teachers pay more attention to children who are misbehaving (talking out of turn, not following instructions) than to those who routinely follow class rules.

Positive Consequences Following Performance

Behavioral scientists have conclusively demonstrated the crucial role played by positive consequences in promoting and strengthening learning in animals. They have shown that positive consequences play an equally critical part in the classroom learning of children (Sulzer-Azaroff & Mayer, 1986). Thus, for the classroom teacher today, the important question is not whether to use positive consequences in the classroom, but what type of consequence to use and how.

Behavioral scientists make a distinction between positive consequences and positive reinforcers. Positive consequences, such as smiles, praise, happy faces, "happy-grams," and prizes are enjoyable or pleasurable things that teachers (or parents) do for

children to encourage their good efforts and motivate them to do better. They may or may not serve as positive reinforcers.

Something can be called a *positive reinforcer* only when it can be conclusively shown that it increases the frequency of a target behavior. When you praise a learner's correct punctuation with the intention of increasing the likelihood that she will continue her progress, you are using a positive consequence. In order to classify this consequence as a positive reinforcer, you must show that the learner continues to make progress and that your praise was the causal factor. Some teachers develop elaborate systems of positive rewards, hoping that they will energize their learners to achieve increasingly higher levels of both social and academic skills (Canter, 1989). However, the teachers believe they are using positive reinforcers when they are simply using positive consequences.

We will now extend our discussion of positive consequences following learning to address two additional issues: (1) how to use positive consequences to promote and maintain learning and (2) how to establish natural reinforcers (i.e., intrinsic motivators) for learners who require extrinsic ones.

The Expert Practice of Positive Reinforcement

Recall from our discussion of operant conditioning that positive reinforcement is the process of strengthening behavior by the presentation of a desired stimulus or reward. While this definition appears simple, reinforcement is nevertheless easily misunderstood and misused. Before we expand on the use of positive reinforcement in the classroom, let's see some examples of what it is not. These will help you grasp the complexity of positive reinforcement.

- Mr. Russo has snack time at 10:15 and 10:30 for his first-grade class. He gives his learners juice, cookies, fruit bits, and other types of reinforcers.
- Mr. Baker, the principal, decided to start a positive

reinforcement program. At the end of the week, each teacher would nominate his or her "best student" to receive the "Principal's Pride Award" at a ceremony each Monday morning. Parents would be invited to attend.

- Mrs. Knipper allows students who finish assignments early to use the computer in the back of the room.
- Mr. French has a popcorn party every Friday if the class has not broken more than five major rules the entire week.
- Mrs. Reimer has a basketful of inexpensive trinkets and school supplies. She lets learners who have been particularly helpful on a given day select a prize from the basket.

Learners who read more than five books a year are treated to a special roller skating party at the end of the school year, hosted by the principal.

There is nothing wrong or inappropriate about these activities. Learners, their teachers, and parents generally like and support them. They even may have some beneficial outcomes on learning, but they are not necessarily examples of positive reinforcement. Positive reinforcement is a complex process that demands a substantial commitment of the teacher's time and effort, as we will now see.

The Process of Positive Reinforcement

When behavioral scientists speak of positive reinforcement they refer to a sequence of actions by a teacher, trainer, or behavioral specialist that has a beginning, middle, and end. When you decide to use positive reinforcement you commit yourself to this specific sequence of steps. Note that very few of these steps were followed in the examples given earlier. Reread the examples now, and ask yourself how many included: baseline measurement of specific behaviors; assessment of reinforcer preferences; immediate, continuous reinforcement for the performance of specific

behaviors; and a gradual fading of the use of extrinsic reinforcers to natural reinforcers.

The point is that the expert practice of positive reinforcement is a demanding intellectual and physical challenge. When you decide to use it, you are committing yourself to a process that involves measurement, consistent delivery of reinforcers, and the responsibility to fade them. Because of this commitment, there may be few examples in regular school classrooms today where the science of reinforcement, as developed by behavioral scientists, is consistently and appropriately applied.

Therefore, it is important to recognize that most reward, recognition, and incentive systems used in today's schools do not constitute positive reinforcement as behavioral scientists use the term. In either case, users of positive reinforcement should be aware of the ethical issues involved in the use of extrinsic rewards, such as paying students for reading books or for staying off drugs.

Natural Reinforcers: Alternatives to Extrinsic Reinforcers

Behavioral scientists have often been criticized for creating a generation of learners who are hooked on artificial or extrinsic consequences in order to learn and behave in the classroom (see, for example, de Charms, 1968, 1976). However, an analysis of the writings of early behaviorists like B. F. Skinner (1953, 1974), or other behavioral scientists like Ogden Lindsley (1991, 1992a, 1992b) and Baer, Wolf, and Risley (1968), challenges this criticism. Such behavioral scientists have advocated the use of **natural reinforcers**, those that are naturally present in the setting where the behavior occurs. Thus, there are natural reinforcers for classrooms (grades), ballfields (the applause of fans), the workplace (money), and the home (story hour, parent attention). Examples of unnatural reinforcers are paying children or giving them treats for achievement in schools, or buying toys for children who behave well at home.

Skinner makes a further distinction in his definition of a natural reinforcer: he sees it as a change in stimulation resulting from the behavior itself. In other words, natural reinforcers occur when the behavior itself produces an environmental change that gives the person pleasure. For example, the natural reinforcer for hitting the correct keys on a piano is the pleasurable sound that the behavior brings. Similarly, the natural reinforcer for writing correct letters is the satisfaction the first-grader experiences when she sees the letters forming on the page. Thus to Skinner, a natural reinforcer is a consequence that results from the very performance of the behavior we want the child to learn; that consequence, in turn, motivates the child to want to perform these behaviors again.

Children who enjoy solving puzzles are receiving natural reinforcement for doing so. Likewise, learners who write poetry, play the guitar, study history, read novels, or compete in gymnastics are receiving natural reinforcement. What these examples have in common is that children are engaging in the behaviors again and again without the need for external praise or other reinforcers delivered by another person.

Some learners are naturally reinforced by learning to write, read, color, answer questions, play sports, solve equations, answer textbook questions, and write essays, but others are not. Many learners require external reinforcers to engage in certain classroom activities that they do not find naturally reinforcing. For such children, external reinforcers have an important role to play. They can accomplish two things. They enable you to (1) shape and improve the behaviors you desire
through the use of positive reinforcement and (2) transfer their control over the learner's behavior to natural reinforcers. Behavioral scientists refer to this process as conditioning (Horcones, 1992).

Conditioning a Natural Reinforcer. Over the past decade, the Communidad Los Horcones (Horcones, 1985, 1987, 1991, 1992) has developed a strategy for transferring the control of extrinsic reinforcers to that of natural, or **intrinsic reinforcers**. This process as a whole is referred to as intrinsic reinforcement. Note how the

use of natural reinforcers relies on the learner's intrinsic motivation and thus allows you to transfer control of the behavior to the learner herself.

Positive Consequences: A Final Comment. Behavioral scientists emphasize that there is nothing wrong with extrinsic reinforcers, particularly when they are used as a means to get learning started and to condition natural reinforcers. But there are drawbacks to their use. Some learners stop studying when they are removed (Emmer, Evertson, Clements, & Worsham, 1994). They are not always available for all learners at the same time nor available for individual learners when they are needed. This is not the case with natural reinforcers.

Moreover, extrinsic reinforcers can be effective only when they are consistently delivered by another person. It is impractical to expect teachers to reinforce the most important behaviors of all learners at the right moment. Natural reinforcers allow for this possibility.

We will return to the subject of reinforcement when we study motivational theories in future chapters. Let's turn now to a discussion of the third type of consequence that teachers can use following learner performance: negative consequences.

The Use of Negative Consequences

We will end our discussion of the use of the behavioral science approach with the final type of consequence teachers can use negative consequences. Here are some examples of negative consequences:

- Mr. Holt's fourth-period math class was just before lunch. His students often failed to complete their seatwork during this period. He decided to delay the lunch period for any learners who did not finish their work.

- Ms. Tolbert wanted to help her learners spell more accurately. She made them write each misspelled word 25 times in their notebooks.
- Mr. Blandon was a stickler for correct punctuation. Any student who failed to capitalize a sentence or place a period at the end received a firm lecture on carelessness.
- Mr. Thomas decided to do something about students who weren't doing homework—students who didn't turn in homework assignments were required to do them after school.
- Mr. Altman sent "sad-grams" home to the parents of students who were doing poorly in his math class.

These are all examples of negative consequences, things that teachers (or other adults) do to learners after inappropriate behaviors in the hope that such behaviors will not occur again. Types of negative consequences typically used in schools are these:

Verbal reprimands: Speaking harshly to the student: "That work is sloppy and careless, and you should be ashamed of yourself for doing it."

Overcorrection: The learner not only corrects what he did wrong but engages in repetitive, boring practice on the same skill: "After you correct all the spelling mistakes, write each misspelled word correctly 50 times."

Response cost: The teacher takes away some right or privilege: "Whoever fails to complete the assignment loses the first 15 minutes of recess."

Exclusion: The learner is removed from one setting and placed in another, often called "time out": "If you don't cooperate in your groups, you will be removed and put in the back of the room for the rest of the period."

Negative Consequences Versus Punishers

Negative consequences may or may not be punishers. As we have

seen, to a behavioral scientist, a **punisher** is something you do following a behavior to reduce the frequency of that behavior for as long as the punisher is used. In other words, your overcorrection of spelling mistakes is a punisher only if you keep good records that show that spelling mistakes have been substantially reduced. If not, then overcorrection is not a punisher—it is simply a negative consequence, which has no real effect on mistakes and may or may not cause the learner discomfort.

Behavioral scientists are very particular about what they call a punisher (just as they are very particular about what they call a reinforcer). Something is a punisher only if you have demonstrated that it reduces the behavior you targeted. Scolding, overcorrection, sending someone to the principal's office (exclusion), taking away recess (response cost), and even corporal punishment are all negative consequences, but they may not be punishers.

The distinction between a negative consequence and a punisher is significant for two reasons. First, some teachers persist in the use of negative consequences in the belief that they are helping their learners in some way. However, after a scolding, a learner may appear chastened and remorseful. He may even stop the inappropriate behavior for the next hour or day. But the same behavior soon reappears; the teacher, in frustration, scolds or reprimands again; and the cycle repeats itself.

Scolding, in this case, does not reduce the target behavior. It is not a punisher. It is simply a negative consequence, which the teacher uses to relieve frustration with the learner and which gives the illusion of effectiveness. By distinguishing between negative consequences and punishers, behavioral scientists remind us of the importance of gathering evidence that behavior is changing before we persist in the use of any technique. They highlight an important ethical question: What is the justification for the continued use of negative consequences in the absence of proof of their effectiveness?

Second, the distinction between negative consequences and

punishers is also significant because it raises the question of what is required to turn a negative consequence into an effective punisher.

The Use of Punishment

As often as you hear the lament "I tried positive reinforcement and it didn't work," you will hear the assertion "Punishment isn't effective." And just as we can attribute the failure of positive reinforcement to ineffective practice, so we can attribute the failure of punishment to ineffective application.

Many myths have arisen over the past two decades concerning the use of punishment in schools. These myths pertain to both the effectiveness and the ineffectiveness of punishment in reducing undesirable behavior. In the former case, we often hear statements like these: Punishment stops unwanted behavior. When all else fails, use punishment! Children must experience negative consequences for misbehavior! Spare the rod and spoil the child! In the latter case, punishment is frequently criticized because it makes children hate school or teachers create emotional problems, only temporarily suppresses behavior, or deals only with the symptom of the problem and not the cause.

In response to these beliefs, behavioral scientists cite hundreds of studies, carried out with both animal and human subjects over the past half-century, that have led to a set of tested conclusions about punishment and its use (Cooper et al., 1987; Sulzer-Azaroff et al., 1988). Here is what these studies tell us about the use of punishment:

- Punishment can result in the long-term elimination of undesirable behavior, but so can techniques that involve the exclusive use of positive reinforcement to strengthen appropriate behavior.
- Some individuals engage in severe, chronic, life-threatening behaviors that cannot be eliminated by positive reinforcement

alone.

- When punishment to eliminate inappropriate behaviors is used in conjunction with positive reinforcement to teach alternative behaviors, emotional side effects such as fear and dislike of teachers' attempt to escape or avoid school or schoolwork, or anxiety are less likely to occur.
- The failure of some nonaversive and positive reinforcement techniques to suppress undesirable behavior does not automatically justify the use of punishment. Usually, this failure is due to the ineffective use of positive reinforcement.
- The failure of less intense punishment to suppress behavior does not necessarily justify the use of more intense punishment. In fact, increasing the ratio of positive reinforcement to create a contrast with punishment usually precludes the need for increased punishment.

From their studies on the effective use of punishment, behavioral scientists have identified several conditions as essential for the suppression and eventual elimination of undesirable behavior. Not surprisingly, these conditions are similar to those we identified for the successful use of positive reinforcement earlier in this chapter. They include the following:

1. Precise identification and baseline measurement of the target behavior.
2. Precise identification of an alternative, positive behavior.
3. An assessment of the most effective potential punisher for the target behavior prior to its use.
4. Consistent, immediate reinforcement and punishment on a continuous schedule until changes in both the target behavior and the alternative behavior are evident.
5. Fading of both reinforcers and punishers.

PRINCIPLES OF BEHAVIOR ANALYSIS AND MODIFICATION

For a more detailed review of behavior analysis and modification, the OER book

Principles of Behavior Analysis and Modification provides more information.

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Social Cognitive Learning Theory

Albert Bandura disagreed with Skinner's strict behaviorist approach to learning and development because he felt that thinking and reasoning are important components of learning. He presented a social-cognitive theory that emphasizes that the environment and cognitive factors influence behavior. In social-cognitive theory, the concepts of reciprocal determinism, observational learning, and self-efficacy all play a part in learning and development.

Reciprocal Determinism

In contrast to Skinner's idea that the environment alone determines behavior, Bandura (1990) proposed the concept of reciprocal determinism, in which cognitive processes, behavior, and context all interact, each factor influencing and being influenced by the others simultaneously. *Cognitive processes* refer to all characteristics previously learned, including beliefs, expectations, and personality characteristics. *Behavior* refers to anything that we do that may be rewarded or punished. Finally, the *context* in which the behavior occurs refers to the environment or situation, which includes rewarding/punishing stimuli.

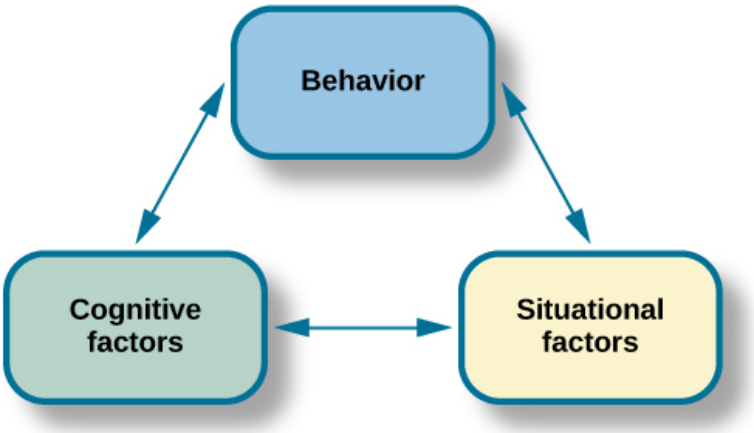

Figure 4.4.1. Bandura proposed the idea of reciprocal determinism: Our behavior, cognitive processes, and situational context all influence each other.

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https://edpsych.pressbooks.sunycreate.cloud/?p=70#oembed-2

Video 4.4.1. *Reciprocal Determinism* explains the interactions between behavior, cognition, and the environment.

Consider, for example, that you're at a festival and one of the attractions is bungee jumping from a bridge. Do you do it? In this example, the behavior is bungee jumping. Cognitive factors that might influence this behavior include your beliefs and values, and your past experiences with similar behaviors. Finally, context refers to the reward structure for the behavior. According to reciprocal determinism, all of these factors are in play.

Observational Learning

Bandura's key contribution to learning theory was the idea that much learning is vicarious. We learn by observing someone else's behavior and its consequences, which Bandura called observational learning. Just as we learn individual behaviors, we learn new behavior patterns when we see them performed by other people or models. Drawing on the behaviorists' ideas about reinforcement, Bandura suggested that whether we choose to imitate a model's behavior depends on whether we see the model reinforced or punished. Through observational learning, we come to learn what behaviors are acceptable and rewarded in our culture, and we also learn to inhibit deviant or socially unacceptable behaviors by seeing what behaviors are punished.

We can see the principles of reciprocal determinism at work in observational learning. For example, personal factors determine which behaviors in the environment a person chooses to imitate, and those environmental events in turn are processed cognitively according to other personal factors. One person may experience receiving attention as reinforcing, and that person may be more inclined to imitate behaviors such as boasting when a model has been reinforced. For others, boasting may be viewed negatively, despite the attention that might result—or receiving heightened attention may be perceived as being scrutinized. In either case, the person may be less likely to imitate those behaviors even though the reasons for not doing so would be different.

Humans and other animals are capable of observational learning. As you will see, the phrase "monkey see, monkey do" really is accurate. The same could be said about other animals. For example, in a study of social learning in chimpanzees, researchers gave juice boxes with straws to two groups of captive chimpanzees. The first group dipped the straw into the juice box, and then sucked on the small amount of juice at the end of the straw. The second group sucked through the straw directly, getting much more juice. When the

first group, the "dippers," observed the second group, "the suckers," what do you think happened? All of the "dippers" in the first group switched to sucking through the straws directly. By simply observing the other chimps and modeling their behavior, they learned that this was a more efficient method of getting juice (Yamamoto, Humle, and Tanaka, 2013).

Figure 4.4.2. *This spider monkey learned to drink water from a plastic bottle by seeing the behavior modeled by a human. (credit: U.S. Air Force, Senior Airman Kasey Close)*

Imitation is much more obvious in humans, but is imitation really the sincerest form of flattery? Consider Claire's experience with observational learning. Claire's nine-year-old son, Jay, was getting into trouble at school and was defiant at home. Claire feared that Jay would end up like her brothers, two of whom were in prison. One day, after yet another bad day at school and another negative note from the teacher, Claire, at her wit's end, beat her son with a belt to get him to behave. Later that night, as she put her children to bed, Claire witnessed her four-year-old daughter, Anna, take a belt to her teddy bear and whip it. Claire was horrified, realizing that Anna was imitating her mother. It was then that Claire knew she wanted to discipline her children in a different manner.

Like Tolman, whose experiments with rats suggested a cognitive component to learning, psychologist Albert Bandura's ideas about learning were different from those of strict behaviorists. Bandura and other researchers proposed a brand of behaviorism called social learning theory, which took cognitive processes into account. According to Bandura, pure behaviorism could not explain why learning can take place in the absence of external reinforcement. He felt that internal mental states must also have a role in learning and that observational learning involves much more than imitation. In imitation, a person simply copies what the model does. Observational learning is much more complex. According to

Lefrançois (2012), there are several ways that observational learning can occur:

1. You learn a new response. After watching your coworker get chewed out by your boss for coming in late, you start leaving home 10 minutes earlier so that you won't be late.
2. You choose whether or not to imitate the model depending on what you saw happen to the model. Remember Julian and his father? When learning to surf, Julian might watch how his father pops up successfully on his surfboard and then attempt to do the same thing. On the other hand, Julian might learn not to touch a hot stove after watching his father get burned on a stove.
3. You learn a general rule that you can apply to other situations.

Bandura identified three kinds of models: live, verbal, and symbolic. A live model demonstrates a behavior in person, as when Ben stood up on his surfboard so that Julian could see how he did it. A verbal instructional model does not perform the behavior, but instead explains or describes the behavior, as when a soccer coach tells his young players to kick the ball with the side of the foot, not with the toe. A symbolic model can be fictional characters or real people who demonstrate behaviors in books, movies, television shows, video games, or Internet sources.

(a)

(b)

Figure 4.4.3. (a) Yoga students learn by observation as their yoga

instructor demonstrates the correct stance and movement for her students (live model). (b) Models don't have to be present for learning to occur: through symbolic modeling, this child can learn a behavior by watching someone demonstrate it on television. (credit a: modification of work by Tony Cecala; credit b: modification of work by Andrew Hyde)

Steps in the Modeling Process

Of course, we don't learn a behavior simply by observing a model. Bandura described specific steps in the process of modeling that must be followed if learning is to be successful: attention, retention, reproduction, and motivation. First, you must be focused on what the model is doing—you have to pay **attention**. Next, you must be able to retain, or remember, what you observed; this is **retention**. Then, you must be able to perform the behavior that you observed and committed to memory; this is **reproduction**. Finally, you must have **motivation**. You need to want to copy the behavior, and whether or not you are motivated depends on what happened to the model. If you saw that the model was reinforced for her behavior, you will be more motivated to copy her. This is known as **vicarious reinforcement**. On the other hand, if you observed the model being punished, you would be less motivated to copy her. This is called **vicarious punishment**. For example, imagine that four-year-old Allison watched her older sister Kaitlyn playing in their mother's makeup, and then saw Kaitlyn get a time out when their mother came in. After their mother left the room, Allison was tempted to play in the make-up, but she did not want to get a time-out from her mother. What do you think she did? Once you actually demonstrate the new behavior, the reinforcement you receive plays a part in whether or not you will repeat the behavior.

Figure 4.4.4. Observational learning model.

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Video 4.4.2. *Observational Learning* explains the steps in the modeling process for observational learning to occur.

Bandura researched modeling behavior, particularly children's modeling of adults' aggressive and violent behaviors (Bandura, Ross, & Ross, 1961). He conducted an experiment with a five-foot inflatable doll that he called a Bobo doll. In the experiment, children's aggressive behavior was influenced by whether the

teacher was punished for her behavior. In one scenario, a teacher acted aggressively with the doll, hitting, throwing, and even punching the doll, while a child watched. There were two types of responses by the children to the teacher's behavior. When the teacher was punished for her bad behavior, the children decreased their tendency to act as she had. When the teacher was praised or ignored (and not punished for her behavior), the children imitated what she did, and even what she said. They punched, kicked, and yelled at the doll.

What are the implications of this study? Bandura concluded that we watch and learn, and that this learning can have both prosocial and antisocial effects. Prosocial (positive) models can be used to encourage socially acceptable behavior. Parents, in particular, should take note of this finding. If you want your children to read, then read to them. Let them see you reading. Keep books in your home. Talk about your favorite books. If you want your children to be healthy, then let them see you eat right and exercise, and spend time engaging in physical fitness activities together. The same holds true for qualities like kindness, courtesy, and honesty. The main idea is that children observe and learn from their parents, even their parents' morals, so be consistent and toss out the old adage "Do as I say, not as I do," because children tend to copy what you do instead of what you say. Besides parents, many public figures, such as Martin Luther King, Jr. and Mahatma Gandhi, are viewed as prosocial models who are able to inspire global social change. Can you think of someone who has been a prosocial model in your life?

The antisocial effects of observational learning are also worth mentioning. As you saw from the example of Claire at the beginning of this section, her daughter viewed Claire's aggressive behavior and copied it. Research suggests that this may help to explain why abused children often grow up to be abusers themselves (Murrell, Christoff, & Henning, 2007). In fact, about 30% of abused children become abusive parents (U.S. Department of Health & Human Services, 2013). We tend to do what we know. Abused children, who grow up witnessing their parents deal with anger and frustration through violent and aggressive acts, often learn to behave in that manner themselves. Sadly, it's a vicious cycle that's difficult to break.

Bandura's Bobo doll Experiment

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Video 4.4.3. *Albert Bandura Bobo Doll Experiment* is explained by Dr. Bandura.

Self-Efficacy

Bandura (1977, 1995) has studied a number of cognitive and personal

factors that affect learning and personality development and most recently has focused on the concept of self-efficacy. Self-efficacy is our level of confidence in our own abilities, developed through our social experiences. Self-efficacy affects how we approach challenges and reach goals. In observational learning, self-efficacy is a cognitive factor that affects which behaviors we choose to imitate as well as our success in performing those behaviors.

People who have high self-efficacy believe that their goals are within reach, have a positive view of challenges see them as tasks to be mastered, develop a deep interest in and a strong commitment to the activities in which they are involved, and quickly recover from setbacks. Conversely, people with low self-efficacy avoid challenging tasks because they doubt their ability to be successful, tend to focus on failure and negative outcomes, and lose confidence in their abilities if they experience setbacks. Feelings of self-efficacy can be specific to certain situations. For instance, a student might feel confident in her ability in English class but much less so in math class.

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Video 4.4.4. *Self-Esteem, Self-Efficacy, and Locus of Control* explains these three psychological phenomena and how they are related.

Locus of Control

Julian Rotter (1966) proposed the concept of locus of control,

another cognitive factor that affects learning and personality development. Distinct from self-efficacy, which involves our belief in our own abilities, locus of control refers to our beliefs about the power we have over our lives. In Rotter's view, people possess either an internal or an external locus of control. Those of us with an internal locus of control ("internals") tend to believe that most of our outcomes are the direct result of our efforts. Those of us with an external locus of control ("externals") tend to believe that our outcomes are outside of our control. Externals see their lives as being controlled by other people, luck, or chance. For example, say you didn't spend much time studying for your psychology test and went out to dinner with friends instead. When you receive your test score, you see that you earned a D. If you possess an internal locus of control, you would most likely admit that you failed because you didn't spend enough time studying and decide to study more for the next test. On the other hand, if you possess an external locus of control, you might conclude that the test was too hard and not bother studying for the next test because you figure you will fail it anyway. Researchers have found that people with an internal locus of control perform better academically, achieve more in their careers, are more independent, are healthier, are better able to cope, and are less depressed than people who have an external locus of control (Benassi, Sweeney, & Durfour, 1988; Lefcourt, 1982; Maltby, Day, & Macaskill, 2007; Whyte, 1977, 1978, 1980).

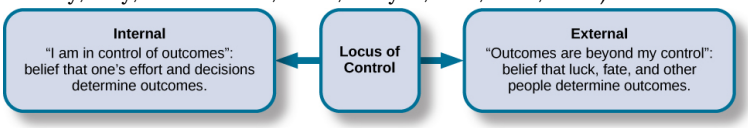

Figure 4.4.5. Locus of control occurs on a continuum from internal to external.

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here:
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Video 4.4.5. *Locus of Control*, *Learned Helplessness*, *and Tyranny of Choice* are explained.

Exercises

Take the Locus of Control Questionnaire to learn more. Scores range from 0 to 13. A low score on this questionnaire indicates an internal locus of control, and a high score indicates an external locus of control.

Self-Regulation

"Self-regulation is the process of identifying a goal or set of goals and, in pursuing these goals, using both internal (e.g., thoughts and affect) and external (e.g., responses of anything or anyone in the environment) feedback to maximize goal attainment.". Self-regulation is also known as willpower. When we talk about willpower, we tend to think of it as the ability to delay gratification. For example, Bettina's teenage daughter made strawberry cupcakes, and they looked delicious. However, Bettina forfeited the pleasure of eating one, because she is training for a 5K race and wants to be fit and do well in the race. Would you be able to resist getting a

small reward now in order to get a larger reward later? This is the question investigated in his now-classic marshmallow test.

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Video 4.4.6. *Self-Control* explains self-regulation's influence on one's ability to delay gratification and control desires.

The marshmallow test is a well-known study to assess self-regulation in young children. In the marshmallow study, Mischel and his colleagues placed a preschool child in a room with one marshmallow on the table. The children were told they could either eat the marshmallow now, or wait until the researcher returned to the room, and then they could have two marshmallows (Mischel, Ebbesen & Raskoff, 1972). This was repeated with hundreds of preschoolers. What Mischel and his team found was that young children differ in their degree of self-control. Mischel and his colleagues continued to follow this group of preschoolers through high school, and what do you think they discovered? The children who had more self-control in preschool (the ones who waited for the bigger reward) were more successful in high school. They had higher SAT scores, had positive peer relationships, and were less likely to have substance abuse issues; as adults, they also had more stable marriages (Mischel, Shoda, & Rodriguez, 1989; Mischel et al., 2010). On the other hand, those children who had poor self-control in preschool (the ones who grabbed the one marshmallow) were not as successful in high school, and they were found to have academic and behavioral problems. A more recent study using a larger and more representative sample found associations between early delay of gratification (Watts, Duncan, & Quan, 2018) and measures of

achievement in adolescence. However, researchers also found that the associations were not as strong as those reported during Mischel's initial experiment and were quite sensitive to situational factors such as early measures of cognitive capacity, family background, and home environment. This research suggests that consideration of situational factors is important to better understand behavior.

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Video 4.4.7. *Resisting the Marshmellow and the Success of Self-Control* explains the implications of self-regulation, as demonstrated by the marshmallow test.

Self-Regulation and School Success

Read more about Self-Regulation and School Success including how self-regulation impacts academic outcomes and how schools can promote self-regulation in students (Duckworth & Carlson, 2013).

Self-Regulation Questionnaire (SRQ)

The Self-Regulation Questionnaire (SRQ) Self-regulation is the ability to develop, implement, and flexibly maintain planned behavior in order to achieve one's goals. Building on the foundational work of Frederick Kanfer (Kanfer, 1970a, 1970b), Miller and Brown formulated a seven-step model of self-regulation (Brown, 1998) (Miller & Brown, 1991). In this model, behavioral self-regulation may falter because of failure or deficits at any of these seven steps:

1. Receiving relevant information
2. Evaluating the information and comparing it to norms
3. Triggering change
4. Searching for options
5. Formulating a plan
6. Implementing the plan
7. Assessing the plan's effectiveness (which recycles to steps 1 and 2)

Item	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
I usually keep track of my progress toward my goals	1	2	3	4	5
My behavior is not that different from other people's.	1	2	3	4	5
Others tell me that I keep on with things too long.	1	2	3	4	5
I doubt I could change even if I wanted to.	1	2	3	4	5
I have trouble making up my mind about things.	1	2	3	4	5
I get easily distracted from my plans.	1	2	3	4	5
I reward myself for progress toward my goals.	1	2	3	4	5
I don't notice the effects of my actions until it's too late.	1	2	3	4	5

My behavior is similar to that of my friends.	1	2	3	4	5
It's hard for me to see anything helpful about changing my ways.	1	2	3	4	5
I am able to accomplish goals I set for myself.	1	2	3	4	5
I put off making decisions.	1	2	3	4	5
I have so many plans that it's hard for me to focus on any one of them.	1	2	3	4	5
I change the way I do things when I see a problem with how things are going.	1	2	3	4	5
It's hard for me to notice when I've "had enough" (alcohol, food, sweets).	1	2	3	4	5
I think a lot about what other people think of me.	1	2	3	4	5

I am willing to consider other ways of doing things.	1	2	3	4	5
If I wanted to change, I am confident that I could do it.	1	2	3	4	5
When it comes to deciding about a change, I feel overwhelmed by the choices.	1	2	3	4	5
I have trouble following through with things once I've made up my mind to do something.	1	2	3	4	5
I don't seem to learn from my mistakes.	1	2	3	4	5
I'm usually careful not to overdo it when working, eating, drinking.	1	2	3	4	5
I tend to compare myself with other people.	1	2	3	4	5
I enjoy a routine, and like things to stay the same.	1	2	3	4	5

I have sought out advice or information about changing.	1	2	3	4	5
I can come up with lots of ways to change, but it's hard for me to decide which one to use.	1	2	3	4	5
I can stick to a plan that's working well.	1	2	3	4	5
I usually only have to make a mistake one time in order to learn from it.	1	2	3	4	5
I don't learn well from punishment.	1	2	3	4	5
I have personal standards, and try to live up to them.	1	2	3	4	5
I am set in my ways.	1	2	3	4	5
As soon as I see a problem or challenge, I start looking for possible solutions.	1	2	3	4	5

I have a hard time setting goals for myself.	1	2	3	4	5
I have a lot of willpower.	1	2	3	4	5
When I'm trying to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
I usually judge what I'm doing by the consequences of my actions.	1	2	3	4	5
I don't care if I'm different from most people.	1	2	3	4	5
As soon as I see things aren't going right I want to do something about it.	1	2	3	4	5
There is usually more than one way to accomplish something.	1	2	3	4	5
I have trouble making plans to help me reach my goals.	1	2	3	4	5
I am able to resist temptation.	1	2	3	4	5

I set goals for myself and keep track of my progress.	1	2	3	4	5
Most of the time I don't pay attention to what I'm doing.	1	2	3	4	5
I try to be like people around me.	1	2	3	4	5
I tend to keep doing the same thing, even when it doesn't work.	1	2	3	4	5
I can usually find several different possibilities when I want to change something.	1	2	3	4	5
Once I have a goal, I can usually plan how to reach it.	1	2	3	4	5
I have rules that I stick by no matter what.					
If I make a resolution to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5

Often I don't notice what I'm doing until someone calls it to my attention.	1	2	3	4	5
I think a lot about how I'm doing.	1	2	3	4	5
Usually I see the need to change before others do.	1	2	3	4	5
I'm good at finding different ways to get what I want.	1	2	3	4	5
I usually think before I act.	1	2	3	4	5
Little problems or distractions throw me off course.	1	2	3	4	5
I feel bad when I don't meet my goals.	1	2	3	4	5
I learn from my mistakes.	1	2	3	4	5
I know how I want to be.	1	2	3	4	5

It bothers me when things aren't the way I want them.	1	2	3	4	5
I call in others for help when I need it.					
Before making a decision, I consider what is likely to happen if I do one thing or another.	1	2	3	4	5
I give up quickly.	1	2	3	4	5
I usually decide to change and hope for the best.	1	2	3	4	5
TOTAL YOUR SCORE:					

> 239 High (intact) self-regulation capacity (top quartile)

214-238 Intermediate (moderate) self-regulation capacity (middle quartiles)

< 213 Low (impaired) self-regulation capacity (bottom quartile)

Sourse: Adapted from Brown, Miller, & Lawendowski, 1999.

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Constructivism in the Classroom

Behaviorist models of learning may be helpful in understanding and influencing what students do, but teachers usually also want to know what students are *thinking*, and how to enrich what students are thinking. For this goal of teaching, some of the best help comes from **constructivism**, which is a perspective on learning focused on how students actively create (or "construct") knowledge out of experiences. As discussed in the previous chapter, constructivist models of learning differ in how much a learner constructs knowledge independently, psychological constructivism, compared to how much he or she takes cues from people who may be more of an expert and who help the learner's efforts, social constructivism.

For many educators, the social context of learning is critical. Ideas are tested not just on the teacher, but by fellow students, friends, and colleagues. Furthermore, knowledge is mainly acquired through social processes or institutions that are socially constructed: schools, universities, and increasingly these days, online communities. Thus what is taken to be 'valued' knowledge is also socially constructed.

Constructivists believe that learning is a constantly dynamic process. Understanding of concepts or principles develops and becomes deeper over time. For instance, as very young children, we understand the concept of heat through touch. As we get older we realize that it can be quantified, such as minus 20 centigrade being very cold (unless you live in Manitoba, where -20C would be considered normal). As we study science, we begin to understand heat differently, for instance, as a form of energy transfer, then as a form of energy associated with the motion of atoms or molecules. Each 'new' component needs to be integrated with prior

understandings and also integrated with other related concepts, including other components of molecular physics and chemistry.

Thus 'constructivist' teachers place a strong emphasis on learners developing personal meaning through reflection, analysis, and the gradual building of layers or depths of knowledge through conscious and ongoing mental processing. Reflection, seminars, discussion forums, small group work, and projects are key methods used to support constructivist learning.

Although problem-solving can be approached in an objectivist way, by pre-determining a set of steps or processes to go through pre-determined by 'experts', it can also be approached in a constructivist manner. The level of teacher guidance can vary in a constructivist approach to problem-solving, from none at all, to providing some guidelines on how to solve the problem, to directing students to possible sources of information that may be relevant to solving that problem, to getting students to brainstorm particular solutions. Students will probably work in groups, help each other and compare solutions to the problem. There may not be considered one 'correct' solution to the problem, but the group may consider some solutions better than others, depending on the agreed criteria of success for solving the problem.

It can be seen that there can be 'degrees' of constructivism, since in practice the teacher may well act as first among equals, and help direct the process so that 'suitable' outcomes are achieved. The fundamental difference is that students have to work towards constructing their own meaning, testing it against 'reality', and further constructing meaning as a result.

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Video 4.6.1. *Constructivist Teaching Strategies* discusses the practice of constructivism in the classroom.

Both types of constructivism focus on individuals' thinking rather than their behavior, but they have distinctly different implications for teaching related to three ideas in particular: the relationship between learning and long-term development, the role or meaning of generalizations and abstractions during development, and the mechanism by which development occurs.

The Relationship Between Learning and Long-Term Development of the Learner

In general psychological constructivism such as Piaget emphasize the ways that long-term development determines a child's ability to learn, rather than the other way around. The earliest stages of a child's life are thought to be rather self-centered and to be dependent on the child's sensory and motor interactions with the environment. When acting or reacting to his or her surroundings, the child has relatively few language skills initially. This circumstance limits the child's ability to learn in the usual, school-like sense of the term. As development proceeds, of course, language skills improve, and hence the child becomes progressively more "teachable" and in this sense more able to learn. But whatever the child's age, the ability to learn waits or depends upon the child's stage of development. From this point of view, therefore, a primary responsibility of teachers is to provide a very rich classroom environment, so that children can interact with it independently and gradually make themselves ready for verbal learning that is increasingly sophisticated.

Social constructivists such as Vygotsky, on the other hand, emphasize the importance of social interaction in stimulating the development of the child. Language and dialogue, therefore, are primary, and development is seen as happening as a result—the

converse of the sequence pictured by Piaget. Obviously, a child does not begin life with a lot of initial language skills, but this fact is why interactions need to be scaffolded with more experienced experts—people capable of creating a zone of proximal development in their conversations and other interactions. In the preschool years, the experts are usually parents; after the school years begin, the experts broaden to include teachers. A teacher's primary responsibility is therefore to provide very rich opportunities for dialogue, both among children and between individual children and the teacher.

The Role of Generalizations and Abstractions During Development

Consistent with the ideas above, psychological constructivism tends to see a relatively limited role for abstract or hypothetical reasoning in the life of children—and even in the reasoning of youth and many adults. Such reasoning is regarded as an outgrowth of years of interacting with the environment very concretely. As explained more fully in the next chapter ("Student development"), elementary-age students can reason, but they are thought to reason only about immediate, concrete objects and events. Even older youth are thought to reason in this way much, or even all of the time. From this perspective, a teacher should limit the amount of thinking about abstract ideas that she expects from students. The idea of "democracy," for example, may be experienced simply as an empty concept. At most it might be misconstrued as an oversimplified, overly concrete idea—as "just" about taking votes in class, for instance. Abstract thinking *is* possible, according to psychological constructivism, but it emerges relatively slowly and relatively late in development after a person accumulates considerable concrete experience.

Social constructivism sees abstract thinking emerging from a dialogue between a relative novice (a child or youth) and a more

experienced expert (a parent or teacher). From this point of view, the more such dialogue occurs, then the more the child can acquire facility with it. The dialogue must, of course, honor a child's need for intellectual scaffolding or a zone of proximal development. A teacher's responsibility can, therefore, include engaging the child in dialogue that uses potentially abstract reasoning but without expecting the child to understand the abstractions fully at first. Young children, for example, can not only engage in science experiments like creating a "volcano" out of baking soda and water but also discuss and speculate about their observations of the experiment. They may not understand the experiment as an adult would, but the discussion can begin moving them toward adult-like understandings.

How Development Occurs

In psychological constructivism, as explained earlier, development is thought to happen because of the interplay between *assimilation* and *accommodation*—between when a child or youth can already understand or conceive of, and the change required of that understanding by new experiences. Acting together, assimilation and accommodation continually create new states of cognitive *equilibrium*. A teacher can, therefore, stimulate development by provoking cognitive dissonance deliberately: by confronting a student with sights, actions, or ideas that do not fit with the student's existing experiences and ideas. In practice, the dissonance is often communicated verbally, by posing questions or ideas that are new or that students may have misunderstood in the past. But it can also be provoked through pictures or activities that are unfamiliar to students—by engaging students in a community service project, for example, that brings them in contact with people who they had previously considered "strange" or different from themselves.

In social constructivism, as also explained earlier, development is thought to happen largely because of scaffolded dialogue in a zone of proximal development. Such dialogue is by implication less like "disturbing" students' thinking than "stretching" it beyond its former limits. The image of the teacher, therefore, is more one of collaborating with students' ideas rather than challenging their ideas or experiences. In practice, however, the actual behavior of teachers and students may be quite similar in both forms of constructivism. Any significant new learning requires setting aside, giving up, or revising former learning, and this step inevitably, therefore "disturbs" thinking, if only in the short term and only in a relatively minor way.

Implications of Constructivism for Teaching

Whether you think of yourself as a psychological constructivist or a social constructivist, there are strategies for helping students help in develop their thinking—in fact, the strategies constitute a major portion of this book, and are a major theme throughout the entire preservice teacher education programs. For now, look briefly at just two. One strategy that teachers often find helpful is to organize the content to be learned as systematically as possible because doing this allows the teacher to select and devise learning activities that are better tailored to students' cognitive abilities, that promote better dialogue, or both. The second strategy is self-assessment and self-direction of learning.

Bloom's Taxonomy

One of the most widely used frameworks for organizing content is a classification scheme proposed by the educator Benjamin Bloom,

published under the somewhat imposing title of *Taxonomy of Educational Objectives: Handbook #1: Cognitive Domain* (Bloom, et al., 1956; Anderson & Krathwohl, 2001). **Bloom's taxonomy**, as it is usually called, describes six kinds of learning goals that teachers can in principle expect from students, ranging from simple recall of knowledge to complex evaluation of knowledge. (The levels are defined briefly in Error: Reference source not found with examples from Goldilocks and the Three Bears.)

Bloom's taxonomy makes useful distinctions among possible kinds of knowledge needed by students, and therefore potentially helps in selecting activities that truly target students' *zones of proximal development* in the sense meant by Vygotsky. A student who knows few terms for the species studied in a biology unit (a problem at Bloom's *knowledge* and *comprehension* levels), for example, may initially need support in remembering and defining the terms before he or she can make useful comparisons among species (Bloom's *analysis* level). Pinpointing the most appropriate learning activities to accomplish this objective remains the job of the teacher-expert (that's you), but the learning itself has to be accomplished by the student. Put in more social constructivist terms, the teacher arranges a zone of proximal development that allows the student to compare species successfully, but the student still has to construct or appropriate the comparisons for him or herself.

Table 4.6.1. Bloom's Taxonomy of Educational Objectives

Category or type of thinking	Definition	Example
Knowledge	Remembering or recalling facts, information, or procedures	List three things Goldilocks did in the three bears' house.
Comprehension	Understanding facts, interpreting information	Explain why Goldilocks liked the little bear's chair the best.
Application	Using concepts in new situations, solving particular problems	Predict some of the things that Goldilocks might have used if she had entered your house.
Analysis	Distinguish parts of information, a concept, or a procedure	Select the part of the story where Goldilocks seemed most comfortable.
Synthesis	Combining elements or parts into a new object, idea, or procedure	Tell how the story would have been different if it had been about three fishes.
Evaluation	Assessing and judging the value or ideas, objects, or materials in a particular situation	Decide whether Goldilocks was a bad girl, and justify your position.

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Video 4.6.2. *Bloom's Taxonomy: Structuring the Learning Journey* explains the various levels and applications of this model.

Metacognition

A second strategy may be coupled with the first. As students gain experience as students, they become able to think about how they *themselves* learn best, and you (as the teacher) can encourage such self-reflection as one of your goals for their learning. These changes allow you to transfer some of your responsibilities for *arranging* learning to the students themselves. For the biology student mentioned above, for example, you may be able not only to plan activities that support comparing species but also to devise ways for the student to think about how he or she might learn the same information independently. The resulting self-assessment and self-direction of learning often go by the name of **metacognition**—an ability to think about and regulate one's own thinking (Israel, 2005). Metacognition can sometimes be difficult for students to achieve, but it is an important goal for social constructivist learning because it gradually frees learners from dependence on expert teachers to guide their learning. Reflective learners, you might say, become their own expert guides. Like with using Bloom's taxonomy, though, promoting metacognition and self-directed learning is important enough that I will come back to it later in more detail (in the chapter on "Facilitating complex thinking").

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Video 4.6.3. *What is Metacognition?* explains the process of metacognition.

By assigning a more active role to expert helpers—which by

implication includes teachers—than does the psychological constructivism, social constructivism may be more complete as a description of what teachers usually do when actually busy in classrooms, and of what they usually hope students will experience there. As we will see in the next chapter, however, there are more uses for a theory than its description of moment-to-moment interactions between teachers and students. As explained there, some theories can be helpful for planning instruction rather than for doing it. It turns out that this is the case for psychological constructivism, which offers important ideas about the appropriate sequencing of learning and development. This fact makes psychological constructivism valuable in its own way, even though it (and a few other learning theories as well) may seem to omit to mention teachers, parents, or experts in detail. So do not make up your mind about the relative merits of different learning theories yet!

Five "E" Model

A popular model for implementing constructivism in the classroom has been defined by the Biological Science Curriculum Study (BSCS). This model suggests that constructivist lessons should engage students, allow them to explore, aid them in explaining their experience, learning is elaborated, and the lesson includes evaluation.

Engage

In the Engage stage, students have their first encounter with the lesson topic. Through questions, thinking, and discussion, students begin to make connections between previous knowledge and the

present learning experiences. This process of engagement helps assess current understanding, establishes the organizational groundwork for the lesson ahead, and stimulates student involvement in the anticipation of learning. This is the opportunity to grab the students' attention and get them excited about what they will be learning. Teachers might ask questions, present a problem, or facilitate some discussion to engage and motivate students.

Explore

In the Exploration stage, the students directly explore the topic of the lesson and related materials. These activities are experiences that ground students in the lesson. Students can work independently, but working in groups allows students to learn from others and build a common understanding of the topic of the lesson. Group work also encourages communication about the topic, which may assist them with sharing what they are learning in subsequent stages. During this stage, the teacher is a facilitator. They provide materials and guidance but allow the students to guide their inquiry. The teacher may ask questions to stimulate students' thinking or give support, but exploration is about students' discovery. Direct instruction should be minimal, if at all.

Explain

The third stage, Explain, is the point at which the learner begins to put the experience of the activity into a communicable form. Students may need to articulate the process they used, the sequence of events, their thought processes, and results. Communication may occur within the learner, with peers, or with

the teacher. Sometimes even all three. Again, working in groups, learners support each other's understanding as they articulate their observations, ideas, questions, and hypotheses. Explanations from the teacher, an expert, can aid novices with acquiring and using language to articulate their learning. For example, a student, through exploration, may report that magnets "stick" to metallic objects. The teacher, in their discussion with the student, can introduce terminology to replace the novice term "stick" by referring to "an attracting force". Introducing terminology after the student has had the experience is more meaningful because the learner now has context to which to attach that term. Establishing a common language for concepts enhances the communication between teachers and students and aids the teacher in determining the students' understanding and possible misconceptions.

Elaborate

In the fourth stage, Elaborate, students expand on the concepts learned, make connections to other related concepts, and apply their understandings to their world. For example, while exploring light phenomena, a learner constructs an understanding of the path light travels through space. Examining a lamppost, she may notice that the shadow of the post changes its location as the day grows later. This observation can lead to further inquiry as to possible connections between the shadow's changing location and the changes in direction of the light source, the Sun. Applications to real-world events, such as where to plant flowers so that they receive sunlight most of the day, or how to prop up a beach umbrella for shade from the Sun, are both extensions and applications of the concept that light travels in a straight path. These connections often lead to further inquiry and new understandings.

Evaluate

Evaluate, the final stage, is actually an ongoing process of assessing students' understanding and knowledge of concepts. Assessment can occur at all stages instructional process, but a more formal assessment is typically done to determine whether learning objectives have been met. Evaluation and assessment might be informal, like posing questions for students to answer in class or listening in on conversations that groups are having during the activity. Evaluation can also be formal, such as a test, report, or prepared presentation. Tools such as rubrics and checklists can be helpful in evaluating outcomes. Concrete evidence of the learning process is most valuable in communications between students, teachers, parents, and administrators.

Evaluation does not need to be the end. The results of the evaluation might guide the development of future lessons and activities. The evaluation might reveal gaps in learning that need further enrichment. They also provide useful feedback so the teacher can make modifications and improvements to the lesson for next time. The evaluation process is a continuous one that gives the constructivist philosophy a cyclical structure where questions lead to answers that lead to more questions and instruction is driven by both the planned lesson and the inquiry process.

The Five "E" Model Demonstrated

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Video 4.6.4. *Constructivism* demonstrates the Five "E" model.

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Information Processing Approach in the Classroom

We previously reviewed the Information Processing Approach to cognition, but how do teachers apply this approach to teaching and learning?

Cognitive Load Theory

The information-processing model has given rise to a theory of instructional design called *cognitive load theory* (Sweller & Chandler, 1994; van Merriënboer & Sweller, 2005). Because working memory is the principal player in the process of learning new information, cognitive load theory focuses exclusively on working memory. The gist of this theory is that there are distinct types of demands imposed upon working memory during learning: intrinsic, extraneous, and germane. We now examine each of these.

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Video 4.7.1. *Cognitive Load Theory* explained.

Intrinsic Cognitive Load

Intrinsic cognitive load represents the burden imposed on working memory by the inherent nature of the material. In other words, simple topics require very little processing capacity in working memory, and complex topics demand a large amount of space. For example, it requires considerably more focus to safely drive a semi-truck through a rainstorm than to sign your name with a pen on paper. Driving the semi requires attention to many different information inputs (e.g., gauges, mirrors, windshield) and coordinating the requisite motor skills in response; all of this processing is conducted in working memory. Signing one's name takes barely any attention at all (for adults) because it has been done thousands of times before. Thus, the effect of having practiced the skill reduces its intrinsic cognitive load.

But practice alone cannot reduce the intrinsic cognitive load of all tasks. The *element interactivity* (i.e., coordination among multiple aspects) inherent in some tasks cannot ultimately reduce the task to a trivial activity, even with extensive practice. If that were the case, we should all be capable of becoming skilled airline pilots or successful politicians.

For beginners learning an essential skill, element interactivity becomes problematic and must be temporarily reduced. When learning a language, one first learns the alphabet and then proceeds to acquire simple words or phrases—not complex prose. But one cannot be considered proficient in a language unless one can understand its complex prose. This is an example of element interactivity because understanding prose depends upon not only understanding its nouns, verbs, adverbs, etc., but also how each of them modifies or alters the meaning of other words nearby. Topics or skills that contain element interactivity must at first be oversimplified and then gradually built up to their full complexity before one can successfully deal with the intrinsic cognitive load.

Extraneous Cognitive Load

Extraneous cognitive load is the set of mental demands that are irrelevant to the current task, consuming precious cognitive resources yet not providing any real benefit to the task of understanding. It is critical to realize that various forms of cognitive load are *additive*—that is, they each increase the amount of processing space that is active in working memory. For example, if the intrinsic load is already high, there is not much room for any extraneous load unless the learner decides (like Pierre) to reduce the processing of the intrinsic load and focus more on the extraneous load. Teachers should strive to reduce extraneous cognitive load in their classrooms because students are likely to sacrifice attention to important material and distract themselves with extraneous stimuli.

Extraneous cognitive load is, for the most part, under the direct control of the teacher. Have you ever seen presentations that were decorated with graphics that were only tangentially related to the content? You probably found yourself sidelined by the images and not paying sufficient attention to the material itself. Because working memory has such a limited capacity, we cannot afford to "clutter up" this valuable space with unproductive ideas that divert attention from more important content. As a teacher, you should make earnest efforts to avoid exposing students to extra "fluff" during learning activities.

How To Reduce Extraneous Cognitive Load

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Video 4.7.2. *Cognitive Load Theory, How Do I Apply It?* provides some suggestions for how to reduce extraneous cognitive load in the presentation of information.

Germane Cognitive Load

Germane cognitive load has been explained in various ways. The explanation I prefer is the more traditional characterization that germane load represents increased demand upon working memory in the service of the learning goal. This can be explained more easily through an example. Most (if not all) languages have forms of expression that are not appropriate for all audiences. For example, in English one would not address the President of the United States in the same informal way as one would address a close friend ("*How is your day going, Mr. President?*" versus "*Hey dude, whazzup?*"). The meaning of the utterance expressed to these two individuals may be the same, but the words and intonation are somewhat different.

If an international student were learning English, it would be important for the language teacher to communicate not only the meaning of the words (intrinsic load) but also the contexts in which those words are appropriate (germane load). Learning the situations in which certain phrases are most appropriately used goes beyond intrinsic load but could hardly be considered extraneous if one's purpose is to learn the language well.

It goes without saying that beginning learners should not be exposed to germane cognitive load; the intrinsic load for many tasks is of sufficient complexity that beginners cannot handle any additional processing burdens. However, as learning proceeds and the intrinsic load becomes more and more automatized, teachers can add aspects of additional complexity that enhance students' understanding of the material in a germane way.

Principles of Effective Learning

We now turn to a few empirical principles, derived from decades of research, that are known to improve learning. These principles will not all apply to every learning situation; however, each of them has been sufficiently demonstrated through carefully controlled scientific studies to merit mentioning them here.

The overarching goal here is to select processing strategies that will increase the likelihood of a learner recalling new information at a later point in time.

Activate Prior Knowledge

One of the most important cognitive principles for a teacher to keep in mind is the importance of relating information from long-term memory to information newly entering the system. Recall our

discussion of elaborative rehearsal earlier, in which I indicated that making a connection to prior knowledge is a superior learning method to simply repeating information over and over without altering it.

Any good lesson-plan format begins the class with some form of prior-knowledge activation. It might be a reminder or a brief review of what was studied in the previous day's lesson, or it could be a question similar to, "Have you ever had a problem you couldn't solve?" The purpose of this phase of the lesson is to activate prior knowledge–i.e., bring long-term memories back into working memory–so that new knowledge can be mingled with old with the result of a more solid understanding of the new (and perhaps even the old) information.

Organization

This is one principle that applies to a rather restricted set of instructional situations, but it is so powerful that it deserves mention here. In contexts where there is a list of items to commit to memory, the task of memorizing the list will be much easier if the items are grouped together (i.e., organized) in a meaningful way. This also works as a basic memory strategy in everyday life—think about your latest visit to the grocery store and imagine remembering a rather random assortment of items versus grouping the dairy items together, the produce items together, etc.

Deep Processing

It is easy to become convinced that if a student spends, say, twenty hours reviewing for an exam, that student should be expected to excel on the exam. However, cognitive studies show that it is not

specifically the *time* one spends studying that matters most; what one *does* during that time matters even more.

Consider, for example, the all-too-common exam-preparation strategy of using flashcards. Students often take terms from the textbook or class discussions, write them down on flashcards, and then rehearse what is written down until the flashcards are memorized. Such a student will walk into the exam confident that the material has been thoroughly mastered. The problem with this approach to studying is that the student has only done "surface-level processing" of the material, rather than "deep" processing. It is surface-level because the student has memorized terms and definitions rather than truly understanding the meaning and applications of those concepts.

Deep processing happens when one uses **elaborative rehearsal** to connect a concept to other concepts that are already known or are being learned. For example, one could write a summary of a concept in one's own words to check for comprehension. Another approach to facilitate deep processing is to think of examples of the newly learned concept from one's own life. One could even make up fictitious examples of the concept if no examples come to mind from one's past experience.

The point is, learning that comes from surface-level processing is not durable. One does not remember the content of flashcards for very long after the exam. But spending the same amount of time (or even less time) meaningfully engaged with the to-be-learned ideas can result in learning that could last for a lifetime.

Distributed Practice

There is one final principle for effective learning that must be mentioned here. To be the most effective learner, one should "space" or "distribute" one's studying over a period of time. Attempting to cram a lot of learning into one or two concentrated

study sessions rarely works. Research cannot prescribe the specific number or length of study sessions required to maximize learning—there are too many variables to account for (e.g., one's prior knowledge of the topic, one's knowledge of related topics, the quality of one's study strategies, etc.). But the benefits of distributing one's study sessions over a period of time are well documented in the research literature.

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Chapter Summary: The Learning Process

Although the term learning has many possible meanings, the term as used by teachers emphasizes its relationship to curriculum, to teaching, and to the issues of sequencing, readiness, and transfer. Viewed in this light, the major psychological perspectives of learning—behaviorism, social cognitive theory, constructivism, and information processing—have important ideas to offer educators. Within the behaviorist perspective, classical conditioning and operant conditioning attempt to explain why students behave as they do, but they offer less help in understanding how they think.

Social cognitive theory also focuses on behavior but also considered the mental processes involved in learning and behavior. Reciprocal determinism emphasizes the interaction between personal factors, the environment, and behavior. Observational learning explains the process steps of learning, through attention, retention, reproduction, and motivation. Finally, self-efficacy and self-regulation were discussed as factors that influence student behavior and success.

Meanwhile, constructivism describes how individuals build or "construct" knowledge by engaging actively with their experiences. Psychological constructivism emphasizes the learners' individual responses to experience—their tendency both to assimilate it and to accommodate it. Social constructivism (or sociocultural theory) emphasizes how other, more expert individuals can create opportunities for the learner to construct new knowledge. Social constructivism suggests that a teacher's role must include deliberate, scaffolded dialogue. It also needs to include deliberate instructional planning, such as facilitated by Bloom's taxonomy of learning objectives. Both of these strategies can promote students' metacognition, or the ability to monitor their own learning.

Psychological emphasizes the teacher's responsibility for arranging a rich learning environment and for emphasizing rich sensory, motor, and concrete experiences wherever possible.

Finally, the information processing approach describes various aspects of cognition that influence learning. Attention and memory, including cognitive loads and processing, can help or hinder the learning process.

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FACILITATING COMPLEX THINKING

Theme: *How Students Think*

Overview of Content:

- Thinking Skills: Critical Thinking, Creative Thinking, and Problem Solving

Learning Objectives:

- Explain critical thinking and how to foster it
- Define problem-solving and the differences in well-defined and ill-defined problems
- Discuss the roles of algorithms, heuristics and the IDEAL approach

Complex Thinking

As we will indicate in this chapter repeatedly, forms of thinking require choices among instructional strategies. To support this idea, we begin the chapter by discussing three kinds of complex thinking in turn: critical thinking, creativity, and problem-solving. We consider how each can be facilitated by appropriate teaching strategies. Then we discuss several broad strategies for encouraging complex thinking, including some that are teacher-directed and others that rely more heavily on students' initiative.

Although instructional strategies differ in their details, they each encourage particular forms of learning and thinking. The forms have distinctive educational purposes, even though they sometimes overlap, in the sense that one form may contribute to success with another form. Consider three somewhat complex forms of thinking that are commonly pursued in classroom learning: (1) critical thinking, (2) creative thinking, and (3) problem-solving

Critical Thinking

Critical thinking requires skill at analyzing the reliability and validity of information, as well as the attitude or disposition to do so. The skill and attitude may be displayed with regard to a particular subject matter or topic, but in principle, it can occur in any realm of knowledge (Halpern, 2003; Williams, Oliver, & Stockade, 2004). A critical thinker does not necessarily have a negative attitude in the everyday sense of constantly criticizing someone or something. Instead, he or she can be thought of as *astute*: the critical thinker asks key questions, evaluates the evidence for ideas, reasons for problems both logically and objectively, and expresses ideas and conclusions clearly and precisely. Last (but not least), the critical thinker can apply these habits of mind in more than one realm of life or knowledge.

Figure 5.2.1. Model of critical thinking.

With such a broad definition, it is not surprising that educators have suggested a variety of specific cognitive skills as contributing to critical thinking. In one study, for example, the researcher found how critical thinking can be reflected in regard to a published article that was stimulated by **annotation**—writing questions and comments in the margins of the article (Liu, 2006). In this study, students were initially instructed in ways of annotating reading materials. Later, when the students completed additional readings for assignments, it was found that some students in fact used their annotation skills much more than others—some simply underlined passages, for example, with a highlighting pen. When essays written about the readings were later analyzed, the ones written by the annotators were found to be better reasoned—more critically astute—than the essays written by the other students.

In another study, on the other hand, a researcher found that critical thinking can also involve oral discussion of personal issues or dilemmas (Hawkins, 2006). In this study, students were asked to verbally describe a recent, personal incident that disturbed them. Classmates then discussed the incident together in order to identify the precise reasons why the incident was disturbing, as well as the assumptions that the student made in describing the incident. The original student—the one who had first told the story—then used the results of the group discussion to frame a topic for a research essay. In one story of a troubling incident, a student told of a time when a store clerk has snubbed or rejected the student during a recent shopping errand. Through discussion, classmates decided that an assumption underlying the student's disturbance was her suspicion that she had been a victim of racial profiling based on her skin color. The student then used this idea as the basis for a research essay on the topic of "racial profiling in retail stores." The oral discussion thus stimulated critical thinking in the student and the classmates, but it also *relied* on their prior critical thinking skills at the same time.

Notice that in both of these research studies, as in others like

them, what made the thinking "critical" was students' use of **metacognition**—strategies for thinking *about* thinking and for monitoring the success and quality of one's own thinking. This concept was discussed in the chapter, "The learning process," as a feature of constructivist views about learning. There we pointed out that when students acquire experience in building their own knowledge, they also become skilled both at knowing *how* they learn, and at knowing *whether* they have learned something well. These are two defining qualities of metacognition, but they are part of critical thinking as well. In fostering critical thinking, a teacher is really fostering a student's ability to construct or control his or her own thinking and to avoid being controlled by ideas unreflectively.

How best to teach critical thinking remains a matter of debate. One issue is whether to infuse critical skills into existing courses or to teach them through separate, free-standing units or courses. The first approach has the potential advantage of integrating critical thinking into students' entire educations. But it risks diluting students' understanding and use of critical thinking simply because critical thinking takes on a different form in each learning context. Its details and appearance vary among courses and teachers. The free-standing approach has the opposite qualities: it stands a better chance of being understood clearly and coherently but at the cost of obscuring how it is related to other courses, tasks, and activities. This dilemma is the issue—again—of **transfer.** Unfortunately, research to compare the different strategies for teaching critical thinking does not settle the matter. The research suggests simply that either infusion or free-standing approaches can work as long as it is implemented thoroughly and teachers are committed to the value of critical thinking (Halpern, 2003).

A related issue about teaching critical thinking is about deciding who needs to learn critical thinking skills the most. Should it be all students or only some of them? Teaching all students seems the more democratic alternative and thus appropriate for educators. Surveys have found, however, that teachers sometimes favor the teaching of critical thinking only to high-advantage students—the

ones who already achieve well, who come from relatively high-income families, or (for high school students) who take courses intended for university entrance (Warburton & Torff, 2005). Presumably, the rationale for this bias is that high-advantage students can benefit and/or understand and use critical thinking better than other students. Yet, there is little research evidence to support this idea, even if it were not ethically questionable. The study by Hawkins (2006) described above, for example, is that critical thinking was fostered even with students considered low-advantage.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=78#oembed-1

Video 5.2.1. *Challenging Students to Think Critically* suggests was to encourage critical thinking.

Teaching Critical Thinking

For suggestions on teaching and fostering critical thinking skills at all academic levels, visit the library at The Foundation for Critical Thinking.

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Creative Thinking

Creativity is the ability to make or do something new that is also useful or valued by others (Gardner, 1993). The "something" can be an object (like an essay or painting), a skill (like playing an instrument), or an action (like using a familiar tool in a new way). To be creative, the object, skill, or action cannot simply be bizarre or strange; it cannot be new without also being useful or valued, and not simply be the result of an accident. If a person types letters at random that form a poem by chance, the result may be beautiful, but it would not be creative by the definition above. Viewed this way, creativity includes a wide range of human experiences that many people, if not everyone, have had at some time or other (Kaufman & Baer, 2006). The experience is not restricted to a few geniuses, nor exclusive to specific fields or activities like art or the composing of music.

Especially important for teachers are two facts. The first is that an important form of creativity is **creative thinking**, the generation of ideas that are new as well as useful, productive, and appropriate. The second is that creative thinking can be stimulated by teachers' efforts. Teachers can, for example, encourage students' **divergent thinking**—ideas that are open-ended and that lead in many directions (Torrance, 1992; Kim, 2006). Divergent thinking is stimulated by open-ended questions—questions with many possible answers, such as the following:

- How many uses can you think of for a cup?
- Draw a picture that somehow incorporates all of these words: cat, fire engine, and banana.
- What is the most unusual use you can think of for a shoe?

Note that answering these questions creatively depends partly on having already acquired knowledge about the objects to which the questions refer. In this sense, divergent thinking depends partly

on its converse, **convergent thinking**, which is focused, logical reasoning about ideas and experiences that lead to specific answers. Up to a point, then, developing students' convergent thinking—as schoolwork often does by emphasizing mastery of content—facilitates students' divergent thinking indirectly, and hence also their creativity (Sternberg, 2003; Runco, 2004; Cropley, 2006). But carried to extremes, excessive emphasis on convergent thinking may discourage creativity.

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https://edpsych.pressbooks.sunycreate.cloud/?p=79#oembed-1

Video 5.3.1. *Convergent Thinking Versus Divergent Thinking* explains the difference between these different approaches to thinking.

Whether in school or out, creativity seems to flourish best when the creative activity is its own intrinsic reward, and a person is relatively unconcerned with what others think of the results. Whatever the activity—composing a song, writing an essay, organizing a party, or whatever—it is more likely to be creative if the creator focuses on and enjoys the activity in itself, and thinks relatively little about how others may evaluate the activity (Brophy, 2004). Unfortunately, encouraging students to ignore others' responses can sometimes pose a challenge for teachers. Not only is it the teachers' job to evaluate students' learning of particular ideas or skills, but also they have to do so within restricted time limits of a course or a school year. In spite of these constraints, though, creativity still can be encouraged in classrooms at least some of the time (Claxton, Edwards, & Scale-Constantinou, 2006). Suppose, for example, that students have to be assessed on their understanding and use of particular vocabulary. Testing their understanding may

limit creative thinking; students will understandably focus their energies on learning "right" answers for the tests. But assessment does not have to happen constantly. There can also be times to encourage experimentation with vocabulary through writing poems, making word games, or in other thought-provoking ways. These activities are all potentially creative. To some extent, therefore, learning content and experimenting or playing with content can both find a place—in fact one of these activities can often support the other. We return to this point later in this chapter, when we discuss student-centered strategies of instruction, such as cooperative learning and play as a learning medium
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Problem-Solving

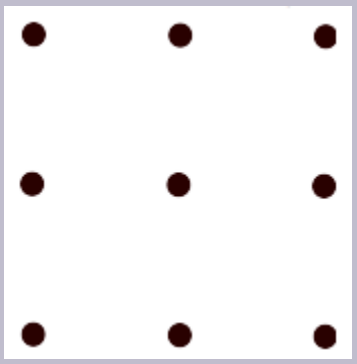
Somewhat less open-ended than creative thinking is **problem-solving**, the analysis and solution of tasks or situations that are complex or ambiguous and that pose difficulties or obstacles of some kind (Mayer & Wittrock, 2006). Problem-solving is needed, for example, when a physician analyzes a chest X-ray: a photograph of the chest is far from clear and requires skill, experience, and resourcefulness to decide which foggy-looking blobs to ignore, and which to interpret as real physical structures (and therefore real medical concerns). Problem-solving is also needed when a grocery store manager has to decide how to improve the sales of a product: should she put it on sale at a lower price, or increase publicity for it, or both? Will these actions actually increase sales enough to pay for their costs?

PROBLEM-SOLVING IN THE CLASSROOM

Problem-solving happens in classrooms when teachers present tasks or challenges that are deliberately complex and for which finding a solution is not straightforward or obvious. The responses of students to such problems, as well as the strategies for assisting them, show the key features of problem-solving. Consider this example and students' responses to it. We have numbered and named the paragraphs to make it easier to comment about them individually:

Scene #1: A problem to be solved

A teacher gave these instructions: "Can you connect all of the dots below using only ***four*** straight lines?" She drew the following display on the chalkboard:



The problem itself and the procedure for solving it seemed very clear: simply experiment with different arrangements of four lines. But two volunteers tried doing it at the board, but were unsuccessful. Several others worked at it at their seats, but also without success.

Scene #2: Coaxing students to re-frame the problem

When no one seemed to be getting it, the teacher asked, "Think about how you've set up the problem in your mind—about what you believe the problem is about. For

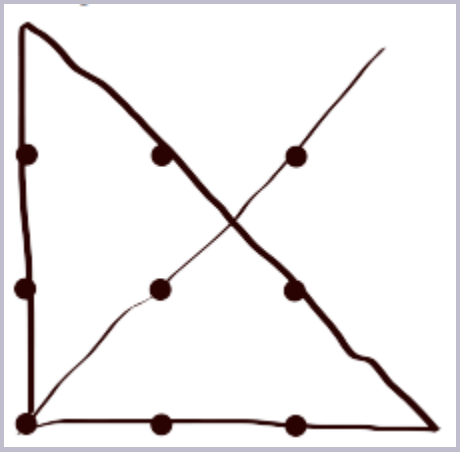
instance, have you made any assumptions about how long the lines ought to be? Don't stay stuck on one approach if it's not working!"

Scene #3: Alicia abandons a fixed response

After the teacher said this, Alicia indeed continued to think about how she saw the problem. "The lines need to be no longer than the distance across the square," she said to herself. So she tried several more solutions, but none of them worked either.

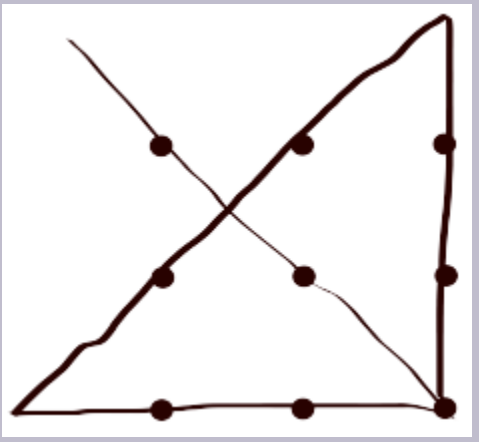
The teacher walked by Alicia's desk and saw what Alicia was doing. She repeated her earlier comment: "Have you assumed anything about how long the lines ought to be?"

Alicia stared at the teacher blankly, but then smiled and said, "Hmm! You didn't actually **say** that the lines could be no longer than the matrix! Why not make them longer?" So she experimented again using oversized lines and soon discovered a solution:



Scene #4: Willem's and Rachel's alternative strategies

Meanwhile, Willem worked on the problem. As it happened, Willem loved puzzles of all kinds and had ample experience with them. He had not, however, seen this particular problem. "It **must** be a trick," he said to himself because he knew from experience that problems posed in this way often were not what they first appeared to be. He mused to himself: "Think outside the box, they always tell you. . ." And **that** was just the hint he needed: he drew lines outside the box by making them longer than the matrix and soon came up with this solution:



When Rachel went to work, she took one look at the problem and knew the answer immediately: she had seen this problem before, though she could not remember where. She had also seen other drawing-related puzzles and knew that their solution always depended on making the lines longer, shorter, or differently angled than first expected. After staring at the dots briefly, she drew a solution faster than Alicia or even Willem. Her solution looked exactly like Willem's.

This story illustrates two common features of problem-solving: the effect of degree of structure or constraint on problem-solving, and the effect of mental obstacles to solving problems. The next sections discuss each of these features and then look at common techniques for solving problems.

The Effect of Constraints: Well-Structured Versus Ill-Structured Problems

Problems vary in how much information they provide for solving a problem, as well as in how many rules or procedures are needed for a solution. A **well-structured problem** provides much of the information needed and can in principle be solved using relatively few clearly understood rules. Classic examples are the word problems often taught in math lessons or classes: everything you need to know is contained within the stated problem and the solution procedures are relatively clear and precise. An **ill-structured problem** has the converse qualities: the information is not necessarily within the problem, solution procedures are potentially quite numerous, and multiple solutions are likely (Voss, 2006). Extreme examples are problems like "How can the world achieve lasting peace?" or "How can teachers ensure that students learn?"

By these definitions, the nine-dot problem is relatively well-structured—though not completely. Most of the information needed for a solution is provided in Scene #1: there are nine dots shown and instructions given to draw four lines. But not *all* necessary information was given: students needed to consider lines that were longer than implied in the original statement of the problem. Students had to "think outside the box," as Willem said—in this case, literally.

When a problem is well-structured, so are its solution procedures likely to be as well. A well-defined procedure for solving a particular kind of problem is often called an **algorithm**; examples are the procedures for multiplying or dividing two numbers or the instructions for using a computer (Leiserson, et al., 2001). Algorithms are only effective when a problem is very well-structured and there is no question about whether the algorithm is an appropriate choice for the problem. In that situation, it pretty much guarantees a correct solution. They do not work well,

however, with ill-structured problems, where they are ambiguities and questions about how to proceed or even about precisely *what* the problem is about. In those cases, it is more effective to use **heuristics**, which are general strategies—"rules of thumb," so to speak—that do not always work but often do, or that provide at least partial solutions. When beginning research for a term paper, for example, a useful heuristic is to scan the library catalog for titles that look relevant. There is no guarantee that this strategy will yield the books most needed for the paper, but the strategy works enough of the time to make it worth trying.

In the nine-dot problem, most students began in Scene #1 with a simple algorithm that can be stated like this: "Draw one line, then draw another, and another, and another." Unfortunately, this simple procedure did not produce a solution, so they had to find other strategies for a solution. Three alternatives are described in Scenes #3 (for Alicia) and 4 (for Willem and Rachel). Of these, Willem's response resembled a heuristic the most: he knew from experience that a good *general* strategy that *often* worked for such problems was to suspect deception or trick in how the problem was originally stated. So he set out to question what the teacher had meant by the word *line* and came up with an acceptable solution as a result.

Common Obstacles to Solving Problems

The example also illustrates two common problems that sometimes happen during problem-solving. One of these is **functional fixedness**: a tendency to regard the *functions* of objects and ideas as *fixed* (German & Barrett, 2005). Over time, we get so used to one particular purpose for an object that we overlook other uses. We may think of a dictionary, for example, as necessarily something to verify spellings and definitions, but it also can function as a gift, a doorstop, or a footstool. For students working on the nine-dot matrix described in the last section, the notion of "drawing"

a line was also initially fixed; they assumed it to be connecting dots but not extending lines beyond the dots. Functional fixedness sometimes is also called **response set**, the tendency for a person to frame or think about each problem in a series in the same way as the previous problem, even when doing so is not appropriate for later problems. In the example of the nine-dot matrix described above, students often tried one solution after another, but each solution was constrained by a set response *not* to extend any line beyond the matrix.

Functional fixedness and the response set are obstacles in **problem representation**, the way that a person understands and organizes information provided in a problem. If information is misunderstood or used inappropriately, then mistakes are likely—if indeed the problem can be solved at all. With the nine-dot matrix problem, for example, construing the instruction to draw four lines as meaning "draw four lines entirely within the matrix" means that the problem simply could not be solved. For another, consider this problem: "The number of water lilies on a lake doubles each day. Each water lily covers exactly one square foot. If it takes 100 days for the lilies to cover the lake exactly, how many days does it take for the lilies to cover exactly half of the lake?" If you think that the size of the lilies affects the solution to this problem, you have not represented the problem correctly. Information about lily size is *not* relevant to the solution and only serves to distract from the truly crucial information, the fact that the lilies *double* their coverage each day. (The answer, incidentally, is that the lake is half covered in 99 days; can you think why?)

Strategies to Assist Problem-Solving

Just as there are cognitive obstacles to problem-solving, there are also general strategies that help the process be successful, regardless of the specific content of a problem (Thagard, 2005). One

helpful strategy is **problem analysis**—identifying the parts of the problem and working on each part separately. Analysis is especially useful when a problem is ill-structured. Consider this problem, for example: "Devise a plan to improve bicycle transportation in the city." Solving this problem is easier if you identify its parts or component subproblems, such as (1) installing bicycle lanes on busy streets, (2) educating cyclists and motorists to ride safely, (3) fixing potholes on streets used by cyclists, and (4) revising traffic laws that interfere with cycling. Each separate subproblem is more manageable than the original, general problem. The solution of each subproblem contributes to the solution of the whole, though of course is not equivalent to a whole solution.

Another helpful strategy is **working backward** *from* a final solution to the originally stated problem. This approach is especially helpful when a problem is well-structured but also has elements that are distracting or misleading when approached in a forward, normal direction. The water lily problem described above is a good example: starting with the day when *all* the lake is covered (Day 100), ask what day would it, therefore, be *half-covered* (by the terms of the problem, it would have to be the day before, or Day 99). Working backward, in this case, encourages reframing the extra information in the problem (i. e. the size of each water lily) as merely distracting, not as crucial to a solution.

A third helpful strategy is **analogical thinking**—using knowledge or experiences with similar features or structures to help solve the problem at hand (Bassok, 2003). In devising a plan to improve bicycling in the city, for example, an analogy of cars with bicycles is helpful in thinking of solutions: improving conditions for both vehicles requires many of the same measures (improving the roadways, educating drivers). Even solving simpler, more basic problems is helped by considering analogies. A first-grade student can partially decode unfamiliar printed words by analogy to words he or she has learned already. If the child cannot yet read the word *screen*, for example, he can note that part of this word looks similar to words he may already know, such as *seen* or *green*, and from this

observation derive a clue about how to read the word *screen*. Teachers can assist this process, as you might expect, by suggesting reasonable, helpful analogies for students to consider.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=80#oembed-1

Video 5.4.1. *Problem Solving* explains strategies used for solving problems.

IDEAL

Many systems for problem-solving can be taught to learners (Pressley, 1995). There are problem-solving strategies to improve general problem solving (Burkell, Schneider, & Pressley, 1990; Mayer, 1987; Sternberg, 1988), scientific thinking (Kuhn, 1989), mathematical problem solving (Schoenfeld, 1989), and writing during the elementary years (Harris & Graham, 1992a) and during adolescence (Applebee, 1984; Langer & Applebee, 1987).

A problem-solving system that can be used in a variety of curriculum areas and with a variety of problems is called IDEAL (Bransford & Steen, 1984). IDEAL
involves five stages of problem-solving:

1. Identify the problem. Learners must know what the problem is before they can solve it. During this stage of problem-solving, learners ask
themselves whether they understand what the problem is and

whether they have stated it clearly.
2. Define terms. During this stage, learners check whether they understand what each word in the problem statement means.
3. Explore strategies. At this stage, learners compile relevant information and try out strategies to solve the problem. This can involve drawing diagrams, working backward to solve a mathematical or reading comprehension problem, or breaking complex problems into manageable units.
4. Act on the strategy. Once learners have explored a variety of strategies, they select one and now use it.
5. Look at the effects. During the final stage of the IDEAL method, learners ask themselves whether they have come up with an acceptable solution.

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Video 5.4.2. *The Problem Solving Model* explains the process involved in solving problems. These steps can be explicitly taught to enhance problem-solving skills.
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Instructional Strategies that Stimulate Complex Thinking

Because the forms of thinking just described—critical thinking, creativity and problem solving—are broad and important educationally, it is not surprising that educators have identified strategies to encourage their development. Some of the possibilities are shown in the figure below and group several instructional strategies along two dimensions: how much the strategy is student-centered and how much a strategy depends on group interaction. It should be emphasized that the two-way classification in Table 1 is not very precise, but it gives a useful framework for understanding the options available for planning and implementing instruction. The more important of the two dimensions in the table is the first one—the extent to which an instructional strategy is either directed by the teacher or initiated by students. We take a closer look at this dimension in the next part of this chapter, followed by discussion of group-oriented teaching strategies.

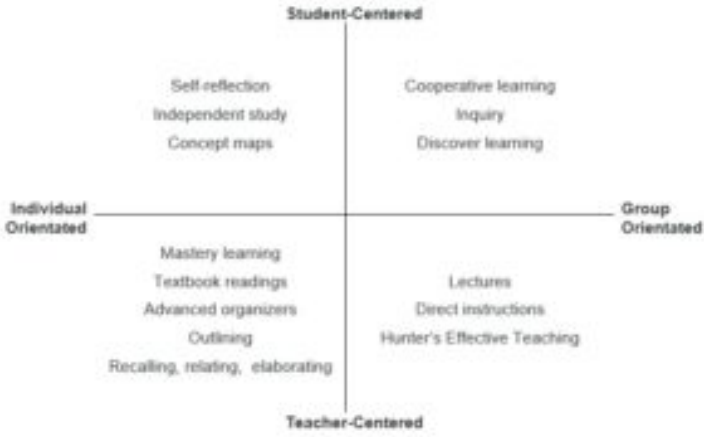

Figure 5.5.1. Instructional strategies to facilitate complex thinking.

DEFINITIONS OF TERMS IN Figure 5.5.1

- **Lecture:** Telling or explaining previously organized information—usually to a group
- **Assigned reading:** Reading, usually individually, of previously organized information
- **Advance organizers:** Brief overview, either verbally or graphically, of material about to be covered in a lecture or text
- **Outlining:** Writing important points of a lecture or reading, usually in a hierarchical format
- **Taking notes:** Writing important points of a lecture or reading, often organized according to the learning needs of an individual student
- **Concept maps:** Graphic depiction of relationships among a set of concepts, terms, or ideas; usually organized by the student, but not always
- **Madeline Hunter's "Effective Teaching":** A set of strategies that emphasizes clear presentation of goals, the explanation and modeling of tasks to students and careful monitoring of students' progress toward the goals

Teacher-Directed Instruction

As the name implies, teacher-directed instruction includes any strategies initiated and guided primarily by the teacher. A classic example is exposition or lecturing (simply telling or explaining important information to students) combined with assigning reading from texts. But teacher-directed instruction also includes strategies that involve a more active response from students, such as encouraging students to elaborate on new knowledge or to explain how new information relates to prior knowledge. Whatever their form, teacher-directed instructional methods normally include the organizing of information on behalf of students, even if teachers also expect students to organize it further on their own. Sometimes, therefore, teacher-directed methods are thought of as transmitting knowledge from teacher to student as clearly and efficiently as possible, even if they also require mental work on the part of the student.

Lectures and Readings

Lectures and readings are traditional staples of educators, particularly with older students (including university students). At their best, they pre-organize information so that (at least in theory) the student only has to remember what was said in the lecture or written in the text in order to begin understanding it (Exley & Dennick, 2004). Their limitation is the ambiguity of the responses they require: listening and reading are by nature quiet and stationary, and do not in themselves indicate whether a student is comprehending or even attending to the material. Educators sometimes complain that "students are too passive" during lectures or when reading. But physical quietness is intrinsic to these activities, not to the students who do them. A book just sits still,

after all, unless a student makes an effort to read it, and a lecture may not be heard unless a student makes the effort to listen to it.

Advance Organizers

In spite of these problems, there are strategies for making lectures and readings effective. A teacher can be especially careful about organizing information *for* students, and she can turn part of the mental work over to students themselves. An example of the first approach is the use of **advance organizers**—brief overviews or introductions to new material before the material itself is presented (Ausubel, 1978). Textbook authors (including ourselves) often try deliberately to insert periodic advance organizers to introduce new sections or chapters in the text. When used in a lecture, advance organizers are usually statements in the form of brief introductory remarks, though sometimes diagrams showing relationships among key ideas can also serve the same purpose (Robinson, et al., 2003). Whatever their form, advance organizers partially organize the material on behalf of the students, so that they know where to put it all, so to speak, as they learn them in more detail.

Recalling and Relating Prior Knowledge

Another strategy for improving teacher-directed instruction is to encourage students to relate the new material to prior familiar knowledge. When one of us (Kelvin) first learned a foreign language (in his case French), for example, he often noticed similarities between French and English vocabulary. A French word for picture, for example, was *image*, spelled exactly as it is in English. The French word for *splendid* was *splendide*, spelled almost the same as

in English, though not quite. Relating the French vocabulary to English vocabulary helped in learning and remembering the French.

As children and youth become more experienced in their academics, they tend to relate new information to previously learned information more frequently and automatically (Goodwin, 1999; Oakhill, Hartt, & Samols, 2005). But teachers can also facilitate students' use of this strategy. When presenting new concepts or ideas, the teacher can relate them to previously learned ideas deliberately—essentially modeling a memory strategy that students learn to use for themselves. In a science class, for example, she can say, "This is another example of. . ., which we studied before"; in social studies she can say, "Remember what we found out last time about the growth of the railroads? We saw that. . ."

If students are relatively young or are struggling academically, it is especially important to remind them of their prior knowledge. Teachers can periodically ask questions like "What do you already know about this topic?" or "How will your new knowledge about this topic change what you know already?" Whatever the age of students, connecting new with prior knowledge is easier with help from someone more knowledgeable, such as the teacher. When learning algorithms for multiplication, for example, students may not at first see how multiplication is related to addition processes that they probably learned previously (Burns, 2001). But if a teacher takes time to explain the relationship and gives students time to explore it, then the new skill of multiplication may be learned more easily.

Elaborating Information

Elaborating on new information means asking questions about the new material, and inferring ideas and relationships among the new concepts. Such strategies are closely related to the strategy of recalling prior knowledge as discussed above: elaboration enriches

the new information and connects it to other knowledge. In this sense, elaboration makes the new learning more meaningful and less arbitrary.

A teacher can help students use elaboration by modeling this behavior. The teacher can interrupt his or her explanation of an idea, for example, by asking how it relates to other ideas, or by speculating about where the new concept or idea may lead. He or she can also encourage students to do the same, and even give students questions to guide their thinking. When giving examples of a concept, for example, a teacher can hold back from offering all of the examples, and instead, ask students to think of additional examples themselves. The same tactic can work with assigned readings; if the reading includes examples, the teacher can instruct students to find or make up additional examples of their own.

Organizing New Information

There are many ways to organize new information that are especially well-suited to teacher-directed instruction. A common way is simply to ask students to **outline information** read in a text or heard in a lecture. Outlining works especially well when the information is already organized somewhat hierarchically into a series of main topics, each with supporting subtopics or subpoints. Outlining is basically a form of the more general strategy of **taking notes**, or writing down key ideas and terms from reading or lecture. Research studies find that the precise style or content of notes is less important than the quantity of notes taken: more detail is usually better than less (Ward & Tatsukawa, 2003). Written notes insure that a student thinks about the material not only while writing it down, but also when reading the notes later. These benefits are especially helpful when students are relatively inexperienced at school learning in general (as in the earlier grade levels), or relatively inexperienced about a specific topic or content

in particular. Not surprisingly, such students may also need more guidance than usual about what and how to write notes. It can be helpful for the teacher to provide a note-taking guide, like the ones in Note-Taking Guides 1 and 2.

NOTE-TAKING GUIDE 1

Notes on Science Experiment

1. Purpose of the experiment (in one sentence):

2. Equipment needed (list each item and define any special terms):

1)

2)

3)

4)

3. Procedure used (be specific!):

4. Results (include each measurement, rounded to the nearest integer):

Observation #1
Observation #2
Observation #3
Observation #4
Average measurement, #1–4:

NOTE-TAKING GUIDE 2

Guide to Notes About Tale of Two Cities

1. Main characters (list and describe in just a few words):

a)

b)

c)

d)

2. Setting of the story (time and place):

3. Unfamiliar vocabulary in the story (list and define):

a)

b)

c)

d)

4. Plot (write down only the main events):

a)

b)

c)

d)

5. Theme (or underlying "message") of the story:

In learning expository material, another helpful strategy—one that is more visually oriented—is to make **concept maps** or diagrams of the connections among concepts or ideas. The figure below shows

concept maps made by two individuals that graphically depict how a key idea, *child development*, relates to learning and education. One of the maps was drawn by a classroom teacher and the other by a university professor of psychology (Seifert, 1991). They suggest possible differences in how the two individuals think about children and their development. Not surprisingly, the teacher gave more prominence to practical concerns (for example, classroom learning and child abuse), and the professor gave more prominence to theoretical ones (for example, Erik Erikson and Piaget). The differences suggest that these two people may have something different in mind when they use the same term, child development. The differences have the potential to create misunderstandings between them (Seifert, 1999; Super & Harkness, 2003). By the same token, the two maps also suggest what each person might need to learn in order to achieve a better understanding of the other person's thinking and ideas.

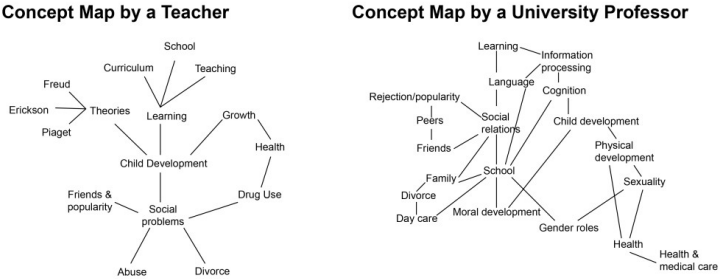

Figure 5.5.2. Maps of personal definitions of "child development"

Mastery Learning

This term refers to an instructional approach in which all students learn the material to an identically high level, even if some students require more time than others to do so (Gentile, 2004). In mastery learning, the teacher directs learning, though sometimes only in the sense of finding, writing, and orchestrating specific modules or

units for students to learn. In one typical mastery learning program, the teacher introduces a few new concepts or topics through a brief lecture or teacher-led demonstration. Then she gives an ungraded assignment or test immediately in order to assess how well students have learned the material, and which ones still need help. The students who have already learned the unit are given enrichment activities. Those needing more help are provided individual tutoring or additional self-guiding materials that clarify the initial content; they work until they have in fact mastered the content (hence the name *mastery learning*). At that point, students take another test or do another assignment to show that they have in fact learned the material to the expected high standard. When the system is working well, all students end up with high scores or grades, although usually, some take longer to do so than others.

As you might suspect, mastery learning poses two challenges. The first is ethical: is it really fair to give enrichment only to faster students and remediation only to slower students? This practice could deteriorate into continually providing the fast with an interesting education, while continually providing the slow only with boring, repetitious material. In using the approach, therefore, it is important to make all materials interesting, whether enrichment or remedial. It is also important to make sure that the basic learning goals of each unit are truly important—even crucial—for everyone to learn so that even slower individuals spend their time well.

The other challenge of mastery learning is more practical: the approach makes strong demands for a detailed, highly organized curriculum. If the approach is to work, the teacher must either locate such a curriculum, write one herself, or assemble a suitable mixture of published and self-authored materials. However the curriculum is created, the end result has to be a program filled with small units of study as well as ample enrichment and remedial materials. Sometimes providing these practical requirements can be challenging. But not always: some subjects (like mathematics) lend themselves to a detailed, sequential organization especially well. In

many cases, too, commercial publishers have produced curricula already organized for use in mastery learning programs (Fox, 2004).

Direct Instruction

Although the term *direct instruction* is sometimes a synonym for *teacher-directed instruction*, more often it refers to a version of mastery learning that is highly scripted, meaning that it not only organizes the curriculum into small modules or units as described above, but also dictates *how* teachers should teach and sometimes even the words they should speak (Adams & Engelmann, 1996; Magliaro, Lockee, & Burton, 2005). Direct instruction programs are usually based on a mix of ideas from behaviorism and cognitive theories of learning. In keeping with behaviorism, the teacher is supposed to praise students immediately and explicitly when they give a correct answer. In keeping with cognitive theory, she is supposed to state learning objectives in advance of teaching them (providing a sort of mini-advance organizer), provide frequent reviews of materials, and check deliberately on how well students are learning. Direct instruction usually also introduces material in small, logical steps, and calls for plenty of time for students to practice.

Direct instruction programs share one of the challenges of other mastery learning approaches: because they hold all students to the same high standard of achievement, they must deal with differences in how long students require to reach the standard. But direct instruction has an additional challenge, in that they often rely on small-group interaction more heavily than other mastery learning programs, and use self-guiding materials less. This difference has the benefit that direct instruction works especially well with younger students (especially kindergarten through third grade), who may have limited skills at working alone for extended periods. The challenge is that reliance on small-group interaction can make

it impractical to use direct instruction with an entire class or for an entire school day. In spite of these limits, however, research has found direct instruction to be very effective in teaching basic skills such as early reading and arithmetic (Adams & Engelmann, 1996).

Madeline Hunter's Effective Teaching Model

A number of direct instruction strategies have been combined by Madeline Hunter into a single, relatively comprehensive approach that she calls **mastery teaching** (not to be confused with the related term mastery learning) or the **effective teaching model** (M. Hunter, 1982; R. Hunter, 2004). Important features of the model are summarized in the outline below (R. Hunter, 2004). As you can see, the features span all phases of contact with students—before, during, and after lessons.

- Prepare students to learn.
    - Make good use of time at the beginning of a lesson or activity, when attention is best
    - Direct students' attention to what lies ahead in a lesson—for example, by offering "advance organizers"
    - Explain lesson objectives explicitly
- Present information clearly and explicitly.
    - Set a basic structure to the lesson and stay with it throughout
    - Use familiar terms and examples
    - Be concise
- Check for understanding and give guided practice.
    - Ask questions that everyone responds to—for example, "Raise your hand if you think the answer is X"
    - Invite choral responses—for example, "Is this a correct answer or not?"

    - Sample individuals' understanding—for example, "Barry, what's your example of X?"
- Provide for independent practice.
    - Work through the first few exercises or problems together
    - Keep independent practice periods brief and intersperse with discussions that offer feedback

What happens even before a lesson begins? Like many forms of teacher-directed instruction, the effective teaching model requires curricula and learning goals that are tightly organized and divisible into small parts, ideas, or skills. In teaching about photosynthesis, for example, the teacher (or at least her curriculum) needs to identify the basic elements that contribute to this process, and how they relate to each other. With photosynthesis, the elements include the sun, plants, animals, chlorophyll, oxygen produced by plants and consumed by animals, and carbon dioxide produced by animals and consumed by plants. The roles of these elements need to be identified and expressed at a level appropriate for the students. With advanced science students, oxygen, chlorophyll, and carbon dioxide may be expressed as part of complex chemical reactions; with first-grade students, though, they may be expressed simply as parts of a process akin to breathing or respiration.

Once this analysis of the curriculum has been done, Hunter's effective teaching model requires making the most of the lesson time by creating an **anticipatory set**, which is an activity that focuses or orients the attention of students to the upcoming content. Creating an anticipatory set may consist, for example, of posing one or more questions about students' everyday knowledge or knowledge of prior lessons. In teaching about the differences between fruits and vegetables, the teacher could start by asking: "If you are making a salad strictly of fruit, which of these would be OK to use: apple, tomato, cucumber, or orange?" As the lesson proceeds, information needs to be offered in short, logical pieces, using language as familiar as possible to the students. Examples should be plentiful and varied: if the purpose is to define and

distinguish fruits and vegetables, for example, then features defining each group should be presented singularly or at most just a few at a time, with clear-cut examples presented of each feature. Sometimes models or analogies also help to explain examples. A teacher can say: "Think of a fruit as a sort of 'decoration' on the plant because if you pick it, the plant will go on living." But models can also mislead students if they are not used thoughtfully, since they may contain features that differ from the original concepts. In likening a fruit to decoration, for example, students may overlook the essential role of fruit in plant reproduction, or think that lettuce qualifies as a fruit since picking a few lettuce leaves does not usually kill a lettuce plant.

Throughout a lesson, the teacher repeatedly **checks for understanding** by asking questions that call for active thinking on the part of students. One way is to require all students to respond somehow, either with an actual choral response (speaking in unison together), or another way with a non-verbal signal like raising hands to indicate answers to questions. In teaching about fruits and vegetables, for example, a teacher can ask, "Here's a list of fruits and vegetables. As I point to each one, raise your hand if it's a fruit, but not if it's a vegetable." Or she can ask: "Here's a list of fruits and vegetables. Say together what each one is as I point to it; you say 'fruit' or 'vegetable'—whichever applies." Even though some students may hide their ignorance by letting more knowledgeable classmates do the responding, the general level or quality of response can still give a rough idea of how well students are understanding. These checks can be supplemented, of course, with questions addressed to individuals, or with questions to which individuals must respond briefly in writing. A teacher can ask everyone, "Give me an example of one fruit and one vegetable," and then call on individuals to answer. She can also say: "I want everyone to make a list with two columns, one listing all the fruits you can think of and the other listing all the vegetables you can think of."

As a lesson draws to a close, the teacher arranges for students to have **further independent practice**. The point of the practice is not

to explore new material or ideas, but to consolidate or strengthen recent learning. At the end of a lesson about long division, for example, the teacher can make a transition to independent practice by providing a set of additional problems similar to the ones she explained during the lesson. After working one or two with students, she can turn the rest of the task over to the students to practice on their own. But note that even though the practice is supposedly "independent," students' understanding still has to be checked frequently. A long set of practice problems, therefore, needs to be broken up into small subsets of problems, and written or oral feedback offered periodically

What are the Limits of Teacher-Directed Instruction?

Whatever the grade level, most subjects taught in schools have at least some features, skills, or topics that benefit from direct instruction. Even subjects usually considered "creative" can benefit from a direct approach at times: to draw, sing, or write a poem, for example, requires skills that may be easier to learn if presented sequentially in small units with frequent feedback from a teacher. Research supports the usefulness of teacher-directed instruction for a variety of educational contexts when it is designed well and implemented as intended (Rosenshine & Mesister, 1995; Good & Brophy, 2004). Teachers themselves also tend to support the approach in principle (Demant & Yates, 2003).

But there are limits to its usefulness. Some are the practical ones that are pointed out above. Teacher-directed instruction, whatever the form, requires well-organized units of instruction in advance of when students are to learn. Such units may not always be available, and it may not be realistic to expect busy teachers to devise their own. Other limits of direct instruction have more to do with the very nature of learning. Some critics argue that organizing material

on behalf of the students encourages students to be passive—an ironic and undesirable result if true (Kohn, 2000, 2006). According to this criticism, the mere fact that a curriculum or unit of study is constructed by a teacher (or other authority) makes some students think that they should not bother seeking information actively on their own, but wait for it to arrive on its own accord. In support of this argument, critics point to the fact that direct instruction approaches sometimes contradict their own premises by requiring students to do a bit of cognitive organizational work of their own. This happens, for example, when a mastery learning program provides enrichment material for faster students to work independently; in that case, the teacher may be involved in the enrichment activities only minimally.

Criticisms like these have led to additional instructional approaches that rely more fully on students to seek and organize their own learning. In the next section, we discuss some of these options. As you will see, student-centered models of learning do solve certain problems of teacher-directed instruction, but they also have problems of their own.

Student-Centered Models of Learning

Student-centered models of learning shift some of the responsibility for directing and organizing learning from the teacher to the student. Being student-centered does not mean, however, that a teacher gives up organizational and leadership responsibilities completely. It only means a relative shift in the teacher's role, toward one with more emphasis on guiding students' self-chosen directions. As we explained earlier in this chapter, teacher-directed strategies do not take over responsibility for students' learning completely; no matter how much a teacher structures or directs learning, the students still have responsibility for working and expending effort to comprehend new material. By

the same token, student-centered models of learning do not mean handing over all organizational work of instruction to students. The teacher is still the most knowledgeable member of the class and still has both the opportunity and the responsibility to guide learning in directions that are productive.

The Power of Student-Driven Learning

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://edpsych.pressbooks.sunycreate.cloud/?p=81#oembed-1

Video 5.5.1. *The Power of Student-Driven Learning* discusses how changing the orientation of learning empowers and motivates students to learn.

As you might suspect, therefore, teacher-directed and student-centered approaches to instruction may overlap in practice. You can see the overlap clearly, for example, in two instructional strategies commonly thought of as student-centered, *independent study*, and *self-reflection*. In **independent study**, as the name implies, a student works alone a good deal of the time, consulting with a teacher only occasionally. Independent study may be student-centered in the sense that the student may be learning a topic or skill—an exotic foreign language, for example—that is personally interesting. But the opposite may also be true: the

student may be learning a topic or skill that a teacher or an official school curriculum has directed the student to learn—a basic subject for which the student is missing a credit, for example. Either way, though, the student will probably need guidance, support, and help from a teacher. In this sense even independent study always contains elements of teacher-direction.

Similarly, **self-reflection** refers to thinking about beliefs and experiences in order to clarify their personal meaning and importance. In school, it can be practiced in a number of ways: for example by keeping diaries or logs of learning or reading, by retelling stories of important experiences or incidents in a student's life, or by creating concept maps like the ones described earlier in this chapter. Whatever form it takes, self-reflection by definition happens inside a single student's mind, and in this sense is always directed by the student. Yet most research on self-reflection finds that self-reflection only works well when it involves and generates responses and interaction with other students or with a teacher (Seifert, 1999; Kuit, Reay, & Freeman, 2001). To be fully self-reflective, students need to have access to more than their existing base of knowledge and ideas—more than what they know already. In one study about students' self-reflections of cultural and racial prejudices (Gay & Kirkland, 2003), for example, the researchers found that students tended to reflect on these problems in relatively shallow ways if they worked on their own. It was not particularly effective to write about prejudice in a journal that no one read except themselves or to describe beliefs in a class discussion in which neither the teacher nor classmates commented or challenged the beliefs. Much more effective in both cases was for the teacher to respond thoughtfully to students' reflective comments. In this sense, the use of self-reflection, like independent study, required elements of teacher-direction to be successful.

How might a teacher emphasize students' responsibility for directing and organizing their own learning? The alternatives are numerous, as they are for teacher-directed strategies, so we can only sample some of them here. We concentrate on ones that are

relatively well known and used most widely, and especially on two: inquiry learning and cooperative learning.
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Inquiry-Based Learning

Inquiry-based learning stands the usual advice about expository (lecture-style) teaching on its head: instead of presenting well-organized knowledge to students, the teacher (or sometimes fellow students) poses thoughtful questions intended to stimulate discussion and investigation by students. The approach has been described, used, and discussed by educators literally for decades, though sometimes under other names, including *inquiry method* (Postman & Weingartner, 1969), *discovery learning* (Bruner, 1960/2006), or *progressive education* (Dewey, 1933; Martin, 2003). For convenience, we will stay with the term *inquiry learning*.

The questions that begin a cycle of inquiry learning may be posed either by the teacher or by students themselves. Their content depends not only on the general subject area being studied but also on the interests that students themselves have expressed. In elementary-level science, for example, a question might be "Why do leaves fall off trees when winter comes?" In high school social studies classes, it might be "Why do nations get into conflict?" The teacher avoids answering such questions directly, even if asked to do so. Instead, she encourages students to investigate the questions themselves, for example by elaborating on students' ideas and by asking further questions based on students' initial comments. Since students' comments can not be predicted precisely, the approach is by nature flexible. The initial questioning helps students to create and clarify questions that they consider worthy of further investigation. Discussing questions about leaves falling off trees, for example, can prompt students to observe trees in the autumn or to locate books and references that discuss or explain the biology of trees and leaves.

But inquiry is not limited to particular grade levels or topics. If initial questions in a high school social studies class have been about why nations get into conflict, for example, the resulting discussions

can lead to investigating the history of past wars and the history of peace-keeping efforts around the world. Whether the topic is high school social studies or elementary school biology, the specific direction of investigations is influenced heavily by students, but with assistance from the teacher to ensure that the students' initiatives are productive. When all goes well, the inquiry and resulting investigations benefit students in two ways. The first is that students (perhaps obviously) learn new knowledge from their investigations. The second is that students practice a constructive, motivating way of learning, one applicable to a variety of problems and tasks, both in school and out.

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Video 5.6.1. *What is Inquiry-Based Learning* explains inquiry-based learning and the process used in the classroom.
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Cooperative Learning

Even though inquiry-oriented discussion and investigation benefits when it involves the teacher, it can also be useful for students to work together somewhat independently, relying on a teacher's guidance only indirectly. Working with peers is a major feature of **cooperative learning** (sometimes also called *collaborative learning*). In this approach, students work on a task in groups and often are rewarded either partially or completely for the success of the group as a whole. Aspects of cooperative learning have been part of education for a long time; some form of cooperation has always been necessary to participate on school sports teams, for example, or to produce a student-run school newspaper. What is a bit newer is using cooperative or collaborative activities systematically to facilitate the learning of a range of educational goals central to the academic curriculum (Prince, 2004).

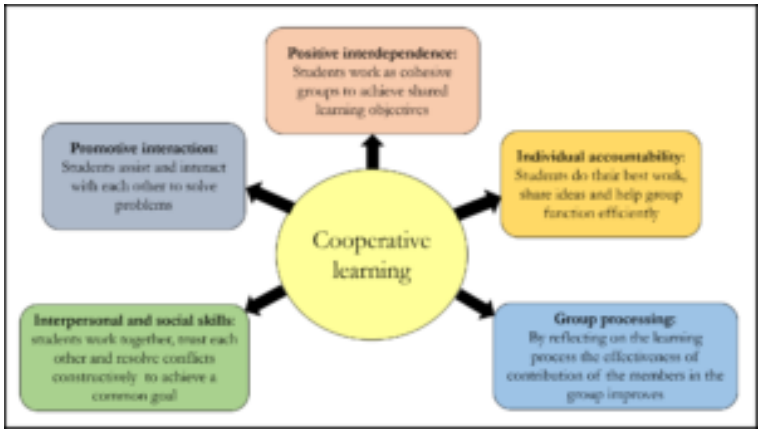

Figure 5.7.1. Components of cooperative learning.

Even though teachers usually value cooperation in students, circumstances at school can sometimes reduce students' incentives

to show it. The traditional practice of assessing students individually, for example, can set the stage for competition over grades, and cultural and other forms of diversity can sometimes inhibit individuals from helping each other spontaneously. Strategies exist, however, for reducing such barriers so that students truly benefit from each other's presence, and are more likely to feel like sharing their skills and knowledge. Here, for example, are several key features that make cooperative learning work well (Johnson & Johnson, 1998; Smith, et al., 2005):

- *Students need time and a place to talk and work together.* This may sound obvious, but it can be overlooked if time in class becomes crowded with other tasks and activities, or with interruptions related to school (like assemblies) but not to the classroom. It is never enough simply to tell students to work together, only to leave them wondering how or when they are to do so.
- *Students need skills at working together.* As an adult, you may feel relatively able to work with a variety of partners on a group task. The same assumption cannot be made, however, about younger individuals, whether teenagers or children. Some students may get along with a variety of partners, but others may not. Many will benefit from advice and coaching about how to focus on the tasks at hand, rather than on the personalities of their partners.
- *Assessment of activities should hold both the group and the individuals accountable for success.* If a final mark for a project goes only to the group as a whole, then **freeloading** is possible: some members may not do their share of the work and may be rewarded more than they deserve. Others may be rewarded less than they deserve. If, on the other hand, a final grade for a group project goes only to each member's individual contribution to a group project, then **overspecialization** can occur: individuals have no real incentive to work together, and cooperative may deteriorate into a set of smaller individual

projects (Slavin, 1994).

- *Students need to believe in the value and necessity of cooperation.* Collaboration will not occur if students privately assume that their partners have little to contribute to their personal success. Social prejudices from the wider society—like racial bias or gender sexism, for example—can creep into the operations of cooperative groups, causing some members to be ignored unfairly while others are overvalued. Teachers can help reduce these problems in two ways: first by pointing out and explaining that a diversity of talents is necessary for success on a group project, and second by pointing out to the group how undervalued individuals are contributing to the overall project (Cohen, Brody, & Sapon-Shevin, 2004).

As these comments imply, cooperative learning does not happen automatically and requires monitoring and support by the teacher. Some activities may not lend themselves to cooperative work, particularly if every member of the group is doing essentially the same task. Giving everyone in a group the same set of arithmetic problems to work on collaboratively, for example, is a formula for cooperative failure: either the most skilled students do the work for others (freeloading) or else members simply divide up the problems among themselves in order to reduce their overall work (overspecialization). A better choice for a cooperative task is one that clearly requires a diversity of skills, what some educators call a *rich group work task* (Cohen, Brody, & Sapon-Shevin, 2004). Preparing a presentation about medieval castles, for example, might require (a) writing skill to create a report, (b) dramatic skill to put on a skit, and (c) artistic talent to create a poster. Although a few students may have all of these skills, more are likely to have only one, and they are therefore likely to need and want their fellow group members' participation.

Examples of Cooperative and Collaborative Learning

Although this description may make the requirements for cooperative learning sound somewhat precise, there are actually a variety of ways to implement it in practice. The table below summarizes several of them. As you can see, the strategies vary in the number of how many students they involve, the prior organization or planning provided by the teacher, and the amount of class time they normally require.

Table 5.7.1. Strategies for encouraging cooperative learning

Strategy	Type of groups involved	What the teacher does	What the students do
Think-pair-share (Lyman, 1981)	Pairs of students, sometimes linked to one other pair	Teacher poses initial problem or question.	First, students think individually of the answer; second, they share their thinking with partner; third, the partnership shares their thinking with another partnership
Jigsaw classroom, version #1 (Aronson, et al., 2001)	5–6 students per group, and 5–6 groups overall	Teacher assigns students to groups and assigns one aspect of a complex problem to each group.	Students in each group work together to become experts in their particular aspect of the problem; later the expert groups disband, and form new groups containing one student from each of the former expert groups.
Jigsaw classroom, version #2 (Slavin, 1994)	4–5 students per group, and 4–5 groups overall	Teacher assigns students to groups and assigns each group to study or learn about the same *entire* complex problem.	Students initially work in groups to learn about the entire problem; later the groups disband and reform as expert groups, with each group focusing on a selected aspect of the general problem; still later the expert groups disband and the original general groups reform to learn what the expert students can now add to their general understanding.

Table 5.7.1. Strategies for encouraging cooperative learning			
STAD (Student-Teams Achievement Divisions) (Slavin, 1994)	4–5 students per team (or group)	Teacher presents a lesson or unit to the entire class, and later tests them on it; grades individuals based partly on individuals' and the team's improvement, not just on absolute level of performance.	Students work together to insure that team mates improve their performance as much as possible. Students take tests as individuals.
Project-Based Learning (Katz, 2000)	Various numbers of students, depending on the complexity of the project, up to and including the entire class.	Teacher or students pose a question or problem of interest to other students; teacher helps students to clarify their interests and make plans to investigate the question	Students work together for extended periods to investigate the original question or problem; project leads to a presentation, written report, or other product.

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Chapter Summary: Facilitating Complex Thinking

Looking broadly at this chapter, you can see that choices among instructional strategies are numerous indeed, and that deciding among them depends on the forms of thinking that you want to encourage, the extent to which ideas or skills need to be organized by you to be understood by students, and the extent to which students need to take responsibility for directing their own learning. Although you may have personal preferences among possible instructional strategies, the choice will also be guided by the uniqueness of each situation of teaching—with its particular students, grade-level, content, and purposes. If you need to develop students' problem solving skills, for example, there are strategies that are especially well suited for this purpose; we described some. If you need to organize complex information so that students do not become confused by it, there are effective ways of doing so. If you want the students to take as much initiative as possible in organizing their own learning, this too can be done.

Yet having this knowledge is still not enough to teach well. What is still needed are ideas or principles for deciding *what* to teach. In this chapter we have still not addressed an obvious question: How do I find or devise goals for my teaching and for my students' learning? And assuming that I can determine the goals, where can I find resources that help students to meet them?

Teaching involves numerous instructional strategies, which are decisions and actions designed to facilitate learning. The choice of strategies depends partly on the forms of thinking intended for students—whether the goal is for students to think critically, for example, to think creatively, or to solve problems. A fundamental

decision in choosing instructional strategies is how much to emphasize teacher-directed instruction, as compared to student-centered models of learning. Teacher-directed strategies of instruction include lectures and readings (expository teaching), mastery learning, scripted or direct instruction, and complex teacher-directed approaches such as Madeline Hunter's effective teaching model. Student-centered models of learning include independent study, student self-reflection, inquiry learning, and various forms of cooperative or collaborative learning. Although for some students, curriculum content and learning goals may lend themselves toward one particular type of instruction, teaching is often a matter of combining different strategies appropriately and creatively.

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MOTIVATION

Theme: Motivation and Learning

Overview of Concepts:

- Innate Theories on Motivation
- Behavior Theories on Motivation
- Cognitive Theories on Motivation
- Process Theories on Motivation
- Maturation and Motivation

Learning Objectives:

- Explain how motivation changes with maturation
- Explain why task-contingent rewards diminish intrinsic motivation
- Discuss how praise influences motivation
- Explain how expectancies and values influence motivation
- Compare mastery versus performance goals
- Identify attributions that enhance motivation
- Explain developmental and group differences in motivation
- Describe outcome expectations and efficacy
- Explain how self-worth affects the motivation of success-orientated students
- Explain how autonomy, competence, and relatedness can facilitate intrinsic motivation

Theories of Motivation

Motivation describes the wants or needs that direct behavior toward a goal, but, why do we do the things we do? What motivations underlie our behaviors? Is motivation an inherited trait or is motivation influenced by reinforcement and consequences that strengthen some behaviors and weaken others? Is the key to motivating learners a lesson plan that captures their interest and attention? In other words, is motivation something innate that we are born with that can be strengthened by reinforcers external to the learning task, or is it something interwoven with the learning process itself?

Intrinsic and Extrinsic Motivation

Some motives are biological, like our need for food or water. However, the motives that we will be more interested in are more psychological. In general, we discuss motivation as being intrinsic (arising from internal factors) or extrinsic (arising from external factors). Intrinsically motivated behaviors are performed because of the sense of personal satisfaction that they bring, while extrinsically motivated behaviors are performed in order to receive something from others.

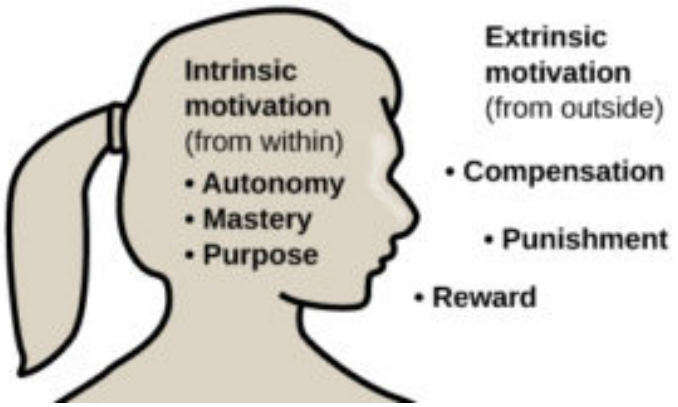

Figure 6.1.1. Intrinsic motivation comes from within the individual, while extrinsic motivation comes from outside the individual.

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Video 6.1.1. *Extrinsic vs Intrinsic Motivation* explains the difference and provides examples of these types of motivation.

Think about why you are currently in college. Are you here because you enjoy learning and want to pursue an education to make yourself a more well-rounded individual? If so, then you are intrinsically motivated. However, if you are here because you want to get a college degree to make yourself more marketable for a high-paying career or to satisfy the demands of your parents, then your motivation is more extrinsic in nature.

In reality, our motivations are often a mix of both intrinsic and extrinsic factors, but the nature of the mix of these factors might

change over time (often in ways that seem counter-intuitive). There is an old adage: "Choose a job that you love, and you will never have to work a day in your life," meaning that if you enjoy your occupation, work doesn't seem like . . . well, work. Some research suggests that this isn't necessarily the case (Daniel & Esser, 1980; Deci, 1972; Deci, Koestner, & Ryan, 1999). According to this research, receiving some sort of extrinsic reinforcement (i.e., getting paid) for engaging in behaviors that we enjoy leads to those behaviors being thought of as work no longer providing that same enjoyment. As a result, we might spend less time engaging in these reclassified behaviors in the absence of any extrinsic reinforcement. For example, Odessa loves baking, so in her free time, she bakes for fun. Oftentimes, after stocking shelves at her grocery store job, she often whips up pastries in the evenings because she enjoys baking. When a coworker in the store's bakery department leaves his job, Odessa applies for his position and gets transferred to the bakery department. Although she enjoys what she does in her new job, after a few months, she no longer has much desire to concoct tasty treats in her free time. Baking has become work in a way that changes her motivation to do it. What Odessa has experienced is called the overjustification effect—intrinsic motivation is diminished when extrinsic motivation is given. This can lead to extinguishing intrinsic motivation and creating a dependence on extrinsic rewards for continued performance (Deci et al., 1999).

Other studies suggest that intrinsic motivation may not be so vulnerable to the effects of extrinsic reinforcements, and in fact, reinforcements such as verbal praise might actually increase intrinsic motivation (Arnold, 1976; Cameron & Pierce, 1994). In that case, Odessa's motivation to bake in her free time might remain high if, for example, customers regularly compliment her baking or cake decorating skills.

These apparent discrepancies in the researchers' findings may

be understood by considering several factors. For one, physical reinforcement (such as money) and verbal reinforcement (such as praise) may affect an individual in very different ways. In fact, tangible rewards (i.e., money) tend to have more negative effects on intrinsic motivation than do intangible rewards (i.e., praise). Furthermore, the expectation of the extrinsic motivator by an individual is crucial: If the person expects to receive an extrinsic reward, then intrinsic motivation for the task tends to be reduced. If, however, there is no such expectation, and the extrinsic motivation is presented as a surprise, then intrinsic motivation for the task tends to persist (Deci et al., 1999).

In addition, culture may influence motivation. For example, in collectivistic cultures, it is common to do things for your family members because the emphasis is on the group and what is best for the entire group, rather than what is best for any one individual (Nisbett, Peng, Choi, & Norenzayan, 2001). This focus on others provides a broader perspective that takes into account both situational and cultural influences on behavior; thus, a more nuanced explanation of the causes of others' behavior becomes more likely. (You will learn more about collectivistic and individualistic cultures when you learn about social psychology.)

In educational settings, students are more likely to experience intrinsic motivation to learn when they feel a sense of belonging and respect in the classroom. This internalization can be enhanced if the evaluative aspects of the classroom are de-emphasized and if students feel that they exercise some control over the learning environment. Furthermore, providing students with activities that are challenging, yet doable, along with a rationale for engaging in various learning activities can enhance intrinsic motivation for those tasks (Niemiec & Ryan, 2009). Consider Hakim, a first-year law student with two courses this semester: Family Law and Criminal Law. The Family Law professor has a rather intimidating classroom: He likes to put students on the spot with tough questions, which often leaves students feeling belittled or embarrassed. Grades are based exclusively on quizzes and exams, and the instructor posts

the results of each test on the classroom door. In contrast, the Criminal Law professor facilitates classroom discussions and respectful debates in small groups. The majority of the course grade is not exam-based but centers on a student-designed research project on a crime issue of the student's choice. Research suggests that Hakim will be less intrinsically motivated in his Family Law course, where students are intimidated in the classroom setting, and there is an emphasis on teacher-driven evaluations. Hakim is likely to experience a higher level of intrinsic motivation in his Criminal Law course, where the class setting encourages inclusive collaboration and a respect for ideas, and where students have more influence over their learning activities.

Think About It

Schools often use concrete rewards to increase adaptive behaviors. How might this be a disadvantage for students intrinsically motivated to learn? What are the educational implications of the potential for concrete rewards to diminish intrinsic motivation for a given task?

We would expect to see a shift from learning for the sake of learning to learning to earn some reward. This would undermine the foundation upon which traditional institutions of higher education are built. For a student motivated by extrinsic rewards, dependence on those may pose issues later in life (post-school) when there are not typically extrinsic rewards for learning.

Theories of Motivation

Like motivation itself, theories of it are full of diversity. For convenience in navigating through the diversity, we have organized the theories around two perspectives about motion. The first set of theories focuses on the innateness of motivation. These theories emphasize instinctual or inborn needs and drives that influence our behavior. The second set of theories proposes cognition as the source of motivation. Individual motivation is influenced by thoughts, beliefs, and values. The variation in these theories is due to disagreement about which cognitive factors are essential to motivation and how those cognitive factors might be influenced by the environment.

Innate Motivation Theories

First, we will describe some early motivational theories that focus on innate needs and drives. Not all of these theories apply to the classroom, but learning about them will show you how different theorists have approached the issue of motivation. You are sure to find some elements of your own thinking about motivation in each of them. We will examine instinct theory, drive theory, and arousal theory as early explanations of motivation. We will also discuss the behavioral perspective on motivation and the deficiency-growth perspective, as exemplified by Maslow's hierarchy of needs.

Cognitive Theories of Motivation

Cognitive theories of motivation assume that behavior is a result of cognitive processes. These theories presume that individuals are interpreting information and making decisions, not just acting on

basic needs and drives. Cognitive motivation theories share strong ties with the cognitive and social learning theories that we discussed previously. We will examine several cognitive motivation theories: interest, attribution theory, expectancy-value theory, and self-efficacy theory. All emphasize that learners need to know, understand, and appreciate what they are doing in order to become motivated. Then, along with these cognitive motivation theories, we will examine a motivational perspective called self-determination theory, which attempts to reconcile cognitive theory's emphasis on intrinsic motivation with more traditional notions of human needs and drives.

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Video 6.1.2. *Instincts, Arousal, Needs, Drives* provides a brief overview of some of the major motivational theories.
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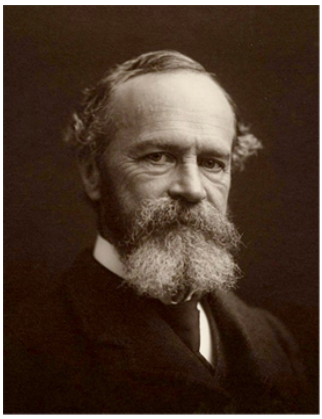
Instinct, Drive, and Arousal Theories

Instinct Theory

William James (1842–1910) was an important contributor to early research into motivation, and he is often referred to as the father of psychology in the United States. James theorized that behavior was driven by a number of instincts, which aid survival. From a biological perspective, an **instinct** is a species-specific pattern of behavior that is not learned. There was, however, considerable controversy among James and his contemporaries over the exact definition of instinct. James proposed several dozen special human instincts, but many of his contemporaries had their own lists that differed. A mother's protection of her baby, the urge to lick sugar, and hunting prey were among the human behaviors proposed as true instincts during James's era. This view—that human behavior is driven by instincts—received a fair amount of criticism because of the undeniable role of learning in shaping all sorts of human behavior. In fact, as early as the 1900s, some instinctive behaviors were experimentally demonstrated to result from associative learning (Faris, 1921).



(a)

(b)

Figure 6.2.1. *(a) William James proposed the instinct theory of motivation, asserting that behavior is driven by instincts. (b) In humans, instincts may include behaviors such as an infant's rooting for a nipple and sucking. (credit b: modification of work by "Mothering Touch"/Flickr)*

Drive Theory

Another early theory of motivation proposed that the maintenance of homeostasis is particularly important in directing behavior. You may recall from your earlier reading that homeostasis is the tendency to maintain a balance, or optimal level, within a biological system. In a body system, a control center (which is often part of the brain) receives input from receptors (which are often complexes of neurons). The control center directs effectors (which may be other neurons) to correct any imbalance detected by the control center.

According to the **drive theory** of motivation, deviations from homeostasis create physiological needs. These needs result in psychological drive states that direct behavior to meet the need and, ultimately, bring the system back to homeostasis. For example, if it's

been a while since you ate, your blood sugar levels will drop below normal. This low blood sugar will induce a physiological need and a corresponding drive state (i.e., hunger) that will direct you to seek out and consume food. Eating will eliminate hunger, and, ultimately, your blood sugar levels will return to normal.

All activity is directed toward reducing the tension triggered by needs and drives. Drive reduction, therefore, is the psychological mechanism underlying both activity and learning. Whatever behavior results in lessening the tension (and consequently the drive) will be repeated until it becomes habitual. A **habit** is a pattern of behavior in which we regularly engage. Once we have engaged in a behavior that successfully reduces a drive, we are more likely to engage in that behavior whenever faced with that drive in the future (Graham & Weiner, 1996).

There are two types of drives: primary and acquired. **Primary drives** are forces within the individual that are triggered by biological needs such as hunger and thirst. These drives produce random activity (recall Skinner's animal experiments). This activity is essentially directionless until the need is satisfied. Whatever behavior satisfies the need eventually becomes learned as a habit through the processes of drive reduction and reinforcement.

Acquired drives include desires for money, for love, to play sports, to write, or to create music. They do not spring from a biological need. Rather, they are acquired through a process of association with a primary drive. Drive theory assumes that almost all psychological motives are acquired drives.

The drive theory of motivation provides the foundation for behavioral learning theory (discussed in the next section) and, unlike instinct theory, still has its proponents. Extrinsic reinforcers (for example, money or good grades) are viewed as incentives that activate acquired drives. The behavior that is instrumental in getting each incentive is learned through a combination of both drive reduction and reinforcement processes.

Arousal Theory

Extensions of drive theory take into account levels of arousal as potential motivators. As you recall from your study of learning, these theories assert that there is an optimal level of arousal that we all try to maintain (Figure 6.2.2). If we are under-aroused, we become bored and will seek out some sort of stimulation. On the other hand, if we are over-aroused, we will engage in behaviors to reduce our arousal (Berlyne, 1960). Most students have experienced this need to maintain optimal levels of arousal over the course of their academic careers. Think about how much stress students experience toward the end of the spring semester. They feel overwhelmed with seemingly endless exams, papers, and major assignments that must be completed on time. They probably yearn for the rest and relaxation that awaits them over the extended summer break. However, once they finish the semester, it doesn't take too long before they begin to feel bored. Generally, by the time the next semester is beginning in the fall, many students are quite happy to return to school. This is an example of how arousal theory works.

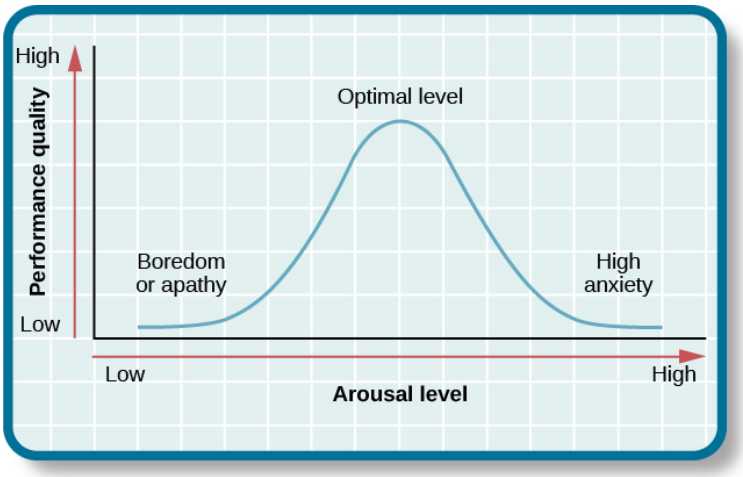


Figure 6.2.2. The concept of optimal arousal in relation to performance on a task is depicted here. Performance is maximized at the optimal level of arousal, and it tapers off during under- and overarousal.

So what is the optimal level of arousal? What level leads to the best performance? Research shows that moderate arousal is generally best; when arousal is very high or very low, performance tends to suffer (Yerkes & Dodson, 1908). Think of your arousal level regarding taking an exam for this class. If your level is very low, such as boredom and apathy, your performance will likely suffer. Similarly, a very high level, such as extreme anxiety, can be paralyzing and hinder performance. Consider the example of a softball team facing a tournament. They are favored to win their first game by a large margin, so they go into the game with a lower level of arousal and get beat by a less skilled team.

But optimal arousal level is more complex than a simple answer that the middle level is always best. Researchers Robert Yerkes (pronounced "Yerk-EES") and John Dodson discovered that the optimal arousal level depends on the complexity and difficulty of the task to be performed (Figure 6.2.3). This relationship is known as **Yerkes-Dodson law**, which holds that a simple task is performed best when arousal levels are relatively high, and complex tasks are best performed when arousal levels are lower.

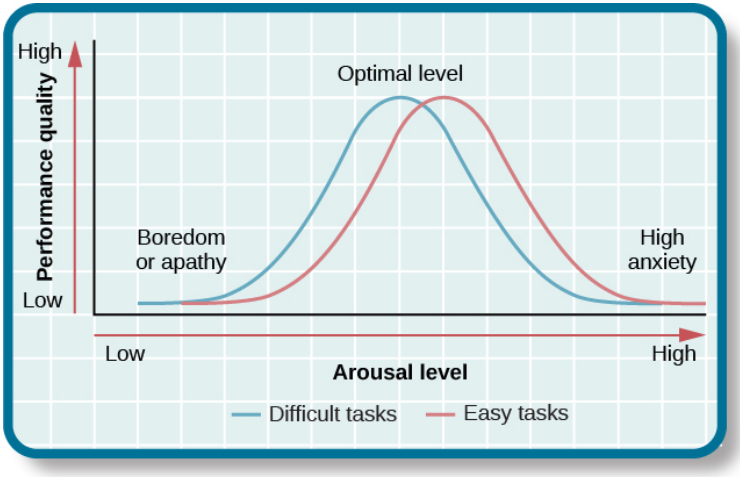


Figure 6.2.3. Task performance is best when arousal levels are in a middle range, with difficult tasks best performed under lower levels of arousal and simple tasks best performed under higher levels of arousal.

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Behaviorism and Motivation

Sometimes it is useful to think of motivation not as something "inside" a student driving the student's behavior, but as *equivalent* to the student's outward behaviors. This is the perspective of behaviorism, which is a way to think about the learning process. In its most thorough-going form, behaviorism focuses almost completely on what can be directly seen or heard about a person's behavior, and has relatively few comments about what may lie behind (or "underneath" or "inside") the behavior. When it comes to motivation, this perspective means minimizing or even ignoring the distinction between the inner drive or energy of students, and the outward behaviors that express the drive or energy. The two are considered the same, or nearly so.

Equating the inner and the outward might seem to violate common sense. How can a student do something without some sort of feeling or thought to make the action happen? As we will explain, this very question has led to alternative models of motivation that are based on cognitive rather than behaviorist theories of learning. We will explain some of these later in this chapter. Before getting to them, however, we encourage you to consider the advantages of a behaviorist perspective on motivation.

Sometimes the circumstances of teaching limit teachers' opportunities to distinguish between inner motivation and outward behavior. Certainly teachers see plenty of student behaviors—signs of motivation of some sort. But the multiple demands of teaching can limit the time needed to determine what the behaviors mean. If a student asks a lot of questions during discussions, for example, is he or she curious about the material itself, or just wanting to look intelligent in front of classmates and the teacher? In a class with many students and a busy agenda, there may not be a lot of time for a teacher to decide between these possibilities. In other cases, the problem may not be limited time as much as communication

difficulties with a student. Consider a student who is still learning English, or who belongs to a cultural community that uses patterns of conversation that are unfamiliar to the teacher, or who has a disability that limits the student's general language skill. In these cases discerning the student's inner motivations may take more time and effort. It is important to invest the extra time and effort for such students, but while a teacher is doing so, it is also important for her to guide and influence the students' behavior in constructive directions. That is where behaviorist approaches to motivation can help.

Operant Conditioning as a Way of Motivating

The most common version of the behavioral perspective on motivation is the theory of operant conditioning associated with B. F. Skinner (1938, 1957). The description in that chapter focused on behavioral learning, but the same operant model can be transformed into an account of motivation. In the operant model, you may recall, a behavior being learned (the "operant") increases in frequency or likelihood because performing it makes a reinforcement available. To understand this model in terms of motivation, think of the likelihood of response as the motivation and the reinforcement as the motivator. Imagine, for example, that a student learns by operant conditioning to answer questions during class discussions: each time the student answers a question (the operant), the teacher praises (reinforces) this behavior. In addition to thinking of this situation as behavioral learning, however, you can also think of it in terms of motivation: the likelihood of the student answering questions (the motivation) is increasing because of the teacher's praise (the motivator).

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Video 6.3.1. *Incentive Theory* discusses how incentives can motivate behaviors through reinforcement.

Many concepts from operant conditioning, in fact, can be understood in motivational terms. Another one, for example, is the concept of extinction, which is the tendency for learned behaviors to become less likely when reinforcement no longer occurs—a sort of "unlearning," or at least a decrease in performance of previously learned. The decrease in performance frequency can be thought of as a loss of motivation, and the removal of the reinforcement can be thought of as the removal of the motivator. Table 6.3.1 summarizes this way of reframing operant conditioning in terms of motivation.

Table 6.3.1. Operant conditioning as learning and as motivation

Concept	Definition phrased in terms of learning	Definition phrased in terms of motivation	Classroom exa
Operant	Behavior that becomes more likely because of reinforcement	Behavior that suggests an increase in motivation	Student listens teacher's comm during lecture d discussion
Reinforcement	Stimulus that increases likelihood of a behavior	Stimulus that motivates	Teacher praises for listening
Positive reinforcement	Stimulus that *increases* likelihood of a behavior by being *introduced* or *added* to a situation	Stimulus that motivates by its *presence*; an "incentive"	Teacher makes encouraging re about student's homework
Negative reinforcement	Stimulus that *increases* the likelihood of a behavior by being *removed* or taken away from a situation	Stimulus that motivates by its *absence* or *avoidance*	Teacher stops n student about late homework
Punishment	Stimulus that decreases the likelihood of a behavior by being introduced or added to a situation	Stimulus that decreases motivation by its presence	Teacher deduct for late homew
Extinction	Removal of reinforcement for a behavior	Removal of motivating stimulus that leads to decrease in motivation	Teacher stops commenting alt about student's homework
Shaping successive approximations	Reinforcements for behaviors that gradually resemble (approximate) a final goal behavior	Stimuli that gradually shift motivation toward a final goal motivation	Teacher praises for returning ho a bit closer to th deadline; gradu praises for actu being on time
Continuous reinforcement	Reinforcement that occurs each *time* that an operant behavior occurs	Motivator that occurs *each* time that a behavioral sign of motivation occurs	Teacher praises active student for *every* time h for five minutes interruption
Intermittent reinforcement	Reinforcement that *sometimes* occurs following an operant behavior, but not on every occasion	Motivator that occurs *sometimes* when a behavioral sign of motivation occurs, but not on every occasion	Teacher praises active student *sometim* he works witho interruption, bu every time

Cautions about Behavioral Perspectives on Motivation

As we mentioned, behaviorist perspectives about motivation do reflect a classroom reality: that teachers sometimes lack time and therefore must focus simply on students' appropriate outward behavior. But there are nonetheless cautions about adopting this view. An obvious one is the ambiguity of students' specific behaviors; what looks like a sign of one motive to the teacher may in fact be a sign of some other motive to the student (DeGrandpre, 2000). If a student looks at the teacher intently while she is speaking, does it mean the student is motivated to learn, or only that the student is daydreaming? If a student invariably looks away while the teacher is speaking, does it mean that the student is disrespectful of the teacher, or that the student comes from a family or cultural group where *avoiding* eye contact actually shows more respect for a speaker than direct eye contact?

Another concern about behaviorist perspectives, including operant conditioning, is that it leads teachers to ignore students' choices and preferences, and to "play God" by making choices on their behalf (Kohn, 1996). According to this criticism, the distinction between "inner" motives and expressions of motives in outward behavior does not disappear just because a teacher (or a psychological theory) chooses to treat a motive and the behavioral expression of a motive as equivalent. Students usually do know what they want or desire, and their wants or desires may not always correspond to what a teacher chooses to reinforce or ignore. This, in a new guise, is once again the issue of *intrinsic* versus *extrinsic* motivation. Approaches that are exclusively behavioral, it is argued, are not sensitive enough to students' *intrinsic*, self-sustaining motivations.

There is truth to this allegation if a teacher actually does rely on rewarding behaviors that she alone has chosen, or even if she persists in reinforcing behaviors that students already find

motivating without external reinforcement. In those cases reinforcements can backfire: instead of serving as an incentive to desired behavior, reinforcement can become a reminder of the teacher's power and of students' lack of control over their own actions. A classic research study of intrinsic motivation illustrated the problem nicely. In the study, researchers rewarded university students for two activities—solving puzzles and writing newspaper headlines —that they already found interesting. Some of the students, however, were *paid* to do these activities, whereas others were not. Under these conditions, the students who were paid were *less* likely to engage in the activities following the experiment than were the students who were not paid, even though both groups had been equally interested in the activities to begin with (Deci, 1971). The extrinsic reward of payment, it seemed, interfered with the intrinsic reward of working the puzzles.

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Video 6.3.2. *Drive: The Surprising Truth About What Motivates Us* reveals unexpected findings regarding the use of rewards for motivating complex behavior.

Later studies confirmed this effect in numerous situations, though they have also found certain conditions where extrinsic rewards do *not* reduce intrinsic rewards. Extrinsic rewards are not as harmful, for example, if a person is paid "by the hour" (i.e. by a flat rate) rather than piecemeal (by the number of items completed) (Cameron & Pierce, 1994; Eisenberger & Cameron, 1996). They also are less harmful if the task itself is relatively well-defined (like working math problems or playing solitaire) and high-quality

performance is expected at all times. So there are still times and ways when externally determined reinforcements are useful and effective. In general, however, extrinsic rewards do seem to undermine intrinsic motivation often enough that they need to be used selectively and thoughtfully (Deci, Koestner, & Ryan, 2001). As it happens, help with being selective and thoughtful can be found in the other, more cognitively oriented theories of motivation. These use the goals, interests, and beliefs of students as ways of explaining differences in students' motives and in how the motives affect engagement with school. We turn to these cognitively oriented theories next, beginning with those focused on students' goals.

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Deficiency-Growth Theory: Maslow's Hierarchy of Needs

Abraham Maslow's perspective on motivation, deficiency-growth needs theory, has both similarities to, and differences from, instinct and drive theory. Like the originators of those theories, Maslow proposes that people are born with innate needs that they strive to satisfy. However, in contrast to Freud and Hull, Maslow (1943, 1970) believes that the ultimate direction of this energy is not simply the satisfaction of biological needs or tension reduction but a striving for self-actualization. Consequently, his theory accentuates the positive, intellectual, uplifting (not simply hedonistic) side of human beings. For Maslow, innate forces and an innate hierarchy of needs (both deficiency needs and growth needs) give human behavior its distinctive energy and direction. The figure below illustrates Maslow's hierarchy of growth and deficiency needs, which range from primitive physiological requirements to complex aesthetic and cognitive needs, which Maslow calls self-actualization.

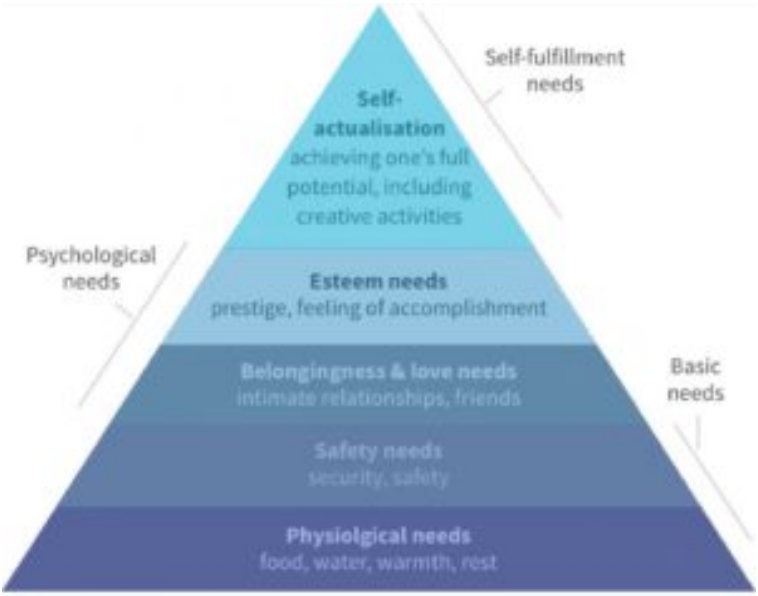

Figure 6.4.1. Maslow's hierarchy of needs model.

Basic needs are physiological and safety needs. These needs are our more primitive and instinctual needs for survival. **Physiological needs** include our needs for food, water, shelter, breathing, and sleep; those functions and requirements to keep us alive. At the **safety needs** level, we are concerned about avoiding harm and keeping safe. This may include physical harm to our body, but may also include psychological safety.

Our *psychological needs* include belongingness and love needs, and esteem needs. These needs relate to having meaning and purpose in our lives, making life worth living. **Belongingness and love needs** relate to our need to feel like we are accepted members of social groups. These groups might include family, friends, work, or other social connections. Esteem needs include our needs for achievement, learning, industry, and status. These things contribute to the development of identity and self-esteem.

The pinnacle of the hierarchy is self-actualization. **Self-actualization** is a brief time in which all needs have been fulfilled and we are able to reach our potential. Not all individuals are able to reach self-actualization due to lower-level needs all needing to be fulfilled first. Those that do reach self-actualization will not remain there long as, eventually, lower-level needs will arise.

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Video 6.4.1. *Maslow's Hierarchy of Needs* explains Maslow's theory and the different needs at each level.

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Interest as Motivation

In addition to holding different kinds of goals—with consequent differences in academic motivation—students show obvious differences in levels of interest in the topics and tasks of the classroom. Suppose that two high school classmates, Frank and Jason, both are taking chemistry, and specifically learning how to balance chemical equations. Frank finds the material boring and has to force himself to study it; as a result, he spends only the time needed to learn the basic material and complete the assignments at a basic level. Jason, on the other hand, enjoys the challenges of balancing chemical equations. He thinks of the task as an intriguing puzzle; he not only solves each of them but also compares the problems to each other as he goes through them.

Frank's learning is based on *effort* compared to Jason's, whose learning is based more fully on *interest*. As the example implies, when students learn from interest they tend to devote more attention to the topic than if they learn from effort (Hidi & Renninger, 2006). The finding is not surprising since interest is another aspect of *intrinsic motivation*—energy or drive that comes from within. A distinction between effort and interest is often artificial, however, because the two motives often get blended or combined in students' personal experiences. Most of us can remember times when we worked at a skill that we enjoyed and found interesting, but that also required effort to learn. The challenge for teachers is therefore to draw on and encourage students' interest as much as possible, and thus keep the required effort within reasonable bounds—neither too hard nor too easy.

Situational Interest versus Personal Interest

Students' interests vary in how deeply or permanently they are

located within students. **Situational interests** are ones that are triggered temporarily by features of the immediate situation. Unusual sights, sounds, or words can stimulate situational interest. A teacher might show an interesting image on the overhead projector, play a brief bit of music, or make a surprising comment in passing. At a more abstract level, unusual or surprising topics of discussion can also arouse interest when they are first introduced. **Personal interests** are relatively permanent preferences of the student and are usually expressed in a variety of situations. In the classroom, a student may (or may not) have a personal interest in particular topics, activities, or subject matter. Outside class, though, he or she usually has additional personal interests in particular non-academic activities (e.g. sports, music) or even in particular people (a celebrity, a friend who lives nearby). The non-academic personal interests may sometimes conflict with academic interests; it may be more interesting to go to the shopping mall with a friend than to study even your favorite subject.

Benefits of Personal Interest

In general, personal interest in an academic topic or activity tends to correlate with achievement related to the topic or activity. As you might suppose, a student who is truly interested is more likely to focus on the topic or activity more fully, work at it for longer periods, use more thoughtful strategies in learning—and enjoy doing so (Hidi, 2001; Hidi & Renninger, 2006). Small wonder that the student achieves more! Note, though, a persistent ambiguity about this benefit: it is often not clear whether personal interest leads to higher achievement, or higher achievement leads to stronger interest. Either possibility seems plausible. Research to sort them out, however, has suggested that at least some of the influence goes in the direction of interest to achievement; when elementary students were given books from which to learn about a new topic,

for example, they tended to learn more from books which they chose themselves than from books that were simply assigned (Reynolds & Symons, 2001). So interest seemed to lead to learning. But this conclusion does not rule out its converse, that achievement may stimulate interest as well. As Joe learns more about history, he steadily finds history more interesting; as McKenzie learns more about biology, she gradually wants to learn more about it.

Stimulating Situational Interests

If a student has little prior personal interest in a topic or activity, the teacher is faced with stimulating initial, situational interest, in hopes that the initial interest will gradually become more permanent and personal. Hidi and Renninger (2006) proposed a four-phase model of interest development describing how interest develops from transient situational interest into stable individual interest.

In the first phase, situational interest is sparked by environmental features such as novel, incongruous, or surprising information, which is called *triggered situational interest*. Triggered situational interest provokes attention and arousal only in the short term. A teacher might include surprises in their comments and in classroom activities from time to time: tell students facts that are true but counter-intuitive, for example, or demonstrate a science experiment that turns out differently than students expect (Guthrie, Wigfield, & Humenick, 2006).

The second phase is referred to as *maintained situational interest*, which involves focused attention and persistence over a longer period of time. Situational interest is sustained when a person finds the meaningfulness of tasks or personal connections to the tasks. Only maintained situational interest can develop into long-term individual interest. The teacher might relate the new material to students' prior experiences even if their experiences are not related

to academics or to school directly. The concepts of gravitation and acceleration, for example, operate every time a ball is hit or thrown in a softball game. If this connection is pointed out to a student who enjoys playing a lot of softball, the concepts can make concepts more interesting.

The third phase of interest development is called e*merging individual interest*, marking a transition to individual interest. This phase is characterized by an individual's tendency to reengage with tasks and to generate his or her own curiosity questions without much external support as well as the individual's (?) positive feelings. A teacher could encourage students to respond to new material actively. By having students talk about the material together, for example, students can begin making their own connections to prior personal interests, and the social interaction itself helps to link the material to their personal, and social interests as well.

The last phase is referred to as *well-developed individual interest*, a person's deep-seated interest that involves a tendency to engage, with positive feelings, with a topic over an extended period of time.

Although the four-phase model of interest development has been generally accepted, the model is underspecified and has received limited empirical support. For example, the model does not provide a psychological mechanism explaining how the transition to the next phase occurs. More research is needed to achieve a better understanding of interest development.

A Caution

Even though it is important to stimulate interest in new material somehow, it is also possible to mislead or distract students accidentally by adding inappropriate, but stimulating features to new material (Garner, et al., 1992; Harp & Mayer, 1998). Distractions happen in a number of ways, such as these, among others:

- deliberately telling jokes in class
- using colorful illustrations or pictures
- adding interesting bits of information to a written or verbal explanation

When well-chosen, all of these moves can indeed arouse students' interest in a new topic. But if they do not really relate to the topic at hand, they may simply create misunderstandings or prevent students from focusing on key material. As with most other learning processes, however, there are individual differences among students in distractability, students who are struggling and are more prone to distraction and misunderstanding than students who are already learning more successfully (Sanchez & Wiley, 2006). On balance, the best advice is probably, therefore, to use strategies to arouse situational interest, but to assess students' responses to them continually and as honestly as possible. The key issue is whether students seem to learn because of the stimulating strategies that you provide, or in spite of them.

Attribution Theory

Attributions are perceptions about the causes of success and failure. Suppose that you get a low mark on a test and are wondering what caused the low mark. You can construct various explanations for—make various attributions about—this failure. Maybe you did not study very hard; maybe the test itself was difficult; maybe you were unlucky; maybe you just are not smart enough. Each explanation attributes the failure to a different factor. The explanations that you settle upon may reflect the truth accurately—or then again, they may not. What is important about attributions is that they reflect personal beliefs about the sources or causes of success and failure. As such, they tend to affect motivation in various ways, depending on the nature of the attribution (Weiner, 2005).

Locus, Stability, and Controllability

Attributions vary in three underlying ways: locus, stability, and controllability. The **locus** of attribution is the location (figuratively speaking) of the source of success or failure. If you attribute a top mark on a test to your ability, then the locus is *internal*; if you attribute the mark to the test's having easy questions, then the locus is *external*. The **stability** of attribution is its relative permanence. If you attribute the mark to your ability, then the source of success is relatively *stable*—by definition, the ability is a relatively lasting quality. If you attribute a top mark to the effort you put into studying, then the source of success is *unstable*—effort can vary and has to be renewed on each occasion, or else it disappears. The **controllability** of attribution is the extent to which the individual can influence it. If you attribute a top mark to your effort at

studying, then the source of success is relatively *controllable*—you can influence effort simply by deciding how much to study. But if you attribute the mark to simple luck, then the source of the success is *uncontrollable*—there is nothing that can influence random chance.

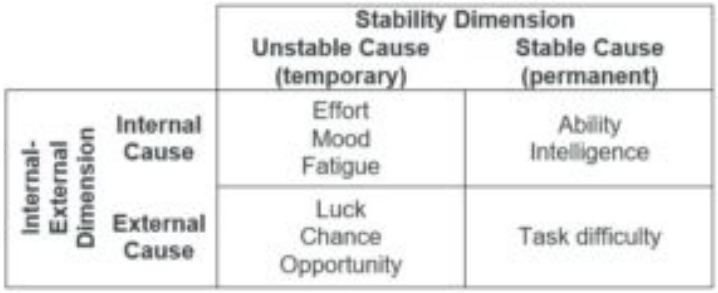

Figure 6.6.1. Attribution theory model.

As you might suspect, the way that these attributions combine affects students' academic motivations in major ways. It usually helps both motivation and achievement if a student attributes academic successes and failures to factors that are internal and controllable, such as effort or a choice to use particular learning strategies (Dweck, 2000). Attributing successes to factors that are internal but stable or controllable (like ability), on the other hand, is both a blessing and a curse: sometimes it can create optimism about prospects for future success ("I always do well"), but it can also lead to indifference about correcting mistakes (Dweck, 2006), or even create pessimism if a student happens not to perform at the accustomed level ("Maybe I'm not as smart as I thought"). Worst of all for academic motivation is attributions, whether stable or not, related to external factors. Believing that performance depends simply on luck ("The teacher was in a bad mood when marking") or on the excessive difficulty of material removes the incentive for a

student to invest in learning. All in all, then, it seems important for teachers to encourage internal, stable attributions about success.

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Video 6.6.1. *Weiner's Attribution Theory* explains the theory and provides examples.

Influencing Students' Attributions

How can they do so? One way or another, effective strategies involve framing teachers' own explanations of success and failure around internal, controllable factors. Instead of telling a student: "Good work! You're smart!" try saying: "Good work! Your effort really made a difference, didn't it?" If a student fails, instead of saying, "Too bad! This material is just too hard for you," try saying, "Let's find a strategy for practicing this more, and then you can try again." In both cases, the first option emphasizes uncontrollable factors (effort, difficulty level), and the second option emphasizes internal, controllable factors (effort, use of specific strategies).

Such attributions will only be convincing, however, if teachers provide appropriate conditions for students to learn—conditions in which students' efforts really do pay off. There are three conditions that have to be in place in particular. First, academic tasks and materials actually have to be at about the right level of difficulty. If you give problems in advanced calculus to a first-grade student, the student will not only fail them but also be justified in attributing

the failure to an external factor, task difficulty. If assignments are assessed in ways that produce highly variable, unreliable marks, then students will rightly attribute their performance to an external, unstable source: luck. Both circumstances will interfere with motivation.

Second, teachers also need to be ready to give help to individuals who need it—even if they believe that an assignment is easy enough or clear enough that students should not need individual help. Readiness to help is always essential because it is often hard to know in advance exactly how hard a task will prove to be for particular students. Without assistance, a task that proves difficult initially may remain difficult indefinitely, and the student will be tempted to make unproductive, though correct, attributions about his or her failure ("I will never understand this," "I'm not smart enough," or "It doesn't matter how hard I study").

Third, teachers need to remember that ability—usually considered a relatively stable factor—often actually changes *incrementally* over the long term. Recognizing this fact is one of the best ways to bring about actual increases in students' abilities (Blackwell, Trzniewski, & Dweck, 2007; Schunk, Pintrich, & Meese, 2008). A middle-years student might play the trumpet in the school band at a high level of ability, but this ability actually reflects a lot of previous effort and a gradual increase in ability. A second-grade student who reads fluently, in this sense may have a high current ability to read; but at some point in the distant past that same student could not read as well, and even further back he may not have been able to read at all. The increases in ability have happened at least in part because of effort. While these ideas may seem obvious, they can easily be forgotten in the classroom because effort and ability evolve according to very different time frames. Effort and its results appear relatively immediately; a student expends effort this week, this day, or even at this very moment, and the effort (if not the results) is visible right away. But ability may take longer to show itself; a student often develops it only over many weeks, months, or years.

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Self-Efficacy Theory

In addition to being influenced by their drives, interests, and attributions, students' motives are affected by *specific* beliefs about the student's personal capacities. In **self-efficacy theory,** the beliefs become a primary, explicit explanation for motivation (Bandura, 1977, 1986, 1997). **Self-efficacy** is the belief that you are capable of carrying out a specific task or of reaching a specific goal. Note that the belief and the action or goal are *specific*. Self-efficacy is a belief that you can write an acceptable term paper, for example, repair an automobile, or make friends with the new student in class. These are relatively specific beliefs and tasks. Self-efficacy is not about whether you believe that you are intelligent in general, whether you always like working with mechanical things, or thinking that you are generally a likable person. These more general judgments are better regarded as various mixtures of *self-concepts* (beliefs about general personal identity) or of *self-esteem* (evaluations of identity). They are important in their own right and sometimes influence motivation, but only indirectly (Bong & Skaalvik, 2004). Self-efficacy beliefs, furthermore, are not the same as "true" or documented skill or ability. They are *self*-constructed, meaning that they are personally developed perceptions. There can sometimes, therefore, be discrepancies between a person's self-efficacy beliefs and the person's abilities. You can believe that you can write a good term paper, for example, without actually being able to do so, and vice versa: you can believe yourself *in*capable of writing a paper, but discover that you *are* in fact able to do so. In this way, self-efficacy is like the everyday idea of *confidence*, except that it is defined more precisely. And as with confidence, it is possible to have either too much or too little self-efficacy. The optimum level seems to be either at or slightly above true capacity (Bandura, 1997). As we indicate below, large discrepancies between self-efficacy and ability can create motivational problems for the individual.

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Video 6.7.1. *Self-Efficacy* theory of motivation explained.

Effects of Self-Efficacy on Students' Behavior

Self-efficacy may sound like a uniformly desirable quality, but research, as well as teachers, experience suggests that its effects are a bit more complicated than they first appear. Self-efficacy has three main effects, each of which has both a "dark" or undesirable side and a positive or desirable side.

Choice of Tasks

The first effect is that self-efficacy makes students more willing to choose tasks where they already feel confident about succeeding. This effect is almost inevitable, given the definition of the concept of self-efficacy, it has also been supported by research on self-efficacy beliefs (Pajares & Schunk, 2001). For teachers, the effect on choice can be either welcome or not, depending on circumstances. If a student believes that he or she can solve mathematical problems, then the student is more likely to attempt the mathematics homework that the teacher assigns. Unfortunately, the converse is also true. If a student believes that he or she is *in*capable of math, then the student is less likely to attempt the math

homework (perhaps telling himself, "What's the use of trying?"), regardless of the student's actual ability in math.

Since self-efficacy is self-constructed, furthermore, it is also possible for students to miscalculate or misperceive their true skills, and the misperceptions themselves can have complex effects on students' motivations. From a teacher's point of view, all is well even if students overestimate their capacity but actually do succeed at a relevant task anyway, or if they underestimate their capacity, yet discover that they *can* succeed and raise their self-efficacy beliefs as a result. All may not be well, though, if students do not believe that they can succeed and therefore do not even try, or if students overestimate their capacity by a wide margin, but are disappointed unexpectedly by failure and lower their self-efficacy beliefs.

Persistence at Tasks

A second effect of high self-efficacy is increased persistence in relevant tasks. If you believe that you can solve crossword puzzles, but encounter one that takes longer than usual, then you are more likely to work longer at the puzzle until you (hopefully) really do solve it. This is probably a desirable behavior in many situations unless the persistence happens to interfere with other, more important tasks (what if you should be doing homework instead of working on crossword puzzles?). If you happen to have low self-efficacy for crosswords, on the other hand, then you are more likely to give up early on a difficult puzzle. Giving up early may often be undesirable because it deprives you of a chance to improve your skill by persisting. Then again (on the third hand?), the consequent lack of success because of giving up may provide a useful incentive to improve your crossword skills. And again, misperceptions of capacity make a difference. Overestimating your capacity by a lot (excessively high self-efficacy) might lead you not to prepare for or focus on a task properly, and thereby impair your performance. So

as with choosing tasks, the effects of self-efficacy vary from one individual to another and one situation to another. The teacher's task is therefore two-fold: first, to discern the variations, and second, to encourage the positive self-efficacy beliefs. Table 1 offers some additional advice about how to do this.

Table 6.7.1. Ways of encouraging self-efficacy beliefs

Strategy	Example of what the teacher might say
Set goals with students, and get a commitment from them to reach the goals.	"By the end of the month, I want you to know all of the times table up to 25 × 25. Can I count on you to do that?"
Encourage students to compare their performance with their own previous performance, not with other students.	"Compare that drawing against the one that you made last semester. I think you'll find improvements!"
Point out links between effort and improvement.	"I saw you studying for this test more this week. No wonder you did better this time!"
In giving feedback about performance, focus on information, not evaluative judgments.	"Part 1 of the lab write-up was very detailed, just as the assignment asked. Part 2 has a lot of good ideas in it, but it needs to be more detailed and stated more explicitly."
Point out that increases in knowledge or skill happen gradually by sustained effort, not because of inborn ability.	"Every time I read another one of your essays, I see more good ideas than the last time. They are so much more complete than when you started the year."

Response to Failure

High self-efficacy for a task not only increases a person's persistence at the task but also improves their ability to cope with stressful conditions and to recover their motivation following outright failures. Suppose that you have two assignments—an essay and a science lab report—due on the same day, and this circumstance promises to make your life hectic as you approach

the deadline. You will cope better with the stress of multiple assignments if you already believe yourself capable of doing both of the tasks, than if you believe yourself capable of doing just one of them or (especially) of doing neither. You will also recover better in the unfortunate event that you end up with a poor grade on one or even both of the tasks.

That is the good news. The bad news, at least from a teacher's point of view, is that the same resilience can sometimes also serve non-academic and non-school purposes. How so? Suppose, instead of two school assignments due on the same day, a student has only one school assignment due but also holds a part-time evening job as a server in a local restaurant. Suppose, further, that the student has high self-efficacy for both of these tasks; he believes, in other words, that he is capable of completing the assignment as well as continuing to work at the job. The result of such resilient beliefs can easily be a student who devotes *less* attention to school work than ideal, and who even ends up with a *lower* grade on the assignment than he or she is capable of.

Learned Helplessness and Self-Efficacy

If a person's sense of self-efficacy is very low, he or she can develop **learned helplessness**, a perception of complete *lack* of control in mastering a task. The attitude is similar to depression, a pervasive feeling of apathy, and a belief that effort makes no difference and does not lead to success. Learned helplessness was originally studied from the behaviorist perspective of classical and operant conditioning by the psychologist Martin Seligman (1995). The studies used a somewhat "gloomy" experimental procedure in which an animal, such as a rat or a dog, was repeatedly shocked in a cage in a way that prevented the animal from escaping the shocks. In a later phase of the procedure, conditions were changed so that the animal could avoid the shocks by merely moving from one side

of the cage to the other. Yet frequently they did not bother to do so! Seligman called this behavior *learned helplessness*.

In people, learned helplessness leads to characteristic ways of dealing with problems. They tend to attribute the source of a problem to themselves, generalize the problem to many aspects of life, and see the problem as lasting or permanent. More optimistic individuals, in contrast, are more likely to attribute a problem to outside sources, to see it as specific to a particular situation or activity, and to see it as temporary or time-limited. Consider, for example, two students who each fail a test. The one with a lot of learned helplessness is more likely to explain the failure by saying something like: "I'm stupid; I never perform well on any schoolwork, and I never will perform well at it." The other, more optimistic student is more likely to say something like: "The teacher made the test too hard this time, so the test doesn't prove anything about how I will do next time or in other subjects."

What is noteworthy about these differences in perception is how much the more optimistic of these perspectives resembles high self-efficacy and how much learned helplessness seems to contradict or differ from it. As already noted, high self-efficacy is a strong belief in one's capacity to carry out a *specific* task successfully. By definition, therefore, self-efficacy focuses attention on a temporary or time-limited activity (the task), even though the cause of successful completion (oneself) is "internal." Teachers can minimize learned helplessness in students, therefore, by encouraging their self-efficacy beliefs. There are several ways of doing this, as we explain next.

Sources of Self-Efficacy Beliefs

Psychologists who study self-efficacy have identified four major sources of self-efficacy beliefs (Pajares & Schunk, 2001, 2002). In order of importance, they are (1) prior experiences of mastering

tasks, (2) watching others mastering tasks, (3) messages or "persuasion" from others, and (4) emotions related to stress and discomfort. Fortunately, the first three can be influenced by teachers directly, and even the fourth can sometimes be influenced indirectly by appropriate interpretive comments from the teacher or others.

Prior Experiences of Mastery

Not surprisingly, past successes at a task increase students' beliefs that they will succeed again in the future. The implication of this basic fact means that teachers need to help students build a history of success. Whether they are math problems, reading assignments, or athletic activities, tasks have to end with success more often than with failure. Note, though, that the successes have to represent mastery that is genuine or competence that is truly authentic. Success at tasks that are trivial or irrelevant does not improve self-efficacy beliefs, nor does praise for successes that a student has not really had (Erikson, 1968/1994).

As a practical matter, creating a genuine history of success is most convincing if teachers also work to broaden a student's vision of "the past." Younger students (elementary-age) in particular have relatively short or limited ideas of what counts as "past experience"; they may go back only a few occasions when forming impressions of whether they can succeed again in the future (Eccles, et al., 1998). Older students (secondary school) gradually develop longer views of their personal "pasts," both because of improvements in memory and because of accumulating a personal history that is truly longer. The challenge for working with any age, however, is to ensure that students base self-efficacy beliefs on *all* relevant experiences from their past, not just on selected or recent experiences.

Watching Others' Experiences of Mastery

A second source of efficacy beliefs comes from *vicarious experience of mastery*, or observing others' successes (Schunk & Zimmerman, 1997). Simply seeing someone else succeed at a task, in other words, can contribute to believing that you, too, can succeed. The effect is stronger when the observer lacks experience with the task and therefore may be unsure of his or her own ability. It is also stronger when the model is someone respected by the observer, such as a student's teacher, or a peer with generally comparable ability. Even under these conditions, though, vicarious experience is not as influential as a direct experience. The reasons are not hard to imagine. Suppose, for example, you witness both your teacher and a respected friend succeed at singing a favorite tune, but you are unsure whether you personally can sing. In that case, you may feel encouraged about your own potential, but are likely still to feel somewhat uncertain of your own efficacy. If on the other hand you do *not* witness others' singing, but you have a history of singing well yourself, it is a different story. In that case, you are likely to believe in your efficacy, regardless of how others perform.

All of which suggests that to a modest extent, teachers may be able to enhance students' self-efficacy by modeling success at a task or by pointing out classmates who are successful. These strategies can work because they not only show how to do a task but also communicate a more fundamental message, the fact that the task *can* in fact be done. If students are learning a difficult arithmetic procedure, for example, you can help by demonstrating the procedure, or by pointing out classmates who are doing it. Note, though, that vicarious mastery is helpful only if backed up with real successes performed by the students themselves. It is also helpful only if the "model classmates" is perceived as truly comparable in ability. Overuse of vicarious models, especially in the absence of real success by learners, can cause learners to disqualify a model's success; students may simply decide that the model is "out of their

league" in skills and is therefore irrelevant to judging their own potential.

Social Messages and Persuasion

A third source of efficacy beliefs is encouragements, both implied and stated, that persuade a person of his or her capacity to do a task. Persuasion does not create high efficacy by itself, but it often increases or supports it when coupled with either direct or vicarious experience, especially when the persuasion comes from more than one person (Goddard, Hoy, & Hoy, 2004).

For teachers, this suggests two things. The first, of course, is that encouragement can motivate students, especially when it is focused on achievable, specific tasks. It can be motivating to say things like: "I think you can do it" or "I've seen you do this before, so I know that you can do it again." But the second implication is that teachers should arrange wherever possible to support their encouragement by designing tasks at hand that is in fact achievable by the student. Striking a balance of encouragement and task difficulty may seem straightforward, but sometimes it can be challenging because students can sometimes perceive teachers' comments and tasks quite differently from how teachers intend. Giving excessive amounts of detailed help, for example, may be intended as support for a student, but be taken as a lack of confidence in the student's ability to do the task independently.

Emotions Related to Success, Stress, or Discomfort

The previous three sources of efficacy beliefs are all rather cognitive or "thinking oriented," but emotions also influence expectations of

success or failure. Feeling nervous or anxious just before speaking to a large group (sometimes even just a class full of students!) can function like a message that says "I'm not going to succeed at doing this," even if there is in fact good reason to expect success. But positive feelings can also raise beliefs about efficacy. When recalling the excitement of succeeding at a previous, unrelated task, people may overestimate their chances of success at a new task with which they have no previous experience, and are therefore in no position to predict their efficacy.

For teachers, the most important implication is that students' motivation can be affected when they generalize from past experiences that they believe, rightly or wrongly, to be relevant. By simply announcing a test, for example, a teacher can make some students anxious even before the students find out anything about the test— whether it is easy or difficult, or even comparable in any way to other experiences called "tests" in their pasts. Conversely, it can be misleading to encourage students on the basis of their success at past academic tasks if the earlier tasks were not really relevant to the requirements of the new tasks at hand. Suppose, for example, that a middle-years student has previously written only brief opinion-based papers, and never written a research-based paper. In that case, boosting the student's confidence by telling him that "it is just like the papers you wrote before" may not be helpful or even honest.

A Caution: Motivation as Content versus Motivation as Process

A caution about self-efficacy theory is its heavy emphasis on just the process of motivation, at the expense of the content of motivation. The basic self-efficacy model has much to say about how beliefs affect behavior, but relatively little to say about which beliefs and tasks are especially satisfying or lead to the greatest well-being in

students. The answer to this question is important to know since teachers might then select tasks as much as possible that are intrinsically satisfying, and not merely achievable.

Another way of posing this concern is by asking: "Is it possible to feel high self-efficacy about a task that you do not enjoy?" It does seem quite possible for such a gap to exist. As a youth, for example, one of us (Kelvin Seifert) had considerable success with solving math problems in high school algebra and expended considerable effort doing algebra assignments as homework. Before long, he had developed high self-efficacy with regard to solving such problems. But Kelvin never really enjoyed solving the algebra problems, and later even turned away permanently from math or science as a career (much to the disappointment of his teachers and family). In this case, self-efficacy theory nicely explained the process of his motivation—Kelvin's belief in his capacity led to persistence in the tasks. But it did not explain the content of his motivation—his growing dislike of the tasks. Accounting for such a gap requires a different theory of motivation, one that includes not only specific beliefs but "deeper" personal needs as well. An example of this approach is self-determination theory, where we turn next.

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Expectancy-Value Theory

As we have explained in this chapter, motivation is affected by several factors, including reinforcement for behavior, but especially also students' goals, interests, and sense of self-efficacy and self-determination. The factors combine to create two general sources of motivation: students' expectations of success and the value that students place on a goal. Viewing motivation in this way is often called the expectancy-value model of motivation (Wigfield & Eccles, 2002; Wigfield, Tonk, & Eccles, 2004), and sometimes written with a multiplicative formula: expectancy x value = motivation. The relationship between expectation and value is "multiplicative" rather than additive because, in order to be motivated, it is necessary for a person to have at least a modest expectation of success and to assign a task at least some positive value. If you have high expectations of success but do not value a task at all (mentally assign it a "0" value), then you will not feel motivated at all. Likewise, if you value a task highly but have no expectation of success in completing it (assign it a "0" expectancy), then you also will not feel motivated at all.

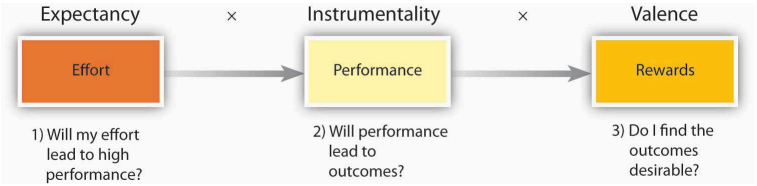

Figure 6.8.1. Expectancy-value model.

Task value answers the question, "Why should I do this task?" There are four possible answers to the question: intrinsic value, attainment value, utility value, and cost (Wigfield & Eccles, 1992). *Intrinsic value* is the pure enjoyment a student feels from performing a task. When they are intrinsically interested in it, students are willing to become involved in a given task. *Attainment value* refers to the importance of doing well on a task. Tasks are

perceived as important when they reflect the important aspects of one's self. *Utility value* is the perception that a task will be useful for meeting future goals, for instance, taking a Chinese class to get a job in China. The last component of task value, *cost*, refers to what an individual has to give up to engage in a task or the effort needed to accomplish the task. If the cost is too high, students will be less likely to engage in a given task. For instance, students may not decide to take an extra course when they need to reduce the hours of their part-time job.

Numerous studies have shown that students' expectancies for success and subjective task values positively influenced achievement behaviors and outcomes (Dennissen, Zarret, & Eccles, 2007; Durik, Shechter, Noh, Rozek, & Harackiewicz, 2015; Wigfield & Eccles, 2000). For example, Bong (2001) reported that college students' perceived competence was a significant predictor of their performance. Also, students' perceived utility predicted future enrollment intentions. These relations have been also found in online learning environments. Joo, Lim, and Kim (2013) reported that the perceived competence and task value of students enrolled in an online university significantly predicted learner satisfaction, persistence, and achievement.

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Video 6.8.1. *Expectancy-Value Theory of Achievement Motivation* explains EVT and application of the theory.

Influencing Student Motivation

Ideally, both expectancies and values are high in students on any key learning task. The reality, however, is that students sometimes do not expect success, nor do they necessarily value it when success is possible. How can a teacher respond to low expectations and low valuing? We have offered a number of suggestions to meet this challenge throughout this chapter. In brief, raising low expectations depends on adjusting task difficulty so that success becomes a reasonable prospect: a teacher must make tasks neither too hard nor too easy. Reaching this general goal depends in turn on thoughtful, appropriate planning—selecting reasonable objectives, adjusting them on the basis of experience, finding supportive materials, and providing students with help when needed.

Raising the value of academic tasks is equally important, but the general strategies for doing so are different than for raising expectations. Increasing value requires linking the task to students' personal interests and prior knowledge, showing the utility of the task to students' future goals, and showing that the task is valuable to other people whom students respect.

Influencing Expectancy Perceptions

Students may not believe that their effort leads to high performance for a multitude of reasons. First, they may not have the skills,

knowledge, or abilities to successfully perform. Supporting students in acquiring the necessary skills and knowledge can help raise expectancy. Second, low levels of expectancy may be because students feel that something other than effort predicts performance, such as fairness or favoritism. If students believe that the learning environment is not conducive to performing well (resources are lacking or teacher's expectations are unclear), expectancy will also suffer. Therefore, clearing the path to performance and creating an environment in which students do not feel restricted will be helpful. Finally, some students may perceive little connection between their effort and performance level because they have an external locus of control, low self-esteem, or other personality traits that condition them to believe that their effort will not make a difference. In such cases, providing positive feedback and encouragement may help motivate them.

Influencing Instrumentality Perceptions

Showing students that their performance is rewarded is going to increase instrumentality perceptions. Therefore, the first step in influencing instrumentality is to connect rewards to performance. However, this is not always sufficient, because students may not be aware of some of the rewards awaiting high performers. Students may need to be made aware of the payoffs to learning. It is also important to highlight that performance, not something else, is

being rewarded. A meritless reward system may actually hamper the motivation of the highest performers by eroding instrumentality. However, performance-related skill mastery and progress can be acknowledged and rewarded without a student mastering all skills or being the best performer.

Influencing Valence

Students are more likely to be motivated if they find the reward to be attractive. This process involves teachers finding what their students value. Desirable rewards tend to be fair and satisfy different students' diverging needs. Ensuring high valence involves getting to know students and giving students various rewards to increase valence.

Figure 6.8.2. Ways to influence expectancy, instrumentality, and valence.

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Self-Determination Theory

Pintrich (1991) believes that both attribution and self-efficacy theory make motivation appear too cognitive, too abstract, and too devoid of energy and passion. Similarly, Deci and his colleagues (1991) argue that most current approaches to motivation fail to deal with the question of why learners desire certain goals or outcomes. For example, Deci believes that attribution and self-efficacy theory emphasize too strongly the role of beliefs when accounting for intrinsic motivation. He questions how these theories account for the needs of learners to feel competent and independent. He claims that such theories make the motivational process appear too rational, too cold, and too isolated from the day-to-day emotions and feelings that characterize the classroom behavior of children.

Deci offers an alternative, self-determination theory. He contends that this theory reintroduces a component of motivation that has long been neglected by most modern cognitive motivational theories: human needs. Moreover, it does so while still assigning a critical role to the learners' thought processes. Let's examine the self-determination perspective and see how it can be applied. Human Needs. In our presentation of attribution theory, we pointed out that a learner's intrinsic motivation for a particular task depended on her beliefs about what was responsible for past successes or failures. We outlined teaching practices that lead learners to believe that success results from factors under their control.

Self-efficacy theory tells us that learners' intrinsic motivation for a task rests with their beliefs about whether they are good at it and can achieve its goals. We learned about instructional practices that promote positive self-efficacy beliefs. Self-determination theory is more complex. It tells us that underlying intrinsic motivation is an attitude of self-determination to accomplish a goal. This attitude is more than just a belief in one's self-efficacy, although that is a

component of self-determination. Likewise, self-determination involves more than beliefs about the causes of success or failure. Rather, self-determination theory focuses on three innate human needs: competence, relationships, and autonomy.

Competence needs involve the learner's knowledge of how to achieve certain goals and the skill for doing so. Deci believes that learners have an innate psychological need to believe that they are competent. Relationship needs are innate requirements for secure and satisfying connections with peers, teachers, and parents. Finally, autonomy needs refer to the ability to initiate and regulate one's own actions.

Note that these needs are all psychological, not physical; hunger and sex, for example, are not on the list. They are also about personal growth or development, not about deficits that a person tries to reduce or eliminate. Unlike food (in behaviorism) or safety (in Maslow's hierarchy), you can never get enough autonomy, competence, or relatedness. You (and your students) will seek to enhance these continually throughout life.

The key idea of self-determination theory is that when persons (such as you or one of your students) feel that these basic needs are reasonably well met, they tend to perceive their actions and choices to be intrinsically motivated or "self-determined." In that case, they can turn their attention to a variety of activities that they find attractive or important, but that does not relate directly to their basic needs. Among your students, for example, some individuals might read books that you have suggested, and others might listen attentively when you explain key concepts from the unit that you happen to be teaching. If one or more basic needs are not met well, however, people will tend to feel coerced by outside pressures or external incentives. They may become preoccupied, in fact, with satisfying whatever need has not been met and thus exclude or avoid activities that might otherwise be interesting, educational, or important. If the persons are students, their learning will suffer.

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https://edpsych.pressbooks.sunycreate.cloud/?p=96#oembed-1

Video 6.9.1. *Motivation: What Moves Us and Why?* explains the principles of self-determination theory.

Self-Determination and Intrinsic Motivation

In proposing the importance of needs, then, self-determination theory is asserting the importance of intrinsic motivation. The self-determination version of intrinsic motivation, however, emphasizes a person's perception of freedom, rather than the presence or absence of "real" constraints on action. Self-determination means a person feels free, even if the person is also operating within certain external constraints. In principle, a student can experience self-determination even if the student must, for example, live within externally imposed rules of appropriate classroom behavior. To achieve a feeling of self-determination, however, the student's basic needs must be met—needs for autonomy, competence, and relatedness. In motivating students, then, the bottom line is that teachers have an interest in helping students to meet their basic needs, and in not letting school rules or the teachers' own leadership styles interfere with or block satisfaction of students' basic needs.

"Pure" self-determination may be ideal for most teachers and students, of course, but the reality is usually different. For a variety of reasons, teachers in most classrooms cannot be expected to meet all students' basic needs at all times. One reason is the sheer number

of students, which makes it impossible to attend to every student perfectly at all times. Another reason is teachers' responsibility for a curriculum, which can require creating expectations for students' activities that sometimes conflict with students' autonomy or makes them feel (temporarily) less than fully competent. Still, another reason is students' personal histories, ranging from divorce to poverty, which may create needs in some individuals which are beyond the power of teachers to remedy.

The result from students' point of view is usually only a partial perception of self-determination, and therefore a simultaneous mix of intrinsic and extrinsic motivations. Self-determination theory recognizes this reality by suggesting that the "intrinsic-ness" of motivation is really a matter of degree, extending from highly *ex*trinsic, through various mixtures of intrinsic and extrinsic, to highly *in*trinsic (Koestner & Losier, 2004). At the extrinsic end of the scale is learning that is regulated primarily by external rewards and constraints, whereas at the intrinsic end is learning regulated primarily by learners themselves. Table 1 summarizes and gives examples of the various levels and their effects on motivation. By assuming that motivation is often a mix of the intrinsic and extrinsic, the job of the teacher becomes more realistic; the job is not to expect purely intrinsic motivation from students all the time, but simply to arrange and encourage motivations that are as intrinsic as possible. To do this, the teacher needs to support students' basic needs for autonomy, competence, and relatedness.

Table 6.9.1. Combinations of intrinsic and extrinsic motivation

Source of regulation of action	Description	Example
"Pure" extrinsic motivation	Person lacks the intention to take any action, regardless of pressures or incentives	Student completes *no* work even when pressured or when incentives are offered
Very external to person	Actions regulated only by outside pressures and incentives, and controls	Student completes assignment *only* if reminded explicitly of the incentive of grades and/or negative consequences of failing
Somewhat external	Specific actions regulated internally, but without reflection or connection to personal needs	Student completes assignment independently, but only because of fear of shaming self or because of guilt about consequences of not completing assignment
Somewhat internal	Actions recognized by individual as important or as valuable as a means to a more valued goal	Student generally completes school work independently, but only because of its value in gaining admission to college
Very internal	Actions adopted by individual as integral to self-concept and to person's major personal values	Student generally completes school work independently, because being well educated is part of the student's concept of himself
"Pure" intrinsic regulation	Actions practiced solely because they are enjoyable and valued for their own sake	Student enjoys every topic, concept, and assignment that every teacher ever assigns, and completes school work solely because of his enjoyment

Using Self-Determination Theory in the Classroom

What are some teaching strategies for supporting students' needs?

Educational researchers have studied this question from a variety of directions, and their resulting recommendations converge and overlap in a number of ways. For convenience, the recommendations can be grouped according to the basic need that they address, beginning with the need for autonomy.

Supporting Autonomy in Learners

A major part of supporting autonomy is to give students *choices* wherever possible (Ryan & Lynch, 2003). The choices that encourage the greatest feelings of self-control, obviously, are ones that are about relatively major issues or that have relatively significant consequences for students, such as whom to choose as partners for a major group project. But choices also encourage some feeling of self-control even when they are about relatively minor issues, such as how to organize your desk or what kind of folder to use for storing your papers at school. It is important, furthermore, to offer choices to *all* students, including students needing explicit directions in order to work successfully; avoid reserving choices for only the best students or giving up offering choices altogether to students who fall behind or who need extra help. All students will feel more self-determined and therefore more motivated if they have choices of some sort.

Teachers can also support students' autonomy more directly by minimizing external rewards (like grades) and comparisons among students' performance, and by orienting and responding themselves to students' expressed goals and interests. In teaching elementary students about climate change, for example, you can support autonomy by exploring which aspects of this topic have *already* come to students' attention and aroused their concern. The point of the discussion would not be to find out "who knows the most" about this topic but to build and enhance students' intrinsic motivations as much as possible. In reality, of course, it may not be possible

to succeed at this goal fully—some students may simply have no interest in the topic, for example, or you may be constrained by time or resources from individualizing certain activities fully. But any degree of attention to students' individuality, as well as any degree of choice, will support students' autonomy.

Supporting the Need for Competence

The most obvious way to make students feel competent is by selecting activities that are challenging but nonetheless achievable with reasonable effort and assistance (Elliott, McGregor, & Thrash, 2004). Although few teachers would disagree with this idea, there are times when it is hard to put into practice, such as when you first meet a class at the start of a school year and therefore are unfamiliar with their backgrounds and interests. But there are some strategies that are generally effective even if you are not yet in a position to know the students well. One is to emphasize activities that require an active response from students. Sometimes this simply means selecting projects, experiments, discussions, and the like that require students to do more than simply listen. Other times it means expecting active responses in all interactions with students, such as by asking questions that call for "divergent" (multiple or elaborated) answers. In a social studies class, for example, try asking "What are some ways we could find out more about our community?" instead of "Tell me the three best ways to find out about our community." The first question invites more divergent, elaborate answers than the second.

Another generally effective way to support competence is to respond and give feedback as immediately as possible. Tests and term papers help subsequent learning more if returned, with comments, sooner rather than later. Discussions teach more if you include your own ideas in them, while still encouraging students' input. Small group and independent activities are more effective if

you provide a convenient way for students to consult authoritative sources for guidance when needed, whether the source is you personally, a teaching assistant, a specially selected reading, or even a computer program. In addition, you can sometimes devise tasks that create a feeling of competence because they have a "natural" solution or ending point. Assembling a jigsaw puzzle of the community, for example, has this quality, and so does *creating* a jigsaw puzzle of the community if the students need a greater challenge.

Supporting the Need to Relate to Others

The main way to support students' need to relate to others is to arrange activities in which students work together in ways that are mutually supportive, recognize students' diversity, and minimize competition among individuals. There is a lot more to say about this strategy—including the discussion of several varieties of cooperative learning and some of their pitfalls to be avoided. For now, simply note that having students work together can happen in many ways. You can, for example, deliberately arrange projects that require a variety of talents; some educators call such activities "rich group work" (Cohen, 1994; Cohen, Brody, & Sapon-Shevin, 2004). In studying in small groups about medieval society, for example, one student can contribute his drawing skills, another can contribute his writing skills, and still, another can contribute his dramatic skills. The result can be a multi-faceted presentation—written, visual, and oral. The groups needed for rich group work provide for students' relationships with each other, whether they contain six individuals or only two.

There are other ways to encourage relationships among students. In the jigsaw classroom (Aronson & Patnoe, 1997), for example, students work together in two phases. In the first phase, groups of "experts" work together to find information on a specialized topic.

In a second phase, the expert groups split up and reform into "generalist" groups containing one representative from each former expert group. In studying the animals of Africa, for example, each expert group might find information about a different particular category of animal or plant; one group might focus on mammals, another on birds, a third on reptiles, and so on. In the second phase of the jigsaw, the generalist groups would pool information from the experts to get a more well-rounded view of the topic. The generalist groups would each have an expert on mammals, for example, but also an expert on birds and about reptiles.

As a teacher, you can add to these organizational strategies by encouraging the development of your own relationships with class members. Your goal, as a teacher, is to demonstrate caring and interest in your students not just as students, but as people. The goal also involves behaving as if good relationships between and among class members are not only possible but ready to develop and perhaps even already developing. A simple tactic, for example, is to speak of "we" and "us" as much as possible, rather than speaking of "you students." Another tactic is to present cooperative activities and assignments without apology, as if they are in the best interests not just of students, but of "us all" in the classroom, yourself included.

Keeping Self-Determination in Perspective

In certain ways, self-determination theory provides a sensible way to think about students' intrinsic motivation and therefore think about how to get them to manage their own learning. A particular strength of the theory is that it recognizes *degrees* of self-determination and bases many ideas on this reality. Most people recognize combinations of intrinsic and extrinsic motivation guiding particular activities in their own lives. We might enjoy teaching, for example, but also do this job partly to receive a

paycheck. To its credit, self-determination theory also relies on a list of basic human needs—autonomy, competence, and relatedness—that relate comfortably with some of the larger purposes of education.

Although these are positive features for understanding and influencing students' classroom motivation, some educators and psychologists nonetheless have lingering questions about the limitations of self-determination theory. One is whether merely providing choices actually improves students' learning, or simply improves their *satisfaction* with learning. There is evidence supporting both possibilities (Flowerday & Schraw, 2003; Deci & Ryan, 2003), and it is likely that there are teachers whose classroom experience supports both possibilities as well. Another question is whether it is possible to *overdo* attention to students' needs—and again there is evidence for both favoring and contradicting this possibility. Too many choices can actually make anyone (not just a student) frustrated and dissatisfied with a choice the person actually *does* make (Schwartz, 2004). Furthermore, differentiating activities to students' competence levels may be impractical if students are functioning at extremely diverse levels within a single class, as sometimes happens. Differentiating may be inappropriate, too, if it holds a teacher back from covering key curriculum objectives which students need and which at least some students are able to learn. These are serious concerns, though in our opinion *not* serious enough to give up offering choices to students or to stop differentiating instruction altogether.

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Goal Orientation Theory

Goal setting is a key motivational process (Locke & Latham, 1984). Goals are the outcome that a person is trying to accomplish. People engage in activities that are believed to lead to goal attainment. As learners pursue multiple goals such as academic goals and social goals, goal choice and the level at which learners commit to attaining the goals influence their motivation to learn (Locke & Latham, 2006; Wentzel, 2000).

Besides goal content (i.e., what a person wants to achieve), the reason that a person tries to achieve a certain goal also has a significant influence on learning and performance. Goal orientations refer to the reasons or purposes for engaging in learning activities and explain individuals' different ways of approaching and responding to achievement situations (Ames & Archer, 1988; Meece, Anderman, & Anderman, 2006). The two most basic goal orientations are mastery and performance goals (Ames & Archer, 1988). Different researchers refer to these goals with the following terms: learning and performance goals (Elliot & Dweck, 1988), task-involved and ego-involved goals (Nicholls, 1984), and task-focused and ability-focused goals (Maehr & Midgley, 1991). A mastery goal orientation is defined as a focus on mastering new skills, trying to gain increased understanding, and improving competence (Ames & Archer, 1988). Students adopting mastery goals define success in terms of improvement and learning. In contrast, a performance goal orientation focuses on doing better than others and demonstrating competence, for example, by striving to best others, using social comparative standards to make judgments about their abilities while seeking favorable judgment from others (Dweck & Leggett, 1988).

In addition to the basic distinction between mastery and performance goals, performance goal orientations have been further differentiated into performance-approach and

performance-avoidance goals (Elliot & Church, 1997; Elliot & Harackiewicz, 1996). Performance-approach goals represent individuals motivated to outperform others and demonstrate their superiority, whereas a performance-avoidance goal orientation refers to those who are motivated to avoid negative judgments and appear inferior to others. Incorporating the same approach and avoidance distinction, some researchers have further distinguished mastery-approach and mastery-avoidance goals (Elliot & McGregor, 2001). Mastery-approach goals are related to attempts to improve knowledge, skills, and learning. In contrast, mastery-avoidance goals represent a focus on avoiding misunderstanding or the failure to master a task. For instance, athletes who are concerned about falling short of their past performances reflect a mastery-avoidance goal. Despite the confirmatory factor analyses of the 22 goal framework (Elliot & McGregor, 2001; see Table 6.11.1), the mastery-avoidance construct remains controversial and is in fact the least accepted construct in the field.

Table 6.11.1. Model of goal orientations

	Mastery Goal	**Performance Goal**
	Focus on mastery of learning	Focus on outperforming others
Approach Focus	• Learn from errors • Judge performance based on standards of self-improvement and progress	• Errors indicative of failure • Judge performance based on normative standards of being the best performer
	Focus on avoiding not mastering task	Focus on avoiding failure
Avoidance Focus	• Errors indicative of failure • Judge performance based on standards of not being wrong	• Errors indicative of failure • Judge performance based on normative standards of not being the worst performer

Studies typically report that mastery-approach goals are associated with positive achievement outcomes such as high levels of effort, interest in the task, and use of deep learning strategies (e.g., Greene, Miller, Crowson, Duke, & Akey, 2004; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Wolters, 2004). On the other hand, research on performance-avoidance goals has consistently reported that these goals induced detrimental effects, such as poor persistence, high anxiety, use of superficial strategies, and low achievement (Linnenbrink, 2005; Urdan, 2004; Wolters, 2003, 2004). With regard to performance-approach goals, the data have yielded a mix of outcomes. Some studies have reported modest positive relations between performance-approach goals and achievement (Linnenbrink-Garcia, Tyson, & Patall, 2008). Others have found maladaptive outcomes such as poor strategy use and test anxiety (Keys, Conley, Duncan, & Domina, 2012; Elliot & McGregor, 2001; Middleton & Midgley, 1997). Taken together, these findings suggest that students who adopt performance-approach goals demonstrate high levels of achievement but experience negative emotionality such as test anxiety. Mastery-avoidance goals are the least studied goal orientation thus far. However, some studies have found mastery-avoidance to be a positive predictor of anxiety and a negative predictor of performance (Howell & Watson, 2007; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010).

Figure 6.11.1. The likelihood of goal success is influenced by the goal orientation. Mastery-approach goals are most likely to be successful, and performance-avoidance goals are least likely.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
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Video 6.11.1. *Goal Orientation Theory* explains the four goal orientations and their implications for teaching.

Goals that Contribute to Achievement

What kinds of achievement goals do students hold? Imagine three individuals, Maria, Sara, and Lindsay, who are taking algebra together. Maria's main concern is to learn the material as well as possible because she finds it interesting and because she believes it will be useful to her in later courses, perhaps at university. Hers is a mastery goal because she wants primarily to learn or master the material. Sara, however, is concerned less about algebra than about getting top marks on the exams and in the course. Hers is a performance goal because she is focused primarily on looking successful; learning algebra is merely a vehicle for performing well in the eyes of peers and teachers. Lindsay, for her part, is primarily concerned about avoiding a poor or failing mark. Hers is a performance-avoidance goal or failure-avoidance goal because she is not really as concerned about learning algebra, as Maria is, or about competitive success, as Sara is; she is simply intending to avoid failure.

As you might imagine, mastery, performance, and performance-avoidance goals often are not experienced in pure form, but in combinations. If you play the clarinet in the school band, you might want to improve your technique simply because you enjoy playing as well as possible—essentially a mastery orientation. But you might also want to look talented in the eyes of classmates—a performance orientation. Another part of what you may wish, at least privately, is to avoid looking like a complete failure at playing the clarinet. One of these motives may predominate over the others, but they all may be present.

Mastery goals tend to be associated with the enjoyment of learning the material at hand, and in this sense represent an outcome that teachers often seek for students. By definition therefore they are a form of *intrinsic motivation*. As such mastery goals have been found to be better than performance goals at sustaining students' interest in a subject. In one review of research about learning goals, for example, students with primarily mastery orientations toward a course they were taking not only tended to express greater interest in the course, but also continued to express interest well beyond the official end of the course, and to enroll in further courses in the same subject (Harackiewicz, et al., 2002; Wolters, 2004).

Performance goals, on the other hand, imply *extrinsic motivation* and tend to show the mixed effects of this orientation. A positive effect is that students with a performance orientation do tend to get higher grades than those who express primarily a mastery orientation. The advantage in grades occurs both in the short term (with individual assignments) and in the long term (with overall grade point average when graduating). But there is evidence that performance-oriented students do not actually learn the material as deeply or permanently as students who are more mastery-oriented (Midgley, Kaplan, & Middleton, 2001). A possible reason is that measures of performance—such as test scores—often reward relatively shallow memorization of information and therefore guide performance-oriented students away from

processing the information thoughtfully or deeply. Another possible reason is that a performance orientation, by focusing on gaining recognition as the best among peers, encourages competition among peers. Giving and receiving help from classmates is thus not in the self-interest of a performance-oriented student, and the resulting isolation limits the student's learning.

Goals that Affect Achievement Indirectly

Failure-Avoidant Goals

As we mentioned, failure-avoidant goals by nature undermine academic achievement. Often they are a negative byproduct of the competitiveness of performance goals (Urdan, 2004). If a teacher (and sometimes also fellow students) put too much emphasis on being the best in the class, and if interest in learning the material as such therefore suffers, then some students may decide that success is beyond their reach or may not be desirable in any case. The alternative—simply avoiding failure—may seem wiser as well as more feasible. Once a student adopts this attitude, he or she may underachieve more or less deliberately, doing only the minimum work necessary to avoid looking foolish or to avoid serious conflict with the teacher. Avoiding failure in this way is an example of **self-handicapping**—deliberate actions and choices that reduce the chances of success. Students may self-handicap in a number of ways; in addition to not working hard, they may procrastinate about completing assignments, for example, or set goals that are unrealistically high.

Social Goals

Most students need and value relationships, both with classmates and with teachers, and often (though not always) they get a good deal of positive support from the relationships. But the effects of social relationships are complex, and at times can work both for and against academic achievement. If a relationship with the teacher is important and reasonably positive, then the student is likely to try to please the teacher by working hard on assignments (Dowson & McInerney, 2003). Note, though, that this effect is closer to performance than mastery; the student is primarily concerned about looking good to someone else. If, on the other hand, a student is especially concerned about relationships with peers, the effects on achievement depend on the student's motives for the relationship, as well as on peers' attitudes. Desiring to be close to peers personally may lead a student to ask for help from, and give help to peers—a behavior that may support higher achievement, at least up to a point. But desiring to impress peers with skills and knowledge may lead to the opposite: as we already mentioned, the competitive edge of such a performance orientation may keep the student from collaborating, and in this indirect way reduce a student's opportunities to learn. The abilities and achievement motivation of peers themselves can also make a difference, but once again the effects vary depending on the context. Low achievement and motivation by peers affect an individual's academic motivation more in elementary school than in high school, more in learning mathematics than learning to read, and more if there is a wide *range* of abilities in a classroom than if there is a more narrow range (Burke & Sass, 2006).

In spite of these complexities, social relationships are valued so highly by most students that teachers should generally facilitate them, though also keep an eye on their nature and their consequent effects on achievement. As we explain further, many assignments can be accomplished productively in groups, for example, as long

as the groups are formed thoughtfully; in that chapter, we discuss some ways of ensuring that such groups are successful, such as by choosing group tasks wisely and recognizing all members' contributions as fully as possible. Relationships can also be supported with activities that involve students or adults from another class or from outside the school, as often happens with school or community service projects. These can provide considerable social satisfaction and can sometimes be connected to current curriculum needs (Butin, 2005). But the majority of students' social contacts are likely always to come from students' own initiatives with each other in simply taking time to talk and interact. The teacher's job is to encourage these informal contacts, especially when they happen at times that support rather than interfere with learning.

Encouraging Mastery Goals

Even though a degree of performance orientation may be inevitable in school because of the mere presence of classmates, it does not have to take over students' academic motivation completely. Teachers can encourage mastery goals in various ways, and should in fact do so because a mastery orientation leads to more sustained, thoughtful learning, at least in classrooms, where classmates may sometimes debate and disagree with each other (Darnon, Butera, & Harackiewicz, 2006).

How can teachers do so? One way is to allow students to choose specific tasks or assignments for themselves, where possible, because their choices are more likely than usual to reflect prior personal interests, and hence be motivated more intrinsically than usual. The limitation of this strategy, of course, is that students may not see some of the connections between their prior interests and the curriculum topics at hand. In that case, it also helps for the teacher to look for and point out the relevance of current topics

or skills to students' personal interests and goals. Suppose, for example, that a student enjoys the latest styles of music. This interest may actually have connections with a wide range of school curricula, such as:

- biology (because of the physiology of the ear and of hearing)
- physics or general science (because of the nature of musical acoustics)
- history (because of changes in musical styles over time)
- English (because of relationships between musical lyrics and themes with literary themes)
- foreign languages (because of comparisons of music and songs among cultures)

Still another way to encourage mastery orientation is to focus on students' individual efforts and improvement as much as possible, rather than on comparing students' successes to each other. You can encourage this orientation by giving students detailed feedback about how they can improve performance, or by arranging for students to collaborate on specific tasks and projects rather than to compete about them, and in general by showing your own enthusiasm for the subject at hand.

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Student Orientation Toward Achievement

The distinction between the orientations of approaching success and avoiding failure is important in understanding students' motivation. Students' tendencies to approach success and avoid failures allow us to understand the motivation of four different types of students. Imagine a student's attempts to approach success falls along a spectrum, with some students highly motivated to achieve success and other students not very motivated. Similarly, avoiding failure is also a spectrum, with students either being highly motivated to avoid failure or not.

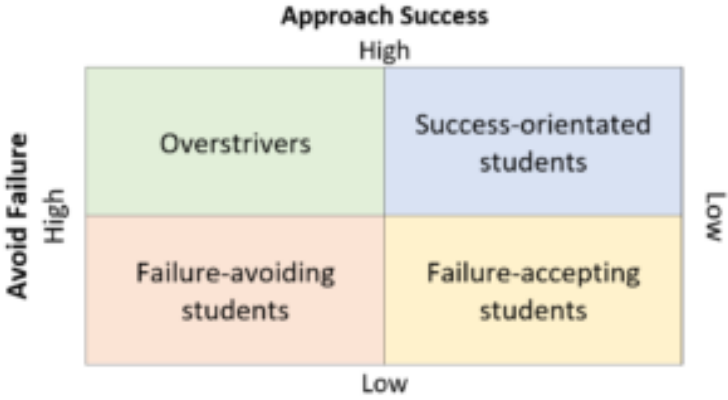

Figure 6.11.1. Student motivation orientation. *Source*: Bohlin, 2011.

Success-oriented students are highly motivated to achieve success and are less concerned with avoiding failure. These students are intrinsically motivated and desire to achieve mastery of goals. Success-orientated students define success as being the best they can be, regardless of the achievements of others. This group

of students differs from the other three groups in that the other defines success as doing better than others.

Like success-oriented students, **overstrivers** are driven to achieve success, but unlike success-oriented students, they fear failure. These students are motivated to prove themselves by outperforming others. To maximize their likelihood of success over their peers they may employ several strategies (Covington, 1984; Stipek, 2002):

1. Select easy tasks to guarantee success with little learning.
2. Maintaining low expectations and aspirations allows students to set the bar low and perceive success when they perform better than anticipated. This strategy gives the impression that with minimal effort the student has high ability.
3. Rehearsed responses involve anticipating which tasks the student will need to perform and practicing the correct response to give the impression that the student has higher ability.
4. Excessive attention to detail and effort. Overstrivers doubt their abilities and attribute their success to effort, such as being overprepared or showing excessive attention to detail. This often involves requiring frequent feedback and check-ins with the teacher.
5. Cheating might be employed as a measure to ensure success and avoid failure. This may be a choice they make over asking for assistance, which they might consider the admission of inability.

Failure-avoiding students are highly motivated to avoid failure but, unlike overstrivers, they do not have high expectations for success. Failure-avoiding students are not only trying to avoid failure but the negative outcomes associated with that failure, such as anxiety or criticism. Instead of learning to be proud of their successes, they learn to internalize the relief of avoiding failure (Covington & Müeller, 2001). To avoid appearing incompetent, they use self-

handicapping strategies that often interfere with learning (Covington, 1984; Covington & Beery, 1976):

1. Minimize, avoid, or withdraw from participation.
2. Make excuses for their lack of performance or effort.
3. Procrastinate in completing tasks.
4. Setting unattainable goals or selecting very difficult tasks that make success unlikely.
5. Not trying to perform or giving others the impression that they didn't really try.

Low-achieving students tend to use more self-handicapping strategies than students who are doing well academically (Leondari & Gonida, 2007). For failure-avoiding students, self-handicapping strategies allow them to attribute failure to causes other than their lack of ability. Students may feel inept if they realize that they must put a great deal of effort into something that others do easily. Also, when students do put forth effort but still fail, this highlights their low ability. However, when a student fails due to a lack of effort, they can avoid acknowledging a lack of ability.

While choosing to not put forth effort might save students from acknowledging their inabilities, it creates a secondary problem. Because teachers tend to value effort, students who do not put forth effort are risking negative consequences (Urdan et al., 1998; Weiner, 1994). When students do not complete tasks or do not put forth an effort, teachers may criticize or even punish this behavior. Students may feel stuck between choosing negative consequences for not trying or risk trying and failing.

Unlike the other three types of students, failure-accepting students are not motivated toward success nor away from failure. These students have experienced significant failure and as a result, they accept failure. Failure-accepting students do not take credit for any successes that they do experience and believe that success is determined by external, uncontrollable factors; however, they do

blame themselves for their failures. Each failure is a confirmation of their lack of ability (Covington, 1984).

Failure-accepting students also experience learned helplessness and are not motivated to learn because they do not believe that they have control over success or failure. Due to their external locus of control, these students are the most difficult to motivate. Positive reinforcement for successes does not work and convincing them that they could succeed in the future is difficult (Ames, 1990; Covington & Omelich, 1985).

In an effort to maintain positive self-worth, failure-avoiding and failure-accepting students may discount the importance of school altogether (Harter, Whitesell, & Junkin, 1998). Some students may shift their efforts to developing abilities in other areas, such as sports, creative endeavors, or trade skills. Others may turn to delinquent behavior (Stipek, 2002). It

It is important for teachers to identify students with failure-avoiding or failure-accepting orientations so they may help them develop more positive mastery behaviors.

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Keller's ARCS Model: Integrating Ideas About Motivation

The shared attributes of the different motivational concepts constitute the acronym ARCS, *attention*, *relevance*, *confidence*, and *satisfaction*, representing Keller's four categories of learner motivation (Keller, 2010). The ARCS model describes strategies for stimulating and sustaining motivation in each of the four categories as well as a systematic process of motivational design.

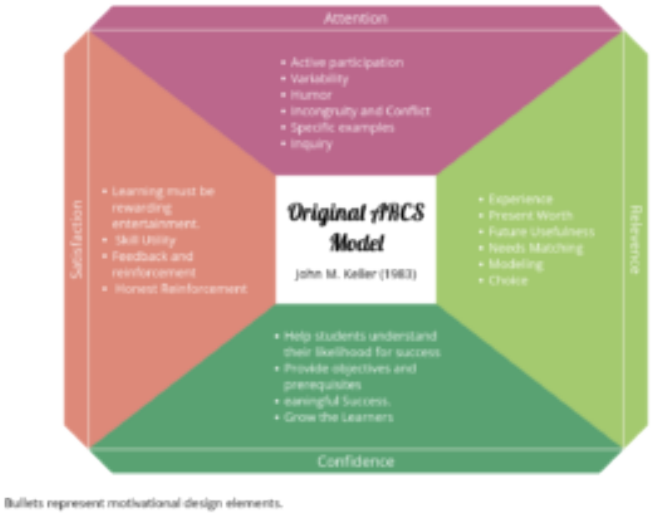

Figure 6.12.1. The ARCs Model

The first category, *attention*, is related to stimulating and maintaining learners' interests. The learner's attention is required

before any learning can take place. This attention should also be sustained in order to keep learners focused and engaged. Keller (2010) describes three categories of attention-getting strategies: perceptual arousal, inquiry arousal, and variability. *Perceptual arousal* refers to capturing interest by arousing learners' senses and emotions. This construct is conceptually similar to triggered situational interest in Hidi and Renninger's (2006) development of interest. Likewise, perceptual arousal is usually transitory. One of the most common ways to provoke perceptual arousal is making an unexpected change in the environment. Example tactics include a change in light, a sudden pause, and presenting a video after text-based information in an online learning environment. *Inquiry arousal*, similar to the construct of maintained situational interest, refers to a cognitive level of curiosity. Students are cognitively attracted to learning materials, for instance, when they contain paradoxical facts. *Variability* concerns variation in instructional methods. No matter how effective motivational tactics are, they lose their potency when used unvaryingly.

The second category, *relevance*, refers to making the learning experience personally relevant or meaningful. According to the goal theory, students engage in learning activities that help to attain their goals (Locke & Latham, 1984). Also, as described in expectancy-value theory and self-determination theory, the perceived value of the task is a critical antecedent of motivation (Deci & Ryan, 2000; Wigfield & Eccles, 1992). One way to establish the perceived relevance of the learning materials is to use authentic or real-world examples and assignments. Simply relating the instruction to what is familiar to learners (e.g., prior knowledge) can also help learners to perceive its relevance.

The *confidence* category is pertinent to self-efficacy and expectancies for the success of the expectancy-value theory. According to self-determination theory, the feeling of competence is one of the basic human needs (Ryan & Deci, 2000). If the learners' need for competence is not satisfied during learning, they would develop low expectancies for success and demonstrate low self-

efficacy, which results in poor motivation to learn (Bandura, 1997; Wigfield & Eccles, 2000). Strategies to enhance self-efficacy, such as the experience of success, can be applied in order to build confidence in instruction. Another way to enhance confidence is to foster learners' belief that they have control over their performance. Autonomy support such as providing choices and making internal, controllable attributions are a few examples.

The last category, *satisfaction*, concerns learners' continued motivation to learn. If they experience satisfying outcomes, students are likely to develop a persistent desire to learn (Skinner, 1963). Satisfying or positive consequences of instruction can result from both extrinsic and intrinsic matters (Ryan & Deci, 2000). High grades, certificates, and other tangible rewards are the most common extrinsic outcomes. However, these extrinsic rewards may not always result in feelings of satisfaction. For example, a student is not pleased with the high score that he or she received on a final exam because the test was extremely easy and most students did well. If the extrinsic rewards fail to fulfill learners' inner needs, students won't be satisfied. Such intrinsic consequences that lead to satisfaction include a feeling of mastery and the pleasure of accomplishing a challenging task.

Attention	Relevance	Confidence	Satisfaction
Perceptual arousal Provide novelty and surprise	**Goal orientation** Present objectives and useful purpose of instruction and specific methods for successful achievement	**Learning requirements** Inform students about learning and performance requirements and assessment criteria	**Intrinsic reinforcement** Encourage and support intrinsic enjoyment of the learning experience
Inquiry arousal Stimulate curiosity by posing questions or problems to solve	**Motive matching** Match objectives to student needs and motives	**Successful opportunities** Provide challenging and meaningful opportunities for successful learning	**Extrinsic rewards** Provide positive reinforcement and motivational feedback
Variability Incorporate a range of methods and media to meet students' varying needs	**Familiarity** Present content in ways that are understandable and that related to the learners' experiences and values	**Personal responsibility** Link learning success to students' personal effort and ability	**Equity** Maintain consistent standards and consequences for success

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Video 6.12.1. *Student Motivation: The ARCS Model* explains the components of the model and its implications for teachers.

Besides identifying the four major categories of motivational design, the ARCS model describes 10 steps for a systematic process of motivational design (Keller, 2010). The first four steps are the analysis process. This includes the acquisition of course and audience information and analysis of audience motivation and

existing materials. The main goal of these steps is to identify motivational problems. The next four steps (Step 5 through Step 8) correspond to the design phase in the traditional instructional design process. The first task in the design phase is to determine the motivational behaviors of learners that you wish to observe based on the motivational problems identified in the previous steps. Then, you select or design motivational tactics that help to achieve the objectives and can be feasibly incorporated into instruction. One important task is to integrate these tactics into instructional materials. Designers are to determine where and how to insert the motivational tactics in the instruction. In this process, they may need to modify the design of instruction. Steps 9 and 10 are the development and evaluation phases. After identifying the motivational tactics to use, designers will develop the actual motivational materials. Lastly, they will evaluate the effectiveness of the embedded motivational tactics, for instance, by collecting learners' reactions to the learning materials. Table 6.12.1 summarizes the steps of motivational design.

Table 6.12.1. The systematic process of motivational design (adapted from Keller, 2010)

	Motivational Design Steps
Analyze	1. Acquisition of course information
	2. Acquisition of audience information
	3. Analysis of audience motivation
	4. Analysis of motivational tactics in existing materials
Design	5. Description of motivational goals and assessment methods
	6. Identification of potential tactics
	7. Design of tactics
	8. Integration of motivational tactics with instructional plans
Develop	9. Development of materials
Evaluate	10. Evaluation of student reactions

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Chapter Summary: Motivation

Motivation—the energy or drive that gives behavior direction and focus—can be understood in a variety of ways, each of which has implications for teaching. Instinct, drive, arousal, and deficiency/growth motivation theories agree that humans, for the most part, give energy and direction to their own behaviors without thinking about it. Instinctual, inherited needs present at birth give behavior its direction. The drive to satisfy these needs explains how behavior becomes energized. Individuals are largely unaware of these two aspects of behavior. Another perspective on motivation comes from behaviorism and equates underlying drives or motives with their outward, visible expression in behavior.

Most theories of motivation come from cognitive theories of learning and development. Motives are affected by the kind of goals set by students—whether they are oriented to mastery, performance, failure-avoidance, or social contact. They are also affected by students' interests, both personal and situational. And they are affected by students' attributions about the causes of success and failure—whether they perceive the causes are due to ability, effort, task difficulty, or luck.

A major current perspective about motivation is based on self-efficacy theory, which focuses on a person's belief that he or she is capable of carrying out or mastering a task. High self-efficacy affects students' choice of tasks, their persistence at tasks, and their resilience in the face of failure. It helps to prevent learned helplessness, a perception of complete lack of control over mastery or success. Teachers can encourage high self-efficacy beliefs by providing students with experiences of mastery and opportunities to see others' experiences of mastery, by offering well-timed messages persuading them of their capacity for success, and by

interpreting students' emotional reactions to success, failure, and stress.

An extension of self-efficacy theory is self-determination theory, which is based on the idea that everyone has basic needs for autonomy, competence, and relatedness to others. According to the theory, students will be motivated more intrinsically if these three needs are met as much as possible. A variety of strategies can assist teachers in doing so. One program for doing so is called TARGET; it draws on ideas from several theories of motivation to make practical recommendations about motivating students.

Glossary

hierarchy of needs: spectrum of needs ranging from basic biological needs to social needs to self-actualization
motivation: wants or needs that direct behavior toward some goal
self-efficacy: individual's belief in his own capabilities or capacities to complete a task
drive theory: deviations from homeostasis create physiological needs that result in psychological drive states that direct behavior to meet the need and ultimately bring the system back to homeostasis
habit: pattern of behavior in which we regularly engage
instinct: species-specific pattern of behavior that is unlearned
motivation: wants or needs that direct behavior toward some goal
Yerkes-Dodson law: simple tasks are performed best when arousal levels are relatively high, while complex tasks are best performed when arousal is lower

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STUDENT DIVERSITY

Theme: *How Individual Differences Affect Learning.*

Overview of Concepts:

- Intelligence, IQ, and development
- Giftedness and Creativity
- Cognitive Disabilities
- Emotional, Social, and Behavioral Disabilities

Learning Objectives:

- Describe Spearman's two-factor theory
- Describe what IQ tests measure
- Describe the influence of environment and heredity on IQ
- Intelligence as it relates to giftedness and creativity
- Identify characteristics of the gifted
- Meeting the needs of the gifted
- Identify characteristics of creativity
- Describe cognitive disabilities and how they are identified
- Describe emotional, social, and behavioral disorders and how they are identified and interventions

Student Differences

For convenience we will make a major distinction between differences among individuals and differences among groups of students. As the term implies, **individual differences** are qualities that are unique; just one person has them at a time. Variation in hair color, for example, is an individual difference; even though some people have nearly the same hair color, no two people are exactly the same. **Group differences** are qualities shared by members of an identifiable group or community, but not shared by everyone in society. An example is gender role: for better or for worse, one portion of society (the males) is perceived differently and expected to behave a bit differently than another portion of society (the females). Notice that distinguishing between individual and group differences is convenient, but a bit arbitrary. Individuals with similar, but nonetheless unique qualities sometimes group themselves together for certain purposes, and groups unusually contain a lot of individual diversity within them. If you happen to enjoy playing soccer and have some talent for it (an individual quality), for example, you may end up as a member of a soccer team or club (a group defined by members' common desire and ability to play soccer). But though everyone on the team fits a "soccer player's profile" at some level, individual members will probably vary in level of skill and motivation. The group, by its very nature, may obscure these signs of individuality.

To begin, then, we look at several differences normally considered to be individual rather than group-based. This discussion will necessarily be incomplete simply because individual differences are so numerous and important in teaching that some of them are also discussed in later chapters. Later sections of this chapter deal with three important forms of group diversity: gender differences, cultural differences, and language differences.

Intelligence

For nearly a century, educators and psychologists have debated the nature of intelligence, and more specifically whether intelligence is just one broad ability or can take more than one form. Many classical definitions of the concept have tended to define **intelligence** as a single broad ability that allows a person to solve or complete many sorts of tasks, or at least many academic tasks like reading, knowledge of vocabulary, and the solving of logical problems (Garlick, 2002). Other psychologists believe that instead of a single factor, intelligence is a collection of distinct abilities. Still, other psychologists believe that intelligence should be defined in more practical terms. We'll review three perspectives on intelligence, Spearman's g, Sternberg's Triarchic Theory of Intelligence, and Gardner's Frame of Mind. Understanding theories of intelligence will help us understand variations in students' intellectual abilities.

British psychologist Charles Spearman believed intelligence consisted of one general factor, called *g*, which could be measured and compared among individuals. Spearman focused on the commonalities among various intellectual abilities and deemphasized what made each unique. There is research evidence of such a global ability, and the idea of general intelligence often fits with society's everyday beliefs about intelligence. Partly for these reasons, an entire mini-industry has grown up around publishing tests of intelligence, academic ability, and academic achievement. Since these tests affect the work of teachers, I return to discussing them later in this book.

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Video 7.1.1. *Intelligence* explains the different definitions of intelligence and the nature/nurture debate in the context of intelligence.

Measuring Intelligence: Standardization and the Intelligence Quotient

The goal of most intelligence tests is to measure "g," the general intelligence factor. Good intelligence tests are **reliable,** *meaning that they are consistent over time*, and also demonstrate **validity,** *meaning that they actually measure intelligence rather than something else*. Because intelligence is such an important individual difference dimension, psychologists have invested substantial effort in creating and improving measures of intelligence, and these tests are now considered the most accurate of all psychological tests. In fact, the ability to accurately assess intelligence is one of the most important contributions of psychology to everyday public life.

Intelligence changes with age. A 3-year-old who could accurately multiply 183 by 39 would certainly be intelligent, but a 25-year-old who could not do so would be seen as unintelligent. Thus understanding intelligence requires that we know the norms or standards in a given population of people at a given age. The **standardization** of a test involves giving it to a large number of people of different ages and computing the average score on the test at each age level.

It is important that intelligence tests be standardized on a regular basis, because the overall level of intelligence in a population may

change over time. The **Flynn effect** refers to *the observation that scores on intelligence tests worldwide have increased substantially over the past decades* (Flynn, 1999). Although the increase varies somewhat from country to country, the average increase is about 3 IQ points every 10 years. There are many explanations for the Flynn effect, including better nutrition, increased access to information, and more familiarity with multiple-choice tests (Neisser, 1998). But whether people are actually getting smarter is debatable (Neisser, 1997).

Once the standardization has been accomplished, we have a picture of the average abilities of people at different ages and can calculate a person's **mental age**, which is *the age at which a person is performing intellectually*. If we compare the mental age of a person to the person's chronological age, the result is the **intelligence quotient (IQ),** *a measure of intelligence that is adjusted for age*. A simple way to calculate IQ is by using the following formula:

$$\text{IQ} = \text{mental age} \div \text{chronological age} \times 100.$$

Thus a 10-year-old child who does as well as the average 10-year-old child has an IQ of 100 (10 ÷ 10 × 100), whereas an 8-year-old child who does as well as the average 10-year-old child would have an IQ of 125 (10 ÷ 8 × 100). Most modern intelligence tests are based on the relative position of a person's score among people of the same age, rather than on the basis of this formula, but the idea of an intelligence "ratio" or "quotient" provides a good description of the score's meaning.

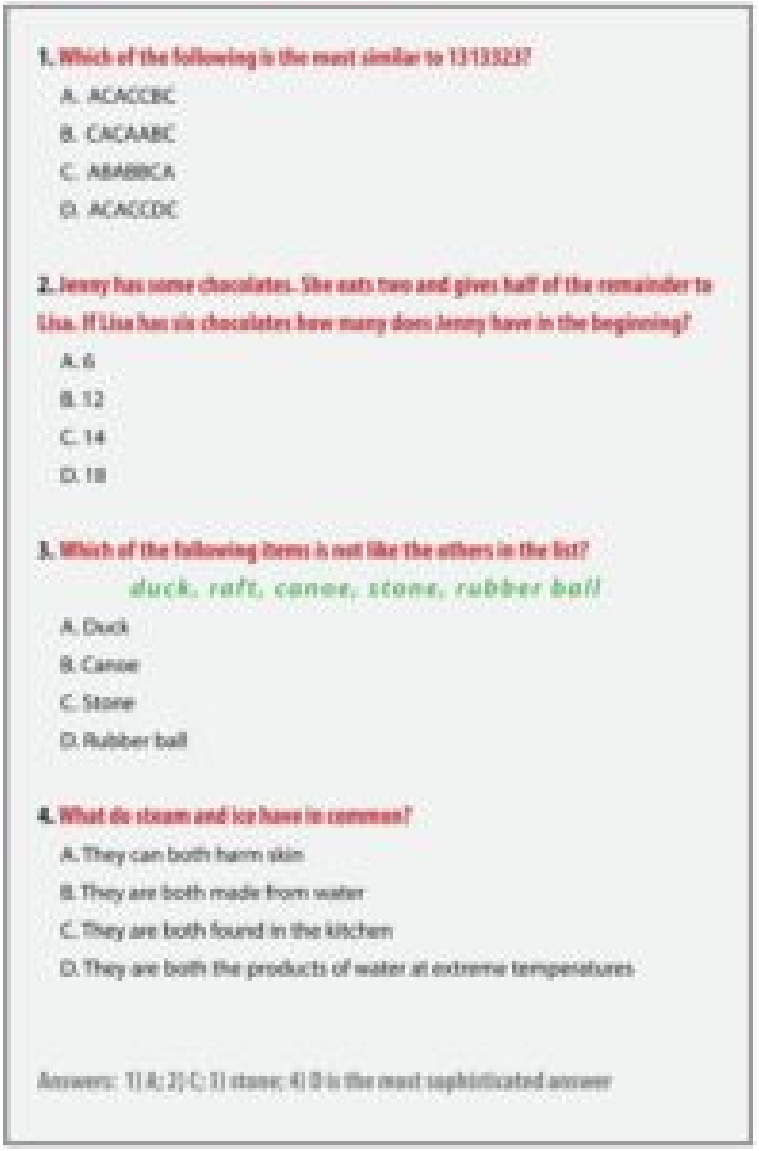

Figure 7.1.1. Examples of the types of items you might see on an intelligence test.

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Wechsler Scales

The **Wechsler Adult Intelligence Scale (WAIS)** is the most widely used intelligence test for adults (Watkins, Campbell, Nieberding, & Hallmark, 1995). The current version of the WAIS, the WAIS-IV, was standardized on 2,200 people ranging from 16 to 90 years of age. It consists of 15 different tasks, each designed to assess intelligence, including working memory, arithmetic ability, spatial ability, and general knowledge about the world. The WAIS-IV yields scores on four domains: verbal, perceptual, working memory, and processing speed. The reliability of the test is high (more than 0.95), and it shows substantial construct validity. The WAIS-IV is correlated highly with other IQ tests such as the Stanford-Binet, as well as with criteria of academic and life success, including college grades, measures of work performance, and occupational level. It also shows significant correlations with measures of everyday functioning among people with intellectual disabilities.

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Video 7.1.2. *Brain vs. Bias* provides an overview of the WAIS & WISC tests, standardization and validity, and IQ performance.

The Wechsler scale has also been adapted for preschool children in the form of the *Wechsler primary and preschool scale of intelligence-fourth edition* (WPPSI-IV) and for older children and adolescents in the form of the *Wechsler intelligence scale for children-fifth edition* (WISC-V).

Bias in Intelligence Testing

Intelligence tests and psychological definitions of intelligence have been heavily criticized since the 1970s for being biased in favor of Anglo-American, middle-class respondents and for being inadequate tools for measuring non-academic types of intelligence or talent. Intelligence changes with experience, and intelligence quotients or scores do not reflect that ability to change. What is considered smart varies culturally as well, and most intelligence tests do not take this variation into account. For example, in the West, being smart is associated with being quick. A person who answers a question the fastest is seen as the smartest, but in some cultures, being smart is associated with considering an idea thoroughly before giving an answer. A well- thought out, the contemplative answer is the best answer.

watch it

Video 7.1.3. Watch this video to learn more about the history behind intelligence testing.

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Theories of Intelligence

Psychologists have long debated how to best conceptualize and measure intelligence (Sternberg, 2003). These questions include how many types of intelligence there are, the role of nature versus nurture in intelligence, how intelligence is represented in the brain, and the meaning of group differences in intelligence.

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Video 7.1.4. *Theories of Intelligence* reviews a few of the different theoretical views of intelligence.

General Intelligence Factor ("g")

From 1904-to 1905 the French psychologist Alfred Binet (1857–1914) and his colleague Théodore Simon (1872–1961) began working on behalf of the French government to develop a measure that would identify children who would not be successful with the regular school curriculum. The goal was to help teachers better educate these students (Aiken, 1994). Binet and Simon developed what most psychologists today regard as the first intelligence test, which consisted of a wide variety of questions that included the ability to name objects, define words, draw pictures, complete sentences, compare items, and construct sentences.

Binet and Simon (Binet, Simon, & Town, 1915; Siegler, 1992) believed that the questions they asked the children all assessed the basic abilities to understand, reason, and make judgments. It turned out that the correlations among these different types of measures were, in fact, all positive; that is, students who got one item correct were more likely to also get other items correct, even though the questions themselves were very different.

On the basis of these results, the psychologist Charles Spearman (1863–1945) hypothesized that there must be a single underlying construct that all of these items measure. He called *the construct that the different abilities and skills measured on intelligence tests have in common* the **general intelligence factor (g).** Virtually all psychologists now believe that there is a generalized intelligence factor, "g," that relates to abstract thinking and that includes the abilities to acquire knowledge, reason abstractly, adapt to novel situations, and benefit from instruction and experience (Gottfredson, 1997; Sternberg, 2003). People with higher general intelligence learn faster.

Soon after Binet and Simon introduced their test, the American psychologist Lewis Terman at Stanford University (1877–1956) developed an American version of Binet's test that became known as the *Stanford- Binet intelligence test*. The Stanford-Binet is a measure

of general intelligence made up of a wide variety of tasks, including vocabulary, memory for pictures, naming of familiar objects, repeating sentences, and following commands.

Sternberg's Triarchic theory

Although there is general agreement among psychologists that "g" exists, there is also evidence for **specific intelligence** "s," *a measure of specific skills in narrow domains*. One empirical result in support of the idea of "s" comes from intelligence tests themselves. Although the different types of questions do correlate with each other, some items correlate more highly with each other than do other items; they form clusters or clumps of intelligences.

One advocate of the idea of multiple intelligences is the psychologist Robert Sternberg. Sternberg has proposed a **Triarchic (three-part) Theory of Intelligence** that proposes that *people may display more or less analytical intelligence, creative intelligence, and practical intelligence*. Sternberg (1985, 2003) argued that traditional intelligence tests assess **analytical intelligence**, *academic problem solving, and performing calculations*, but that they do not typically assess **creative intelligence**, *the ability to adapt to new situations and create new ideas*, and/or **practical intelligence**, *the ability to demonstrate common sense and street- smarts.*

As Sternberg proposed, research has found that creativity is not highly correlated with analytical intelligence (Furnham & Bakhtiar, 2008), and exceptionally creative scientists, artists, mathematicians, and engineers do not score higher on intelligence than do their less creative peers (Simonton, 2000). Furthermore, the brain areas that are associated with **convergent thinking**, *thinking that is directed toward finding the correct answer to a given problem*, are different from those associated with **divergent thinking**, *the ability to generate many different ideas or solutions to a single problem* (Tarasova, Volf, & Razoumnikova, 2010). On the other hand, being

creative often takes some of the basic abilities measured by "g," including the abilities to learn from experience, to remember information, and to think abstractly (bink & marsh, 2000). Ericsson (1998), Weisberg (2006), Hennessey and Amabile (2010), and Simonton (1992) studied creative people and identified at least five components that are likely to be important for creativity as listed in Table 7.1.1.

Table 7.1.1. Important components for creativity

Component	Description
Expertise	Creative people have studied and learned about a topic
Imaginative Thinking	Creative people view problems in new and different ways
Risk-Taking	Creative people take on new, but potentially risky approaches
Intrinsic Interest	Creative people take on projects for interest, not money
Working in Creative Environments	The most creative people are supported, aided, and challenged by other people working on similar projects

The last aspect of the triarchic model, practical intelligence, refers primarily to intelligence that cannot be gained from books or formal learning. Practical intelligence represents a type of "street smarts" or "common sense" that is learned from life experiences. Although a number of tests have been devised to measure practical intelligence (Sternberg, Wagner, & Okazaki, 1993; Wagner & Sternberg, 1985), research has not found much evidence that practical intelligence is distinct from "g" or that it is predictive of success at any particular tasks (Gottfredson, 2003). Practical intelligence may include, at least in part, certain abilities that help people perform well at specific jobs, and these abilities may not always be highly correlated with general intelligence (Sternberg et al., 1993).

Gardner's Frame of Mind

Theory of multiple intelligences: another champion of the idea of specific types of intelligences rather than one overall intelligence is the psychologist Howard Gardner (1983, 1999). Gardner argued that it would be evolutionarily functional for different people to have different talents and skills, and proposed that there are eight intelligences that can be differentiated from each other. A potential ninth intelligence, existential intelligence, still needs empirical support. Gardner investigated intelligences by focusing on children who were talented in one or more areas and adults who suffered from strokes that compromised some capacities, but not others. Gardner also noted that some evidence for multiple intelligences comes from the abilities of **autistic savants**, *people who score low on intelligence tests overall but who nevertheless may have exceptional skills in a given domain*, such as math, music, art, or in being able to recite statistics in a given sport (Treffert & Wallace, 2004). In addition to brain damage and the existence of savants, Gardner identified these 8 intelligences based on other criteria, including a set developmental history and psychometric findings. See table 7.1.2 for a list of Gardner's eight specific intelligences.

Table 7.1.2. Howard Gardner's eight specific intelligences

Intelligence	Description
Linguistic	The ability to speak and write well
Logical-mathematical	The ability to use logic and mathematical skills to solve problems
Spatial	The ability to think and reason about objects in three dimensions
Musical	The ability to perform and enjoy music
Kinesthetic (body)	The ability to move the body in sports, dance, or other physical activities
Interpersonal	The ability to understand and interact effectively with others
Intrapersonal	The ability to have insight into the self
Naturalistic	The ability to recognize, identify and understand animals, plants, and other living things

Source: Adapted from Gardner, H. (1999). *Intelligence Framed: Multiple Intelligences for the 21st Century*. New York, NY: Basic Books.

The idea of multiple intelligences has been influential in the field of education, and teachers have used these ideas to try to teach differently to different students. For instance, to teach math problems to students who have particularly good kinesthetic intelligence, a teacher might encourage the students to move their bodies or hands according to the numbers. On the other hand, some have argued that these "intelligences" sometimes seem more like "abilities" or "talents" rather than real intelligence. There is no clear conclusion about how many intelligences there are. Our sense of humor, artistic skills, dramatic skills, and so forth also separate intelligences? Furthermore, and again demonstrating the underlying power of a single intelligence, the many different intelligences are, in fact, correlated and thus represent, in part, "g" (Brody, 2003).

Nonetheless, whatever the status of the research evidence, the model itself can be useful as a way for teachers to think about their work. Multiple intelligences suggest the importance of diversifying instruction in order to honor and to respond to diversity in

students' talents and abilities. Viewed like this, whether Gardner's classification scheme is actually accurate is probably less important than the fact there is (or may be) more than one way to be "smart." In the end, as with cognitive and learning styles, it may not be important to label students' talents or intellectual strengths. It may be more important simply to provide important learning and knowledge in several modes or styles, ways that draw on more than one possible form of intelligence or skill. A good example of this principle is your own development in learning to teach. It is well and good to read books about teaching (like this one, perhaps), but it is even better to read books and talk with classmates and educators about teaching and getting actual experience in classrooms. The combination both invites and requires a wide range of your talents and usually proves more effective than any single type of activity, whatever your profile of cognitive styles or intellectual abilities happens to be.

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Extremes of Intelligence: Intellectual Disability and Giftedness

The results of studies assessing the measurement of intelligence show that IQ is distributed in the population in the form of a **Normal Distribution (or bell curve),** which *is the pattern of scores usually observed in a variable that clusters around its average*. In a normal distribution, the bulk of the scores fall toward the middle, with many fewer scores falling at the extremes. The normal distribution of intelligence shows that on IQ tests, as well as on most other measures, the majority of people cluster around the average (in this case, where IQ = 100), and fewer are either very smart or very dull. Because the standard deviation of an IQ test is about 15, this means that about 2% of people score above an IQ of 130, often considered the threshold for giftedness, and about the same

percentage score below an IQ of 70, often being considered the threshold for intellectual disability.

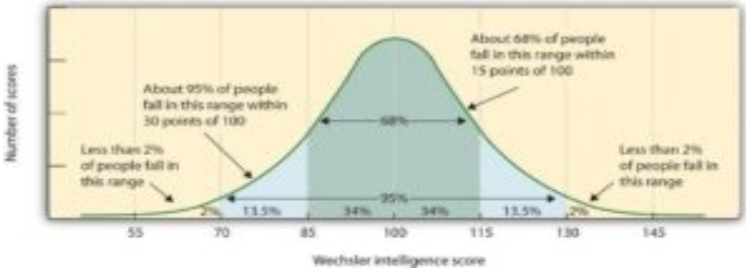

Figure 7.1.2. Distribution of IQ Scores in the General PopulationThe normal distribution of IQ scores in the general population shows that most people have about average intelligence, while very few have extremely high or extremely low intelligence.

Intellectual Disabilities

People with very low IQ define one end of the distribution of intelligence scores. **Intellectual disability** (or **intellectual developmental disorder**) is assessed based on cognitive capacity (IQ) and adaptive functioning. The severity of the disability is based on adaptive functioning, or how well the person handles everyday life tasks. About 1% of the United States population, most of them males, fulfill the criteria for intellectual developmental disorder, but some children who are given this diagnosis lose the classification as they get older and better learn to function in society.

Students with intellectual disabilities score poorly on standardized tests of intelligence. They may have limited language or impaired speech and may not perform well academically. Everyday tasks that most people take for granted, like getting

dressed or eating a meal, may be possible, but they may also take more time and effort than usual. Health and safety can sometimes be a concern (for example, knowing whether it is safe to cross a street). For older individuals, finding and keeping a job may require help from supportive others. The exact combination of challenges varies from one person to another, but it always (by definition) involves limitations in *both* intellectual and daily functioning.

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Video 7.1.5. *Intellectual Disabilities* defines intellectual disabilities (ID), explains the characteristics, and how to support students with ID.

Levels of Support for Individuals with Intellectual Disabilities

Intellectual disabilities happen in different degrees or amounts, though most often are relatively mild. Traditionally the intensity or "amount" of the disability was defined by scores on a standardized test of scholastic aptitude (or "IQ test"), with lower scores indicating a more severe disability. Because of the insensitivity of such tests to individuals' daily social functioning, however, current trends are toward defining intensities by the amount of support needed by the individual. Table 1 summarizes the most commonly used scheme for this purpose, one created by the American Association on Intellectual and Developmental Disabilities (AAMR, 2002). Levels of support range from *intermittent* (just occasional or "as needed" for specific activities) to *pervasive* (continuous in all realms of living).

Table 7.1.3. Levels and areas of support for intellectual disabilities

Level of support	Duration of support	Frequency of support	Setting of support	Amount of professional assistance
Intermittent	Only as needed	Occasional or infrequent	Usually only one or two (e.g. 1–2 classes or activities)	Occasional consultation or monitoring by professional
Limited	As needed, but sometimes continuing	Regular, but frequency varies	Several settings, but not usually all	Occasional or regular contact with professionals
Extensive	Usually continuing	Regular, but frequency varies	Several settings, but not usually all	Regular contact with professionals at least once a week
Pervasive	May be lifelong	Frequent or continuous	Nearly all settings	Continuous contact and monitoring by professionals

Source: American Association on Mental Retardation, 2002: Schalock & Luckassen, 2004.

As a classroom teacher, the intellectual disabilities that you are most likely to see are the ones requiring the least support in your classroom. A student requiring only intermittent support may require special help with some learning activities or classroom routines, but not others; he or she might need help with reading or putting on winter clothes, for example, but primarily on occasions when there is pressure to do these things relatively quickly. Students requiring somewhat more support are likely to spend somewhat less time in your classroom and more time receiving special help from other professionals, such as a special education teacher, a speech and language specialist, or an assistant to these professionals. These circumstances have distinct implications for ways of teaching these students.

Teaching Students with Intellectual Disabilities

There are many specific techniques that can help in teaching students with mild or moderate intellectual disabilities, but most can be summarized into three more general strategies. The first is to give more time and practice than usual; the second is to embed activities into the context of daily life or functioning where possible; and the third is to include the child both in social and in academic activities, rather than just one or the other. Let us look briefly at each of these ideas.

Giving More Time and Practice

If a student has a mild intellectual disability, they may be able to learn important fundamentals of the academic curriculum—basic arithmetic, for example, and basic reading. Because of the disability, though, the student may need more time or practice than most other students. They may be able to read many words by sight (*day*, *night*, *morning*, *afternoon*, etc.), but need longer than other students to recognize and say them. Or the student may know that 2 + 3 = 5, but need help applying this math fact to real objects; you (or a helper) might need to show the student that two *pencils* plus three *pencils* make five *pencils*.

Giving extra help takes time and perseverance, and can try the patience of the student (and of you, too). To deal with this problem, it may help to reward the student frequently for effort and successes with well-timed praise, especially if it is focused on specific, actual achievements; "You added that one correctly," may be more helpful than "You're a hard worker," even if both comments are true. Giving appropriate praise is in turn easier if you set reasonable, "do-able" goals by breaking skills or tasks into steps that the student is likely to learn without becoming overly discouraged. At the same time, it is important not to insult the student with

goals or activities that are *too* easy or by using curriculum materials clearly intended for children who are much younger. Setting expectations too low actually deprives a student with an intellectual disability of rightful opportunities to learn—a serious ethical and professional mistake (Bogdan, 2006). In many curriculum areas, fortunately, there are already existing materials that are simplified, yet also appropriate for older students (Snell, et al., 2005). Special education teacher-specialists can often help in finding them and in devising effective ways of using them.

Adaptive and Functional Skills

Students with intellectual disabilities present especially clear examples of a universal dilemma of teaching: since there is not enough time to teach everything, how do we choose what to teach? One basis for selecting activities is to relate learning goals to students' everyday lives and activities, just as you would with all students. This strategy addresses the other defining feature of intellectual disability, the student's difficulties with adapting to and functioning in everyday living. In teaching addition and subtraction, for example, you can create examples about the purchasing of common familiar objects (e.g. food) and about the need to make or receive change for the purchases. Similar considerations apply to learning new reading or oral language vocabulary. Instead of simply learning words in a "basic reading" series (or reading a textbook), try encouraging the student to learn words that are especially useful to the student's own life. Often the student, not you yourself, is the best person to decide what these words actually are.

An adaptive, functional approach can help in non-academic areas as well. In learning to read or "tell time" on a clock, for example, try focusing initially on telling the times important to the student, such as when he or she gets up in the morning or when school starts. As you add additional times that are personally meaningful to the student, he or she works gradually towards full knowledge of how

to read the hands on a clock. Even if the full knowledge proves slow to develop, however, the student will at least have learned the most useful clock knowledge first.

Include the Student in Group Activities

The keyword here is *inclusion*: the student should participate in and contribute to the life of the class as much as possible. This means that wherever possible, the student attends special events (assemblies, field days) with the class; that if the class plays a group game, then the student with the disability is part of the game; that if classmates do an assignment as a group, then if at all possible the student is assigned to one of the groups. The changes resulting from these inclusions are real but can be positive for everyone. On the one hand, they foster acceptance and helpfulness toward the child with the disability; classmates learn that school is partly about providing opportunities for everyone, and not just about evaluating or comparing individuals' skills. On the other hand, the changes caused by inclusion stimulate the student with the disability to learn as much as possible from classmates, socially and academically. Among other benefits, group activities can give the student chances to practice "belonging" skills—how to greet classmates appropriately, or when and how to ask the teacher a question. These are skills, I might add, that are beneficial for everyone to learn, disabled or not.

Gifted and Talented Students

Giftedness *refers to those who have an IQ of 130 or higher* (Lally & Valentine-French, 2015). Having an extremely high IQ is clearly less of a problem than having an extremely low IQ, but there may also be challenges to being particularly smart. It is often assumed

that schoolchildren who are labeled as "gifted" may have adjustment problems that make it more difficult for them to create social relationships. To study gifted children, Lewis Terman and his colleagues (Terman & Oden, 1959) selected about 1,500 high school students who scored in the top 1% on the Stanford-Binet and similar IQ tests (i.e., who had IQs of about 135 or higher), and tracked them for more than seven decades (the children became known as the "termites" and are still being studied today). This study found that these students were not unhealthy or poorly adjusted, but rather were above average in physical health and were taller and heavier than individuals in the general population. The students also had above-average social relationships and were less likely to divorce than the average person (Seagoe, 1975).

Terman's study also found that many of these students went on to achieve high levels of education and entered prestigious professions, including medicine, law, and science. Of the sample, 7% earned doctoral degrees, 4% earned medical degrees, and 6% earned law degrees. These numbers are all considerably higher than what would have been expected from a more general population. Another study of young adolescents who had even higher IQs found that these students ended up attending graduate school at a rate more than 50 times higher than that of the general population (Lubinski & Benbow, 2006).

As you might expect based on our discussion of intelligence, kids who are gifted have higher scores on general intelligence "g," but there are also different types of giftedness. Some children are particularly good at math or science, some at automobile repair or carpentry, some at music or art, some at sports or leadership, and so on. The idea of multiple intelligences leads to new ways of thinking about students who have special gifts and talents. More recently, however, the meaning of *gifted* has broadened to include unusual talents in a range of activities, such as music, creative writing, or the arts (G. Davis & Rimm, 2004). To indicate the change, educators often use the dual term *gifted and talented*.

Qualities of the Gifted and Talented

What are students who are gifted and talented like? Generally, they show some combination of the following qualities:

- They learn more quickly and independently than most students their own age.
- They often have a well-developed vocabulary, as well as advanced reading and writing skills.
- They are very motivated, especially on tasks that are challenging or difficult.
- They hold themselves to higher than usual standards of achievement.

Contrary to a common impression, students who are gifted or talented are *not* necessarily awkward socially, less healthy, or narrow in their interests—in fact, quite the contrary (Steiner & Carr, 2003). They also come from all economic and cultural groups.

Ironically, in spite of their obvious strengths as learners, such students often languish in school unless teachers can provide them with more than the challenges of the usual curriculum. A kindergarten child who is precociously advanced in reading, for example, may make little further progress at reading if her teachers do not recognize and develop her skill; her talent may effectively disappear from view as her peers gradually catch up to her initial level. Without accommodation to their unusual level of skill or knowledge, students who are gifted or talented can become bored with school, and eventually, the boredom can even turn into behavior problems.

Partly for these reasons, students who are gifted or talented have sometimes been regarded as the responsibility of special education, along with students with other sorts of disabilities. Often their needs are discussed, for example, in textbooks about special education, alongside discussions of students with intellectual disabilities, physical impairments, or major behavior disorders

(Friend, 2008). There is some logic to this way of thinking about their needs; after all, they *are* quite exceptional, and they do require modifications of the usual school programs in order to reach their full potential. But it is also misleading to ignore obvious differences between exceptional giftedness and exceptional disabilities of other kinds. The key difference is in students' potential. By definition, students with gifts or talents are capable of creative, committed work at levels that often approach talented adults. Other students—including students with disabilities—may reach these levels, but not as soon and not as frequently. Many educators, therefore, think of the gifted and talented not as examples of students with disabilities, but as examples of diversity. As such they are not so much the responsibility of special education specialists, as the responsibility of all teachers to differentiate their instruction.

Supporting Gifted and Talented Students

Supporting the gifted and talented usually involves a mixture of *acceleration* and *enrichment* of the usual curriculum (Schiever & Maker, 2003). **Acceleration** involves either a child's skipping a grade, or else the teacher's redesigning the curriculum within a particular grade or classroom so that more material is covered faster. Either strategy works, but only up to a point: children who have skipped a grade usually function well in the higher grade, both academically and socially. Unfortunately skipping grades cannot happen repeatedly unless teachers, parents, and the students themselves are prepared to live with large age and maturity differences within single classrooms. In itself, too, there is no guarantee that instruction in the new, higher-grade classroom will be any more stimulating than it was in the former, lower-grade classroom. Redesigning the curriculum is also beneficial to the student, but impractical to do on a widespread basis; even if teachers had the

time to redesign their programs, many non-gifted students would be left behind as a result.

Enrichment involves providing additional or different instruction added to the usual curriculum goals and activities. Instead of books at more advanced reading levels, for example, a student might read a wider variety of types of literature at the student's current reading level, or try writing additional types of literature himself. Instead of moving ahead to more difficult kinds of math programs, the student might work on unusual logic problems not assigned to the rest of the class. Like acceleration, enrichment works well up to a point. Enrichment curricula exist to help classroom teachers working with gifted students (and save teachers the time and work of creating enrichment materials themselves). Since enrichment is not part of the normal, officially sanctioned curriculum, however, there is a risk that it will be perceived as busywork rather than as intellectual stimulation, particularly if the teacher herself is not familiar with the enrichment material or is otherwise unable to involve herself in the material fully.

Obviously, acceleration and enrichment can sometimes be combined. A student can skip a grade and also be introduced to interesting "extra" material at the new grade level. A teacher can move a student to the next unit of study faster than she moves the rest of the class, while at the same time offering additional activities not related to the unit of study directly. For a teacher with a student who is gifted or talented, however, the real challenge is not simply to choose between acceleration and enrichment, but to observe the student, get to know him or her as a unique individual, and offer activities and supports based on that knowledge. This is essentially the challenge of differentiating instruction, something needed not just by the gifted and talented, but by students of all sorts. As you might suspect, differentiating instruction poses challenges in managing instruction.

There is a lively debate among scholars about whether it is appropriate or beneficial to label some children as "gifted and talented" in school and to provide them with accelerated special

classes and other programs that are not available to everyone. Although doing so may help the gifted kids (Colangelo & Assouline, 2009), it also may isolate them from their peers and make such provisions unavailable to those who are not classified as "gifted."

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Video 7.1.6. *Gifted and Talented Students: Teaching Strategies* suggests ways to support gifted students.
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Learning Differences

All of us, including our students, have preferred ways of learning. Teachers often refer to these differences as **learning styles**, though this term may imply that students are more consistent across situations than is really the case. One student may like to make diagrams to help remember a reading assignment, whereas another student may prefer to write a sketchy outline instead. Yet in many cases, the students could in principle reverse the strategies and still learn the material: if coaxed (or perhaps required), the diagram-maker could take notes for a change and the note-taker could draw diagrams. Both would still learn, though neither might feel as comfortable as when using the strategies that they prefer. This reality suggests that a balanced, middle-of-the-road approach may be a teacher's best response to students' learning styles. Or put another way, it is good to support students' preferred learning strategies where possible and appropriate, but neither necessary nor desirable to do so all of the time (Loo, 2004; Stahl, 2002). Most of all, it is neither necessary nor possible to classify or label students according to seemingly fixed learning styles and then allow them to learn only according to those styles. A student may prefer to hear new material rather than see it; he may prefer for you to explain something orally, for example, rather than to see it demonstrated in a video. But he may nonetheless tolerate or sometimes even prefer to see it demonstrated. In the long run, in fact, he may learn it best by encountering the material in both ways, regardless of his habitual preferences.

That said, there is evidence that individuals, including students, do differ in how they habitually think. These differences are more specific than learning styles or preferences, and psychologists sometimes call them **cognitive styles**, meaning typical ways of perceiving and remembering information, and typical ways of solving problems and making decisions (Zhang & Sternberg, 2006).

In a style of thinking called **field dependence**, for example, individuals perceive patterns as a whole rather than focus on the parts of the pattern separately. In a complementary tendency, called **field independence**, individuals are more inclined to analyze overall patterns in their parts. Cognitive research from the 1940s to the present has found field dependence/independence differences to be somewhat stable for any given person across situations, though not completely so (Witkin, Moore, Goodenough, & Cox, 1977; Zhang & Sternberg, 2005). Someone who is field-dependent (perceives globally or "wholistically") in one situation, tends to a modest extent to perceive things globally or holistically in other situations. Field dependence and independence can be important in understanding students because the styles affect students' behaviors and preferences in school and classrooms. Field-dependent persons tend to work better in groups, it seems, and prefer "open-ended" fields of study like literature and history. Field *in*dependent persons, on the other hand, tend to work better alone and prefer highly analytic studies like math and science. The differences are only a tendency, however, and there are a lot of students who contradict the trends. As with the broader notion of learning styles, the cognitive styles of field dependence and independence are useful for tailoring instruction to particular students, but their guidance is only approximate. They neither can nor should be used to "lock" students to particular modes of learning or to replace students' own expressed preferences and choices about the curriculum.

Another cognitive style is **impulsivity** as compared to **reflectivity**. As the names imply, an *impulsive* cognitive style is one in which a person reacts quickly, but as a result, makes comparatively more errors. A *reflective* style is the opposite: the person reacts more slowly and therefore makes fewer errors. As you might expect, the reflective style would seem better suited to many academic demands of school. Research has found that this is indeed the case for academic skills that clearly benefit from reflection, such as mathematical problem solving or certain reading tasks (Evans,

2004). Some classroom or school-related skills, however, may actually develop better if a student is relatively impulsive. Being a good partner in a cooperative learning group, for example, may depend partly on responding spontaneously (i.e. just a bit "impulsively") to others' suggestions; and being an effective member of an athletic team may depend on *not* taking time to reflect carefully on every move that you or your teammates make.

There are two major ways to use knowledge of students' cognitive styles (Pritchard, 2005). The first and the more obvious is to build on students' existing style strengths and preferences. A student who is field-independent and reflective, for example, can be encouraged to explore tasks and activities that are relatively analytic and that require relatively independent work. One who is field-dependent and impulsive, on the other hand, can be encouraged and supported to try tasks and activities that are more social or spontaneous. But a second, less obvious way to use knowledge of cognitive styles is to encourage more balance in cognitive styles for students who need it. A student who *lacks* field independence, for example, may need explicit help in organizing and analyzing key academic tasks (like organizing a lab report in a science class). One who is already highly reflective may need encouragement to try ideas spontaneously, as in a creative writing lesson.

Diversity in Learning and Special Education Needs

Beyond the diversity of learning styles, classrooms have become increasingly diverse due to the inclusion of students with disabilities in classrooms with non-disabled peers. In the United States, the trend began in the 1970s, but accelerated with the passage of the Individuals with Disabilities Education Act in 1975, and again when the Act was amended in 2004 (United States Government Printing Office, 2005). The law guarantees free,

appropriate education for children with disabilities of any kind—whether the impairment is physical, cognitive, emotional, or behavioral. The laws also recognize that such students need special support in order to learn or function effectively in a classroom with non-disabled peers, so they provide special services (for example, teaching assistants) and procedures for making individualized educational plans for students with disabilities.

Children with Disabilities: Legislation

Since the 1970s, political and social attitudes have moved increasingly toward including people with disabilities in a wide variety of "regular" activities. In the United States, the shift is illustrated clearly in the Federal legislation that was enacted during this time. Three major laws were passed that guaranteed the rights of persons with disabilities, and of children and students with disabilities in particular. The third law has had the biggest impact on education.

Rehabilitation Act of 1973, Section 504: This law, the first of its kind, required that individuals with disabilities be accommodated in any program or activity that receives Federal funding (PL 93-112, 1973). Although this law was not intended specifically for education, in practice, it has protected students' rights in some extra-curricular activities (for older students) and in some child care or after-school care programs (for younger students). If those programs receive Federal funding of any kind, the programs are not allowed to exclude children or youths with disabilities, and they have to find reasonable ways to accommodate the individuals' disabilities.

Americans with Disabilities Act of 1990 (or ADA): This legislation also prohibited discrimination on the basis of disability, just as Section 504 of the Rehabilitation Act had done (PL 101-336, 1990). Although the ADA also applies to all people (not just to students),

its provisions are more specific and "stronger" than those of Section 504. In particular, ADA extends to all employment and jobs, not just those receiving Federal funding. It also specifically requires accommodations to be made in public facilities such as buses, restrooms, and telephones. ADA legislation is therefore responsible for some of the "minor" renovations in schools that you may have noticed in recent years, like wheelchair-accessible doors, ramps, restrooms, and public telephones with volume controls.

Individuals with Disabilities Education Act (or IDEA): As its name implied, this legislation was more focused on education than either Section 504 or ADA. It was first passed in 1975 and has been amended several times since, including most recently in 2004 (PL 108-446, 2004). To be eligible under IDEA, a student must be adversely affected in oral expression, listening comprehension, written expression, basic reading skills, reading fluency skills, reading comprehension, mathematics calculation, or mathematics problem-solving. In its current form, the law guarantees the following rights related to education for anyone with a disability from birth to age 21. The first two influence schooling in general, but the last three affect the work of classroom teachers rather directly:

- *Free, appropriate education*: An individual or an individual's family should not have to pay for education simply because the individual has a disability, and the educational program should be truly educational; i.e., not merely care-taking or babysitting the person.
- *Due process*: In case of disagreements between an individual with a disability and the schools or other professionals, there must be procedures for resolving the disagreements that are fair and accessible to all parties, including the person himself or herself or the person's representative.
- *Fair evaluation of performance in spite of disability*: Tests or other evaluations should not assume test-taking skills that a person with a disability cannot reasonably be expected to have, such as holding a pencil, hearing or seeing questions,

working quickly, or understanding and speaking orally. Evaluation procedures should be modified to allow for these differences. This provision of the law applies both to evaluations made by teachers and to school-wide or "high-stakes" testing programs.

- *Education in the "least restrictive environment"*: Education for someone with a disability should provide as many educational opportunities and options for the person as possible, both in the short term and in the long term. In practice, this requirement has meant including students in regular classrooms and school activities as much as possible, though often not totally.
- *An individualized educational program*: Given that every disability is unique, instructional planning for a person with a disability should be unique or individualized as well. In practice, this provision has led to classroom teachers planning individualized programs jointly with other professionals (like reading specialists, psychologists, or medical personnel) as part of a team.

Students are eligible for the rights afforded under the IDEA if their academic achievement is being impacted due to a learning disability, autism spectrum disorder, visual or hearing impairment, orthopedic impairment, traumatic brain injury, speech or language impairment, intellectual disability, emotional disturbance, or other health impairment.

Center for Parent Information and Resources

Read more on evaluating children for disability and the categories of disability under IDEA.

Learning Disabilities

A **Learning Disability** (or LD) is a specific impairment of academic learning that interferes with a specific aspect of schoolwork, and that reduces a student's academic performance significantly. An LD shows itself as a major discrepancy between a student's ability and some feature of achievement: The student may be delayed in reading, writing, listening, speaking, or doing mathematics, but not in all of these at once. A learning problem is not considered a learning disability if it stems from physical, sensory, or motor handicaps, or from generalized intellectual impairment. It is also not an LD if the learning problem really reflects the challenges of learning English as a second language. Genuine LDs are the learning problems left over after these other possibilities are accounted for or excluded. Typically, a student with an LD has not been helped by teachers' ordinary efforts to assist the student when he or she falls behind academically, though what counts as an "ordinary effort," of course, differs among teachers, schools, and students. Most importantly, though, an LD relates to a fairly specific area of academic learning. A student may be able to read and compute well enough, for example, but not be able to write. LDs are by far the most common form of special educational need, accounting for half of all students with special needs in the United States and anywhere from 5 to 20% of all students, depending on how the numbers are estimated (United States Department of Education, 2005; Ysseldyke & Bielinski, 2002). Students with LDs are so common, in fact, that most teachers regularly encounter at least one per class in any given school year, regardless of the grade level they teach.

These difficulties are identified in school because this is when children's academic abilities are being tested, compared, and measured. Consequently, once academic testing is no longer essential in that person's life (as when they are working rather than going to school), these disabilities may no longer be noticed or

relevant, depending on the person's job and the extent of the disability.

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https://edpsych.pressbooks.sunycreate.cloud/?p=106#oembed-1

Video 7.2.1. *Common Learning Disabilities* defines what makes something a learning disability and explains some of the most common learning disabilities.

Dyslexia is one of the most commonly diagnosed disabilities and involves having difficulty in the area of reading. This diagnosis is used for a number of reading difficulties. Common characteristics are difficulty with phonological processing, which includes the manipulation of sounds, spelling, and rapid visual/verbal processing. Additionally, the child may reverse letters, have difficulty reading from left to right, or may have problems associating letters with sounds. It appears to be rooted in neurological problems involving the parts of the brain active in recognizing letters, verbally responding, and manipulating sounds. Recent studies have identified a number of genes that are linked to developing dyslexia (National Institute of Neurological Disorders and Stroke, 2016). Treatment typically involves altering teaching methods to accommodate the person's particular problematic area.

Dysgraphia, a writing disability, is often associated with dyslexia (Carlson, 2013). There are different types of dysgraphia, including phonological dysgraphia, when the person cannot sound out words and write them phonetically. Orthographic dysgraphia is demonstrated by those individuals who can spell regularly spelled words, but not irregularly spelled ones. Some individuals with

dysgraphia experience difficulties in motor control and experience trouble forming letters when using a pen or pencil.

Dyscalculia refers to problems in math. Cowan and Powell (2014) identified several terms used when describing difficulties in mathematics, including dyscalculia, mathematical learning disability, and mathematics disorder. All three terms refer to students with average intelligence who exhibit poor academic performance in mathematics. When evaluating a group of third graders, Cowan and Powell (2014) found that children with dyscalculia demonstrated problems with working memory, reasoning, processing speed, and oral language, all of which are referred to as domain-general factors. Additionally, problems with multi-digit skills, including number system knowledge, were also exhibited.

LDs are by far the most common form of special educational need, accounting for half of all students with special needs in the United States and anywhere from 5 to 20 percent of all students, depending on how the numbers are estimated (United States Department of Education, 2005; Ysseldyke & Bielinski, 2002). Students with LDs are so common, in fact, that most teachers regularly encounter at least one per class in any given school year, regardless of the grade level they teach.

Assisting Students with Learning Disabilities

There are various ways to assist students with learning disabilities, depending not only on the nature of the disability, of course, but also on the concepts or theories of learning to guide you. Let's take Irma, for example. Irma is a tenth-grader who adds multiple-digit numbers as if they were single-digit numbers stuck together: 42 + 59 equals 911 rather than 101, though 23 + 54 correctly equals 77. Stated more formally, Irma adds two-digit numbers without carrying digits forward from the one's column to the tens column,

or from the tens to the hundreds column. Example 1 shows the effect that her strategy has on one of her homework papers. What is going on here and how could a teacher help Irma?

Example 1: Irma's math homework about two-digit addition

Look at Irma's homework below:

Directions: *Add the following numbers.*

- 42 + 59 = 911
- 23 + 54 = 77
- 11 + 48 = 59
- 47 + 23 = 610
- 97 + 64 = 1511
- 41 + 27 = 68

Three out of the six problems are done correctly, even though Irma seems to use an incorrect strategy systematically on all six problems.

Behaviorism: Reinforcement for Wrong Strategies

One possible approach comes from the behaviorist theory. Irma

may persist with the single-digit strategy because it has been reinforced a lot in the past. Maybe she was rewarded so much for adding single-digit numbers (3 + 5, 7 + 8, etc.) correctly that she generalized this skill to two-digit problems—in fact over generalized it. This explanation is plausible because she would still get many two-digit problems right, as you can confirm by looking at it. In behaviorist terms, her incorrect strategy would still be reinforced, but now only on a "partial schedule of reinforcement." Partial schedules are especially slow to extinguish, so Irma persists seemingly indefinitely with treating two-digit problems as if they were single-digit problems.

From the point of view of behaviorism, changing Irma's behavior is tricky since the desired behavior (borrowing correctly) rarely happens and therefore cannot be reinforced very often. It might therefore help the teacher to reward behaviors that compete directly with Irma's inappropriate strategy. The teacher might reduce credit for simply finding the correct answer, for example, and increase credit for a student showing her work—including the work of carrying digits forward correctly. Or the teacher might make a point of discussing Irma's math work with Irma frequently, so as to create more occasions when she can praise Irma for working problems correctly.

Metacognition and Responding Reflectively

Part of Irma's problem may be that she is thoughtless about doing her math: the minute she sees numbers on a worksheet, she stuffs them into the first arithmetic procedure that comes to mind. Her learning style, that is, seems too impulsive and not reflective enough. Her style also suggests a failure of metacognition (remember that idea?), which is her self-monitoring of her own thinking and its effectiveness. As a solution, the teacher could encourage Irma to think out loud when she completes two-digit problems—literally get her to "talk her way through" each problem.

If participating in these conversations was sometimes impractical, the teacher might also arrange for a skilled classmate to take her place some of the time. Cooperation between Irma and the classmate might help the classmate as well, or even improve overall social relationships in the classroom.

Constructivism, Mentoring, and the Zone of Proximal Development

Perhaps Irma has in fact learned how to carry digits forward, but has not learned the procedure well enough to use it reliably on her own; so she constantly falls back on the earlier, better-learned strategy of single-digit addition. In that case, her problem can be seen in constructivist terms. In essence, Irma has lacked appropriate mentoring from someone more expert than herself, someone who can create a "zone of proximal development" in which she can display and consolidate her skills more successfully. She still needs mentoring or "assisted coaching" more than independent practice. The teacher can arrange some of this in much the way she encourages her to be more reflective, either by working with Irma herself or by arranging for a classmate or even a parent to volunteer to do so. In this case, however, whoever serves as a mentor should not only listen but also actively offer Irma help. The help has to be just enough to ensure that Irma completes two-digit problems correctly—neither more nor less. Too much help may prevent Irma from taking responsibility for learning the new strategy, but too little may cause her to take the responsibility prematurely.

Autism Spectrum Disorder

Autism spectrum disorder is probably the most misunderstood and puzzling of neurodevelopmental disorders. Children with this disorder show signs of significant disturbances in three main areas: (a) deficits in social interaction, (b) deficits in communication, and (c) repetitive patterns of behavior or interests. These disturbances appear early in life and cause serious impairments in functioning (APA, 2013).

The student with autism spectrum disorder might exhibit deficits in social interaction by not initiating conversations with others or turning their heads away when spoken to. They may not make eye contact with others and seem to prefer being alone rather than with others. In a certain sense, it is almost as though these individuals live in a personal and isolated social world others are simply not privy to or able to penetrate.

Communication deficits can range from a complete lack of speech to one-word responses (e.g., saying "Yes" or "No" when replying to questions or statements that require additional elaboration), echoed speech (e.g., parroting what another person says, either immediately or several hours or even days later), to difficulty maintaining a conversation because of an inability to reciprocate others' comments. These deficits can also include problems in using and understanding nonverbal cues (e.g., facial expressions, gestures, and postures) that facilitate normal communication.

Figure 7.2.1. Dr. Temple Grandin, advocate for individuals with autism.

Repetitive patterns of behavior or interests can be exhibited in a number of ways. The child might engage in stereotyped, repetitive movements (rocking, head-banging, or repeatedly dropping an object and then picking it up), or she might show great distress at small changes in routine or the environment. For example, the child might throw a temper tantrum if an object is not in its proper place or if a regularly- scheduled activity is rescheduled. In some cases, the person with autism spectrum disorder might show highly restricted and fixated interests that appear to be abnormal in their intensity. For instance, the child might learn and memorize every detail about something, even though doing so serves no apparent purpose. Importantly, autism spectrum disorder is not the same thing as intellectual disability, although these two conditions can occur together. The DSM-5 specifies that the symptoms of autism spectrum disorder are not caused or explained by intellectual disability.

The qualifier "spectrum" in autism spectrum disorder is used to indicate that individuals with the disorder can show a range, or spectrum, of symptoms that vary in their magnitude and severity: Some severe, others less severe. The previous edition of the DSM included a diagnosis of Asperger's disorder, generally recognized as a less severe form of autistic disorder; individuals diagnosed with Asperger's disorder were described as having average or high intelligence and a strong vocabulary, but exhibiting impairments in social interaction and social communication, such as talking only about their special interests (Wing, Gould, & Gillberg, 2011). However, because research has failed to demonstrate that Asperger's disorder differs qualitatively from autistic disorder, the DSM-5 does not include it. Some individuals with autism spectrum disorder, particularly those with better language and intellectual skills, can live and work independently as adults. However, most do not because the symptoms remain sufficient to cause serious impairment in many realms of life (APA, 2013).

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Video 7.2.2. *What is Autism Spectrum Disorder?* explains the range of behaviors and symptoms associated with autism spectrum disorder.

Currently, estimates indicate that nearly 1 in 88 children in the United States have autism spectrum disorder; the disorder is 5 times more common in boys (1 out of 54) than girls (1 out of 252) (CDC, 2012). Rates of autistic spectrum disorder have increased dramatically since the 1980s. For example, California saw an increase of 273% in reported cases from 1987 through 1998 (Byrd, 2002); between 2000 and 2008, the rate of autism diagnoses in the United States increased by 78% (CDC, 2012). Although it is difficult to interpret this increase, it is possible that the rise in prevalence is the result of the broadening of the diagnosis, increased efforts to identify cases in the community, and greater awareness and acceptance of the diagnosis. In addition, mental health professionals are now more knowledgeable about autism spectrum disorder and are better equipped to make the diagnosis, even in subtle cases (Novella, 2008).

The exact causes of autism spectrum disorder remain unknown despite massive research efforts over the last two decades (Meek, Lemery-Chalfant, Jahromi, & Valiente, 2013). Autism appears to be strongly influenced by genetics, as identical twins show concordance rates of 60%– 90%, whereas concordance rates for fraternal twins and siblings are 5%–10% (Autism Genome Project Consortium, 2007). Many different genes and gene mutations have been implicated in autism (Meek et al., 2013). Among the genes involved are those important in the formation of synaptic circuits that facilitate communication between different areas of the brain

(Gauthier et al., 2011). A number of environmental factors are also thought to be associated with increased risk for autism spectrum disorder, at least in part, because they contribute to new mutations. These factors include exposure to pollutants, such as plant emissions and mercury, urban versus rural residence, and vitamin D deficiency (Kinney, Barch, Chayka, Napoleon, & Munir, 2009).

There is no scientific evidence that a link exists between autism and vaccinations (Hughes, 2007). Indeed, a recent study compared the vaccination histories of 256 children with autism spectrum disorder with that of 752 control children across three time periods during their first two years of life (birth to 3 months, birth to 7 months, and birth to 2 years) (DeStefano, Price, & Weintraub, 2013). At the time of the study, the children were between 6 and 13 years old, and their prior vaccination records were obtained. Because vaccines contain immunogens (substances that fight infections), the investigators examined medical records to see how many immunogens children received to determine if those children who received more immunogens were at greater risk for developing autism spectrum disorder. The results of this study clearly demonstrated that the number of immunogens from vaccines received during the first two years of life was not at all related to the development of autism spectrum disorder.

Other Health Impairment: ADHD

Attention Deficit Hyperactivity Disorder (ADHD) is not a learning disability but can be considered as an 'other health impairment' if it is impacting academic performance. Individuals with ADHD show a constant pattern of inattention and/or hyperactive and impulsive behavior that interferes with normal functioning (American Psychological Association (APA), 2013). Some of the signs of inattention include great difficulty with, and avoidance of, tasks that require sustained attention (such as conversations or reading),

failure to follow instructions (often resulting in failure to complete schoolwork and other duties), disorganization (difficulty keeping things in order, poor time management, sloppy and messy work), lack of attention to detail, becoming easily distracted, and forgetfulness. Hyperactivity is characterized by excessive movement, and includes fidgeting or squirming, leaving one's seat in situations when remaining seated is expected, having trouble sitting still (e.g., in a restaurant), running about and climbing on things, blurting out responses before another person's question or statement has been completed, difficulty waiting one's turn for something, and interrupting and intruding on others. Frequently, the hyperactive child comes across as noisy and boisterous. The child's behavior is hasty, impulsive, and seems to occur without much forethought; these characteristics may explain why adolescents and young adults diagnosed with ADHD receive more traffic tickets and have more automobile accidents than do others their age (Thompson, Molina, Pelham, & Gnagy, 2007).

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Video 7.2.3. *What is ADHD?* explains the types and symptoms of ADHD.

ADHD occurs in about 5% of children (APA, 2013). On average, boys are 3 times more likely to have ADHD than girls; however, such findings might reflect the greater propensity of boys to engage in aggressive and antisocial behavior and thus incur a greater likelihood of being referred to psychological clinics (Barkley, 2006). Children with ADHD face severe academic and social challenges. Compared to their non-ADHD counterparts, children with ADHD

have lower grades and standardized test scores and higher rates of expulsion, grade retention, and dropping out (Loe & Feldman, 2007). They also are less well-liked and more often rejected by their peers (Hoza et al., 2005).

Differences in Perceptions: ADHD Versus High Activity

It is important to note that classrooms are places that make heavy demands on *not* showing ADHD-like behaviors: students are often supposed to sit for long periods, avoid interrupting others, finish tasks after beginning them, and keep their minds (and materials) organized. Ironically, therefore, classroom life may sometimes aggravate ADHD without the teacher intending for it to do so. A student with only a mild or occasional tendency to be restless, for example, may fit in well outdoors playing soccer but feel unusually restless indoors during class. It also should not be surprising that teachers sometimes mistake a student who is merely rather active for a student with ADHD, since any tendency to be physically active may contribute to problems with classroom management. The tendency to "over-diagnose" is more likely for boys than for girls (Maniadaki, et al., 2003), presumably because gender role expectations cause teachers to be especially alert to high activity in boys. Over-diagnosis is also especially likely for students who are culturally or linguistically non-Anglo (Chamberlain, 2005), presumably because cultural and language differences may sometimes lead teachers to misinterpret students' behavior. To avoid making such mistakes, it is important to keep in mind that in true ADHD, restlessness, activity, and distractibility are widespread and sustained. A student who shows such problems at school but never at home, for example, may not have ADHD; he may simply not be getting along with his teacher or classmates.

Is the Prevalence of ADHD Increasing?

Many people believe that the rates of ADHD have increased in recent years, and there is evidence to support this contention. In a recent study, investigators found that the parent-reported prevalence of ADHD among children (4–17 years old) in the United States increased by 22% during a 4-year period, from 7.8% in 2003 to 9.5% in 2007 (CDC, 2010). ADHD may be over-diagnosed by doctors who are too quick to medicate children as behavior treatment. There is also greater awareness of ADHD now than in the past. Nearly everyone has heard of ADHD, and most parents and teachers are aware of its key symptoms. Thus, parents may be quick to take their children to a doctor if they believe their child possesses these symptoms, or teachers may be more likely now than in the past to notice the symptoms and refer the child for evaluation.

ADHD can persist into adolescence and adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002). A recent study found that 29.3% of adults who had been diagnosed with ADHD decades earlier still showed symptoms (Barbaresi et al., 2013). Somewhat troubling, this study also reported that nearly 81% of those whose ADHD persisted into adulthood had experienced at least one other comorbid disorder, compared to 47% of those whose ADHD did not persist. Additional concerns when an adult has ADHD include worse educational attainment, lower socioeconomic status, less likely to be employed, more likely to be divorced, and more likely to have non-alcohol-related substance abuse problems (Klein et al., 2012).

Family and twin studies indicate that genetics play a significant role in the development of ADHD. Burt (2009), in a review of 26 studies, reported that the median rate of concordance for identical twins was .66, whereas the median concordance rate for fraternal twins was .20. The specific genes involved in ADHD are thought to include at least two that are important in the regulation of the neurotransmitter dopamine (Gizer, Ficks, & Waldman, 2009), suggesting that dopamine may be important in ADHD. Indeed,

medications used in the treatment of ADHD, such as methylphenidate (Ritalin) and amphetamine with dextroamphetamine (Adderall), have stimulant qualities and elevate dopamine activity. People with ADHD show less dopamine activity in key regions of the brain, especially those associated with motivation and reward (Volkow et al., 2009), which provides support to the theory that dopamine deficits may be a vital factor in the development this disorder (Swanson et al., 2007).

Brain imaging studies have shown that children with ADHD exhibit abnormalities in their frontal lobes, an area in which dopamine is in abundance. Compared to children without ADHD, those with ADHD appear to have smaller frontal lobe volume, and they show less frontal lobe activation when performing mental tasks. Recall that one of the functions of the frontal lobes is to inhibit our behavior. Thus, abnormalities in this region may go a long way toward explaining the hyperactive, uncontrolled behavior of ADHD.

Many parents attribute their child's hyperactivity to sugar. A statistical review of 16 studies, however, concluded that sugar consumption has no effect at all on the behavioral and cognitive performance of children (Wolraich, Wilson, & White, 1995). Additionally, although food additives have been shown to increase hyperactivity in non-ADHD children, the effect is rather small (McCann et al., 2007). Numerous studies, however, have shown a significant relationship between exposure to nicotine in cigarette smoke during the prenatal period and ADHD (Linnet et al., 2003). Maternal smoking during pregnancy is associated with the development of more severe symptoms of the disorder (Thakur et al., 2013).

Recommended treatment for ADHD includes behavioral interventions, cognitive behavioral therapy, parent and teacher education, recreational programs, and lifestyle changes, such as getting more sleep (Clay, 2013). For some children, medication is prescribed. Parents are often concerned that stimulant medication may result in their child acquiring a substance use disorder.

However, research using longitudinal studies has demonstrated that children diagnosed with ADHD who received pharmacological treatment had a lower risk for substance abuse problems than those children who did not receive medication (Wilens, Fararone, Biederman, & Gunawardene, 2003). The risk of substance abuse problems appears to be even greater for those with ADHD who are un-medicated and also exhibit antisocial tendencies (Marshal & Molina, 2006).

Teaching students with ADHD

Research also shows that ADHD can be reduced for many students if they take certain medications, of which the most common is *methylphenidate*, commonly known by the name Ritalin (Wilens, 2005; Olfson, 2003). This drug and others like it act by stimulating the nervous system, which reduces symptoms by helping a student pay better attention to the choices he or she makes and to the impact of actions on others. Unfortunately, the medications do not work on all students with ADHD, especially after they reach adolescence, and its long-term effects are uncertain (Breggin, 1999). In any case, Ritalin and similar drugs have certain practical problems. Drugs cost money, for one thing, which is a problem for a family without much money, to begin with, or for a family lacking medical insurance that pays for medications—a particularly common situation in the United States. For another thing, drugs must be taken regularly in order to be effective, including on weekends. Keeping a regular schedule can be difficult if parents' own schedules are irregular or simply differ from the child's, for example, because of night shifts at work or because parents are separated and share custody of the child.

In any case, since teachers are not doctors and medications are not under teachers' control, it may be more important simply to provide an environment where a student with ADHD can organize

choices and actions easily and successfully. Clear rules and procedures, for example, can reduce the "noise" or chaotic quality in the child's classroom life significantly. The rules and procedures can be generated jointly with the child; they do not have to be imposed arbitrarily, as if the student were incapable of thinking about them reasonably. Sometimes a classmate can be enlisted to model slower, more reflective styles of working, but in ways that do not imply undue criticism of the student with ADHD. The more reflective student can complete a set of math problems, for example, while explaining what he or she is thinking about while doing the work. Sometimes the teacher can help by making lists of tasks or of steps in long tasks. Use visual cues to help remind students of what they should be doing. It can help to divide focused work into small, short sessions rather than grouping it into single, longer sessions. Whatever the strategies that you use, they should be consistent, predictable, and generated by the student as much as possible. Students can also benefit from explicit teaching of self-monitoring skills. By having these qualities, the strategies can strengthen the student's self-direction and ability to screen out the distractions of classroom life. The goal for teachers, in essence, is to build the student's metacognitive capacity, while at the same time, of course, treating the student with respect.

How Difficult Can This be–The F.A.T. City Workshop

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Video 7.2.4. *How Difficult Can This Be–The F.A.T. City Workshop* is a simulation provided by Rick Lavoie. While the recording is dated, this award-winning video remains one of the most powerful means for conveying the experience of the learning disabled child to educators and parents. Individuals with learning disabilities often express that this video accurately articulates their schooling experience.

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Behavior Disorders

Behavior disorders are a diverse group of conditions in which a student chronically performs highly inappropriate behaviors. A student with this condition might seek attention, for example, by acting out disruptively in class. Other students with the condition might behave aggressively, be distractible and overly active, seem anxious or withdrawn, or seem disconnected from everyday reality. As with learning disabilities, the sheer range of signs and symptoms defies concise description. But the problematic behaviors do have several general features in common (Kauffman, 2005; Hallahan & Kauffman, 2006):

- they tend to be extreme
- they persist for extended periods of time
- they tend to be socially unacceptable (e.g. unwanted sexual advances or vandalism against school property)
- they affect schoolwork
- they have no other obvious explanation (e.g. a health problem or temporary disruption in the family)

The variety among behavioral disorders means that estimates of their frequency also tend to vary among states, cities, and provinces. It also means that in some cases, a student with a behavioral disorder may be diagnosed with a psychological disorder, such as oppositional defiance disorder, conduct disorder, ADHD, or bipolar disorder. In other cases, a behavioral problem may be serious enough to warrant intervention, but the student does not have another disorder label. In any case, available statistics suggest that only about one to two percent of students, or perhaps less, have true behavioral disorders—a figure that is only about one-half or one-third of the frequency for intellectual disabilities (Kauffman, 2005). Because of the potentially disruptive effects of behavioral disorders, however, students with this condition are of special

concern to teachers. Just one student who is highly aggressive or disruptive can interfere with the functioning of an entire class, and challenge even the best teacher's management skills and patience.

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> *https://edpsych.pressbooks.sunycreate.cloud/?p=107#oembed-1*

Video 7.4.1. *Disruptive, Impulse Control, and Conduct Disorders* discusses a few of the psychological diagnoses that are behavior disorders.

Children's Mental Health Disorder Fact Sheet for the Classroom

The Children's Mental Health Disorder Fact Sheet for the Classroom provides a list and description of psychological disorders that teachers may encounter with their students, as well as educational implications, instructional strategies, and classroom accommodations.

Strategies for Teaching Students with Behavioral Disorders

The most common challenges of teaching students with behavioral

disorders have to do with classroom management. Three important ideas discussed there, however, also deserve special emphasis here: (1) identifying circumstances that trigger inappropriate behaviors, (2) teaching of interpersonal skills explicitly, and (3) disciplining a student fairly.

Identifying Circumstances that Trigger Inappropriate Behaviors

Dealing with disruption is more effective if you can identify the specific circumstances or event that triggers it, rather than focusing on the personality of the student doing the disruption. A wide variety of factors can trigger inappropriate behavior (Heineman, Dunlap, & Kincaid, 2005):

- physiological effects—including illness, fatigue, hunger, or side effects from medications
- physical features of the classroom—such as the classroom being too warm or too cold, the chairs being exceptionally uncomfortable for sitting, or seating patterns that interfere with hearing or seeing
- instructional choices or strategies that frustrate learning—including restricting students' choices unduly, giving instructions that are unclear, choosing activities that are too difficult or too long, or preventing students from asking questions when they need help

By identifying the specific variables often associated with disruptive behaviors, it is easier to devise ways to prevent the behaviors, either by avoiding the triggers if this is possible or by teaching the student alternative but quite specific ways of responding to the triggering circumstance.

Teaching Interpersonal Skills Explicitly

Because of their history and behavior, some students with behavior disorders have had little opportunity to learn appropriate social skills. Simple courtesies (like remembering to say *please* or *thanks*) may not be totally unknown, but maybe unpracticed and seem unimportant to the student, as might body language (like eye contact or sitting up to listen to a teacher rather than slouching and looking away). These skills can be taught in ways that do not make them part of the punishment, make them seem "preachy," or put a student to shame in front of classmates. Depending on the age or grade level of the class, one way is by reading or assigning books and stories in which the characters model good social skills. Another is through games that require courteous language to succeed; one that I recall from my own school days, for example, was called "Mother, May I?" (Sullivan & Strang, 2002). Still, another is through programs that link an older student or adult from the community as a partner to the student at risk for behavior problems; a prominent example of such a program in the United States is Big Brothers Big Sisters of America, which arranges for older individuals to act as mentors for younger boys and girls (Tierney, Grossman, & Resch, 1995; Newburn & Shiner, 2006).

In addition, strategies based on behaviorist theory have proved effective for many students, especially if the student needs opportunities simply to practice social skills that he has learned only recently and may still feel awkward or self-conscious in using (Algozzine & Ysseldyke, 2006). Behaviorist techniques include the use of positive reinforcement, extinction, generalization, and the like. In addition to these, teachers can arrange for **contingency contracts**, which are agreements between the teacher and a student about exactly what work the student will do, how it will be rewarded, and what the consequences will be if the agreement is *not* fulfilled (Wilkinson, 2003). An advantage of all such behaviorist techniques is their precision and clarity: there is little room for

misunderstanding about just what your expectations are as the teacher. The precision and clarity, in turn, make it less tempting or necessary for you, as a teacher, to become angry about infractions of rules or a student's failure to fulfill contracts or agreements since the consequences tend already to be relatively obvious and clear. "Keeping your cool" can be especially helpful when dealing with behavior that is by nature annoying or disrupting.

Fairness in Disciplining

Many strategies for helping a student with a behavior disorder may be spelled out in the student's *individual educational plan*, such as discussed earlier in this chapter. The plan can (and indeed is supposed to) serve as a guide in devising daily activities and approaches with the student. Keep in mind, however, that since an IEP is akin to a legal agreement among a teacher, other professionals, a student, and the student's parents, departures from it should be made only cautiously and carefully, if ever. Although such departures may seem unlikely, a student with a behavior disorder may sometimes be exasperating enough to make it tempting to use stronger or more sweeping punishments than usual (for example, isolating a student for extended times). In case you are tempted in this direction, remember that every IEP also guarantees the student and the student's parents *due process* before an IEP can be changed. In practice, this means consulting with everyone involved in the case—especially parents, other specialists, and the student himself—and reaching an agreement before adopting new strategies that differ significantly from the past.

Instead of "increasing the volume" of punishments, a better approach is to *keep careful records* of the student's behavior and of your own responses to it, documenting the reasonableness of your rules or responses to any major disruptions. By having the records, collaboration with parents and other professionals can be

more productive and fair-minded, and increase others' confidence in your judgments about what the student needs in order to fit in more comfortably with the class. In the long term, more effective collaboration leads both to better support and to more learning for the student (as well as to better support for you as a teacher!).
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Physical Disabilities and Sensory Impairments

A few students have serious physical, medical, or sensory challenges that interfere with their learning. Usually, physical and medical challenges are medical conditions or diseases that require ongoing medical care. The sensory challenges are usually a loss either in hearing or in vision, or more rarely in both. Whatever the specific problem, it is serious enough to interfere with activities in regular classroom programs and to qualify the student for special education services or programs

Physical challenges that are this serious are relatively infrequent compared to some of the other special needs discussed in this chapter, though they are of course important in the lives of the students and their families, as well as important for teachers to accommodate. Only about one percent of US students have a hearing loss serious enough to be served by special programs for such students (United States Department of Education, 2005). Only about half that number have visual impairments that lead them to be served by special programs. For two reasons, though, these figures are a bit misleading. One reason is that many more students have vision or hearing problems that are too mild (such as wearing eyeglasses for "ordinary" nearsightedness). Another is that some students with serious sensory impairments may also have other disabilities and therefore not be counted in statistics about sensory impairments.

Hearing Loss

A child can acquire a hearing loss for a variety of reasons, ranging

from disease early in childhood, to difficulties during childbirth, to reactions to toxic drugs. In the classroom, however, the cause of the loss is virtually irrelevant because it makes little difference in how to accommodate a student's educational needs. More important than the cause of the loss is its extent. Students with only mild or moderate loss of hearing are sometimes called *hearing impaired* or *hard of hearing*; only those with nearly complete loss are called *deaf*. As with other sorts of disabilities, the milder the hearing loss, the more likely you are to encounter the student in a regular classroom, at least for part of the day.

Signs of Hearing Loss

Although determining whether a student has a hearing loss may seem straightforward ("Just give a hearing test!"), the assessment is often not clear-cut if it takes the student's daily experiences into account. A serious or profound hearing loss tends to be noticed relatively quickly and therefore often receives special help (or at least receives additional diagnosis) sooner. Mild or moderate hearing loss is much more common, however, and is more likely to be overlooked or mistaken for some other sort of learning problem (Sherer, 2004). Students with a mild hearing loss sometimes have somewhat depressed (or lowered) language and literacy skills—though not always, and in any case, so do some students *without* any loss. They may also seem not to listen or attend to a speaker because of trouble in locating the source of sounds—but then again, sometimes students *without* loss also fail to listen, though for entirely different reasons. Students with hearing loss may frequently give incorrect answers to questions—but so do certain other students with normal hearing. In addition, partial hearing loss can be hidden if the student teaches himself or herself to lip read, for example, or is careful in choosing which questions to answer in a class discussion. And so on. Systematic hearing tests

given by medical or hearing specialists can resolve some of these ambiguities. But even they can give a misleading impression since students' true ability to manage in class depends on how well they combine cues and information from the entire context of classroom life.

In identifying a student who may have a hearing loss, therefore, teachers need to observe the student over an extended period of time and in as many situations as possible. In particular, look for a persistent combination of some of the following, but look for them over repeated or numerous occasions (Luckner & Carter, 2001):

- delayed language or literacy skills, both written and oral
- some ability (usually partial) to read lips
- less worldly knowledge than usual because of lack of involvement with oral dialogue and/or delayed literacy
- occasionally, tendency to social isolation because of awkwardness in communication

Teaching Students with Hearing Loss

In principle, adjustments in teaching students with hearing loss are relatively easy to make though they do require deliberate actions or choices by the teacher and by fellow students. Interestingly, many of the strategies make good advice for teaching all students!

- Take advantage of the student's residual hearing. Seat the student close to you if you are doing the talking, or close to key classmates if the students are in a workgroup. Keep competing for noise, such as unnecessary talking or whispering, to a minimum (because such noise is especially distracting to someone with a hearing loss). Keep instructions concise and to the point. Ask the student occasionally whether he or she is understanding.

- Use visual cues liberally. Make charts and diagrams wherever appropriate to illustrate what you are saying. Look directly at the student when you are speaking to him or her (to facilitate lip reading). Gesture and point to keywords or objects—but within reason, not excessively. Provide handouts or readings to review visually the points that you make orally.
- Include the student in the community of the classroom. Recruit one or more classmates to assist in "translating" oral comments that the student may have missed. If the student uses American Sign Language (ASL) at home or elsewhere, then learn a few basic, important signs of ASL yourself ("Hello" "thank you" "How are you?"). Teach them to classmates as well.

Visual Impairment

Students with visual impairments have difficulty seeing even with corrective lenses. Most commonly the difficulty has to do with refraction (the ability to focus), but some students may also experience a limited field of view (called *tunnel vision*) or be overly sensitive to light in general. As with hearing loss, labels for visual impairment depend somewhat on the extent and nature of the problem. *Legal blindness* means that the person has significant tunnel vision or else visual acuity (sharpness of vision) of 20/200 or less, which means that he or she must be 20 feet away from an object that a person with normal eyesight can see at 200 feet. *Low vision* means that a person has some vision usable for reading, but often needs a special optical device such as a magnifying lens for doing so. As with hearing loss, the milder the impairment, the more likely that a student with a vision problem will spend some or even all the time in a regular class.

Signs of Visual Impairment

Students with visual impairments often show some of the same signs as students with simple, common nearsightedness. The students may rub their eyes a lot, for example, blink more than usual, or hold books very close to read them. They may complain of itchiness in their eyes, or of headaches, dizziness, or even nausea after doing a lot of close eye work. The difference between the students with visual impairment and those with "ordinary" nearsightedness is primarily a matter of degree: the ones with impairment show the signs more often and more obviously. If the impairment is serious enough or has roots in certain physical conditions or diseases, they may also have additional symptoms, such as crossed eyes or swollen eyelids. As with hearing loss, the milder forms ironically can be the most subtle to observe and therefore the most prone to being overlooked at first. For classroom teachers, the best strategy may be to keep track of a student whose physical signs happen in combination with learning difficulties, and for whom the combination persists for many weeks.

Teaching Students with Visual Impairment

In general, advice for teaching students with mild or moderate visual impairment parallels the advice for teaching students with hearing loss, though with obvious differences because of the nature of the students' disabilities.

- Take advantage of the student's residual vision. If the student still has some useful vision, place him or her where he can easily see the most important parts of the classroom—whether that is you, the chalkboard, a video screen, or particular fellow students. Make sure that the classroom, or at least the student's part of it, is well lit (because good lighting makes

reading easier with low vision). Make sure that handouts, books, and other reading materials have good, sharp contrast (also helpful with a visual impairment).

- Use non-visual information liberally. Remember not to expect a student with visual impairment to learn information that is by nature only visual, such as the layout of the classroom, the appearance of photographs in a textbook, or of story lines in a video. Explain these to the student somehow. Use hands-on materials wherever they will work, such as maps printed in three-dimensional relief or with different textures. If the student knows how to read Braille (an alphabet for the blind using patterns of small bumps on a page), allow him to do so.
- Include the student in the community of the classroom. Make sure that the student is accepted as well as possible into the social life of the class. Recruit classmates to help explain visual material when necessary. Learn a bit of basic Braille and encourage classmates to do the same, even if none of you ever become as skilled with it as the student himself or herself.

Teaching Students with Disabilities

Universal Design for Learning

Universal design for learning (UDL) is a set of principles for designing curricula that provides all individuals with equal opportunities to learn. UDL is designed to serve all learners, regardless of ability, disability, age, gender, or cultural and linguistic background. UDL provides a blueprint for designing goals, methods, materials, and assessments to reach all students including those with diverse needs. Grounded in research of learner differences and effective instructional settings, UDL principles call for varied and flexible ways to:

- Present or access information, concepts, and ideas (the "what" of learning),
- Plan and execute learning tasks (the "how" of learning), and
- Get engaged—and stay engaged—in learning (the "why" of learning)

UDL is different from other approaches to curriculum design in that educators begin the design process expecting the curriculum to be used by a diverse set of students with varying skills and abilities. UDL is an approach to learning that addresses and redresses the primary barrier to learning: inflexible, one-size-fits-all curricula that raise unintentional barriers. Learners with disabilities are the most vulnerable to such barriers, but many students without disabilities also find that curricula are poorly designed to meet their learning needs. UDL helps meet the challenges of diversity by recommending the use of flexible instructional materials, techniques, and strategies that empower educators to meet students' diverse needs. A universally designed curriculum is shaped from the outset to meet the needs of the greatest number of users, making costly, time-consuming, and after-the-fact changes to the

curriculum unnecessary. The UDL framework is grounded in three principles

- Multiple means of representation – using a variety of methods to present information, and provide a range of means to support
- Multiple means of action and expression –providing learners with alternative ways to act skillfully and demonstrate what they know
- Multiple means of engagement – tapping into learners' interests by offering choices of content and tools; motivating learners by offering adjustable levels of challenge.

Students Benefit from UDL

Students benefit from two major aspects of UDL: (1) its emphasis on a flexible curriculum, and (2) the variety of instructional practices, materials, and learning activities. All students, including those learning English, older students, and those with disabilities appreciate the multifaceted ways content is presented, as well as options for demonstrating what they know. UDL helps educators meet the challenge of serving those with special needs while enhancing learning for all.

Incorporate UDL in the Classroom

Instructors may want to try the following strategies (Rose & Meyer, 2002):

- Use multiple strategies to present content. Enhance instruction through the use of case studies, music, role play,

cooperative learning, hands-on activities, field trips, guest speakers, Web-based communications, and educational software. Example: Students can role-play important events in American history to give them a better understanding of the events and people involved. Also, offer a choice of learning contexts by providing opportunities for individual, pair, and group work as well as distance learning, peer learning, and fieldwork.

- Use a variety of materials. To present, illustrate, and reinforce new content, use materials such as online resources, videos, podcasts, PowerPoint presentations, realia, manipulatives, and e-books.
- Provide cognitive support. Give students organizing clues; for example: "I have explained the four main points, and now I am going to summarize them." Present background information for new concepts using pictures, artifacts, videos, and other materials that are not lecture-based. Scaffold student learning (provide temporary support to reduce the complexity of a task) by providing a course syllabus, outlines, summaries, study guides, and copies of PowerPoint slides.
- Teach to a variety of learning styles. Build movement into learning. Give instructions both orally and in writing to engage students auditorily and visually. Consider using large visual aids for slides, graphics, and charts.
- Provide flexible opportunities for assessment. Allow students to demonstrate their learning in multiple ways that include visual and oral presentation, rather than only written assessment.

One or more interactive elements has been excluded from this version of the text. You can view them online

here:
https://edpsych.pressbooks.sunycreate.cloud/?p=109#oembed-1

Video 7.6.1. *UDL at a Glance* explains universal design for learning and the UDL guidelines.

CAST: Universal Design for Learning

For more information, read about research, guidelines, and suggestions at the Universal Design for Learning website.

Alternative Assessments

In the context of students with disabilities, **assessment** refers to gathering information about a student in order both to identify the strengths of the student and to decide what special educational support, if any, the student needs. In principle, of course, these are tasks that teachers have for all students: assessment is a major reason why we give tests and assignments, for example, and why we listen carefully to the quality of students' comments during class discussions. For students with disabilities, however, such traditional or conventional strategies of assessment often seriously underestimate the students' competence (Koretz & Barton, 2003/2004; Pullin, 2005). Depending on the disability, a student may have trouble with (a) holding a pencil, (b) hearing a question clearly, (c)

focusing on a picture, (d) marking an answer in time even when he or she knows the answer, (e) concentrating on a task in the presence of other people, or (f) answering a question at the pace needed by the rest of the class. Traditionally, teachers have assumed that all students either have these skills or can learn them with just modest amounts of coaching, encouragement, and willpower. For many other students, for example, it may be enough to say something like: "Remember to listen to the question carefully!" For students with disabilities, however, a comment like this may not work and may even be insensitive. A student with visual impairment does not need to be reminded to "look closely at what I am writing on the board"; doing so will not cause the student to see the chalkboard more clearly—though the reminder might increase the student's anxiety and self-consciousness.

There are a number of strategies for modifying assessments in ways that attempt to be fair and that at the same time recognize how busy teachers usually are. One is to consider supplementing conventional assignments or tests with **portfolios**, which are collections of a student's work that demonstrate a student's development over time, and which usually include some sort of reflective or evaluative comments from the student, the teacher, or both (Carothers & Taylor, 2003; Wesson & King, 1996). Another is to devise a system for observing the student regularly, even if briefly, and informally recording notes about the observations for later consideration and assessment. A third strategy is to recruit help from teaching assistants, who are sometimes present to help a student with a disability; an assistant can often conduct a brief test or activity with the student, and later report on and discuss the results with you.

If you reflect on these strategies, you may realize that they may sometimes create issues about fairness. If a student with a disability demonstrates competence one way but other students demonstrate it another, should they be given similar credit? On the other hand, is it fair for one student to get a lower mark because the student

lacks an ability—such as normal hearing—that teachers cannot, in principle, ever teach?

Response to Intervention

Response to intervention (RTI) is an approach to academic intervention that provides early, systematic, and appropriately intensive assistance to children who are at risk for or are already underperforming compared to their peers. RTI seeks to promote academic success through universal screening, early intervention, frequent progress monitoring, and increasingly intensive research-based instruction or interventions for children who continue to have difficulty.

RTI was proposed as an alternative to the ability–achievement discrepancy model, which requires children to exhibit a significant discrepancy between their ability (often measured by IQ testing) and academic achievement (as measured by their grades and standardized testing). Methods to identify students with specific learning disabilities have been controversial for decades. Opponents of the ability-achievement discrepancy model have charged that this method leads to over-diagnosing low-performing students with having a learning disability. Proponents of RTI claim that the process brings more clarity to the diagnostic process and helps differentiate low-performing and leading disabled students. In the process of identifying learning disabilities, RTI differs from the formerly standard "ability–achievement discrepancy" approach in that decisions are based on outcomes of targeted interventions rather than mathematical discrepancies between scores achieved on standardized assessments.

RTI now refers to an education framework that involves research-based instruction and interventions, regular monitoring of student

progress, and the subsequent use of these data over time to make a variety of educational decisions, including, but not limited to learning disabilities. To facilitate this broadened conception of RTI, there was a shift to labeling this as one of the approaches of a Multi-Tier System of Supports (MTSS) occurring in schools and the professional literature.

In the RTI process, service delivery is typically divided into three levels (tiers) of support, with the intensity of interventions increasing with each level.

Tier 1 is focused specifically on the core curriculum, with instruction and interventions targeting all students. Approximately 80% to 85% of the general student body should be able to meet grade-level norms without additional assistance beyond the first tier. Students who consistently do not perform within the expected level of performance are then provided with additional supplementary interventions at **Tier 2**, which typically involves small group instruction. Approximately 3% to 6% of students will continue to have difficulties after Tier 2 interventions; these students will then receive **Tier 3** individualized intervention services, which is the most intense level of intervention (often one-on-one) provided in the regular education environment. Through RTI, educators can get enough evidence-based data to eliminate the possibility that poor academic performance is due to inadequate instruction. Therefore, it is argued that RTI is a more powerful process to identify whether a student has a learning disability.

Response to Intervention Action Network

For more information on Response to Intervention, including interventions, the theoretical basis for the model,

and research on the process, the Response to Intervention Action Network is an excellent source.

Least Restrictive Environment

The IDEA legislation calls for placing students with disabilities in the **least restrictive environment** (or **LRE**), defined as the combination of settings that involve the student with regular classrooms and school programs as much as possible. The precise combination is determined by the circumstances of a particular school and of the student. A kindergarten child with a mild cognitive disability, for example, may spend the majority of time in a regular kindergarten class, working alongside and playing with non-disabled classmates and relying on a teacher assistant for help where needed. An individual with a similar disability in high school, however, might be assigned primarily to classes specially intended for slow learners, but nonetheless, participate in some school-wide activities alongside non-disabled students. The difference in LREs might reflect teachers' perceptions of how difficult it is to modify the curriculum in each case; rightly or wrongly, teachers are apt to regard adaptation as more challenging at "higher" grade levels. By the same token, a student with a disability that is strictly physical might spend virtually all his or her time in regular classes throughout the student's school career; in this case, adjustment of the curriculum would not be an issue.

For you, the policy favoring the least restrictive environment means that if you continue teaching long enough, you will very likely encounter a student with a disability in one or more of your classes, or at least have one in a school-related activity for which you are responsible. It also means that the special educational needs of these students will most often be the "mildest." Statistically, the

most frequent forms of special needs are *learning disabilities*, which are impairments in specific aspects of learning, especially in reading. Learning disabilities account for about half of all special educational needs—as much as all other types put together. Somewhat less common are *speech and language disorders*, *cognitive disabilities*, and *attention deficit hyperactivity disorders* (or ADHD). Because of their frequency and the likelihood that you will meet students for whom these labels have been considered, I describe them more fully later in this chapter, along with other disability conditions that you will encounter much less frequently.

Individual Educational Plan

The third way that IDEA legislation and current educational approaches affect teachers is by requiring teachers and other professional staff to develop an annual **individual educational plan** (or **IEP**) for each student with a disability. The plan is created by a team of individuals who know the student's strengths and needs; at a minimum, it includes one or more classroom teachers, a "resource" or special education teacher, and the student's parents or guardians. Sometimes, too, the team includes a school administrator (like a vice-principal) or other professionals from outside the school (like a psychologist or physician), depending on the nature of the child's disability. An IEP can take many forms, but it always describes a student's current social and academic strengths as well as the student's social or academic needs. It also specifies educational goals or objectives for the coming year, lists special services to be provided, and describes how progress toward the goals will be assessed at the end of the year. Exhibit 3 shows a simple, imaginary IEP. (But keep in mind that the actual visual formats of IEP plans vary widely among states, provinces, and school jurisdictions.) This particular plan is for a student named Sean, a boy having difficulties with reading. IEPs, like the one in

the figure, originally served mainly students in the younger grades, but more recently they have been extended and modified to serve **transition planning** for adolescents with disabilities who are approaching the end of their public schooling (West, et al., 1999). For these students, the goals of the plan often include activities (like finding employment) to extend beyond schooling.

Student: Sean Cortinez	**Birth Date:** 26 May 2002	**Period Covered by IEP:** September 20xx – July 20xy
Address:		Phone:
School: Grant Park Middle School	**Grade Level:** 3	**Teacher(s):** G. Eidse

Support Team

List specialists (educational, medical, or other) involved in assisting the student:

Resource teacher, instructional aide (part time):

Special Curriculum Needs to be Addressed:

List general needs here; use separate sheet(s) for specific, short-term objectives as appropriate:

Sean can read short, familiar words singly, but cannot read connected text even when familiar. Needs help especially with decoding and other "word attack" skills. Some trouble focusing on reading tasks. Sean speaks clearly and often listens well when the topic interests him.

Special Materials or Equipment Needed:

Modified test procedures and reading materials as required.

Signatures:

Parent or guardian: K. Cortinez

Teacher(s): G. Eidse

Principal: L. Stauffer

Date of IEP Meeting: 26 October 20xx

Figure 7.6.1. A sample individual education plan (IEP).

If you have a student with an IEP, you can expect two consequences for teaching. The first is that you should expect to make definite, clear plans for the student, and to put the plans in writing. This consequence does not, of course, prevent you from

taking advantage of unexpected or spontaneous classroom events as well in order to enrich the curriculum. But it does mean that an educational program for a student with a disability cannot consist *only* of the unexpected or spontaneous. The second consequence is that you should not expect to construct an educational plan alone, as is commonly done when planning regular classroom programs. When it comes to students with disabilities, expect instead to plan as part of a team. Working with others ensures that everyone who is concerned about the student has a voice. It also makes it possible to improve the quality of IEPs by pooling ideas from many sources—even if, as you might suspect, it also challenges professionals to communicate clearly and cooperate respectfully with team members in order to serve a student as well as possible.

Guide to Special Education

The Advocates for Children of New York's Guide to Special Education provides an overview of special education services, the rights of students with disabilities, and the rights of parents of a child with a disability, including the process for identifying students with disabilities and how to plan for special education services.

For more information about special education services for younger children, refer to Advocates for Children's Guide to Early Intervention and Guide to Preschool Special Education Services.

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- Teaching Students with Disabilities. **Authored by**: Nicole Arduini-Van Hoose. **Provided by**: Hudson Valley Community College. **Retrieved from**: https://courses.lumenlearning.com/edpsy/chapter/teaching-studentu2026ith-disabilities/%20u200e. **License**: CC BY-NC-SA: *Attribution-NonCommercial-ShareAlike*

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Gender Differences in the Classroom

Gender roles are the patterns of behaviors, attitudes, and expectations associated with a particular sex—with being either male or female. For clarity, psychologists sometimes distinguish *gender differences*, which are related to social roles, from *sex differences*, which are related only to physiology and anatomy. Using this terminology, gender matters in teaching more than sex.

Although there are many exceptions, boys and girls do differ on average in ways that parallel conventional gender stereotypes, and that affects how the sexes behave at school and in class. The differences have to do with physical behaviors, styles of social interaction, academic motivations, behaviors, and choices. They have a variety of sources—primarily parents, peers, and the media. Teachers are certainly not the primary cause of gender role differences, but sometimes teachers influence them by their responses to and choices made on behalf of students.

Physical Differences in Sex and Gender Roles

Physically, boys tend to be more active than girls, and by the same token more restless if they have to sit for long periods. They are also more prone than girls to rely on physical aggression if they are frustrated (Espelage & Swearer, 2004). Both tendencies are inconsistent with the usual demands of classroom life, of course, and make it a little more likely that school will be a difficult experience for boys, even for boys who never actually get in trouble for being restless or aggressive.

During the first two or three years of elementary school, gross motor skills develop at almost the same average rate for boys and girls. As a *group*, both sexes can run, jump, throw a ball, and the like with about equal ease, though there are of course wide significant differences among *individuals* of both sexes. Toward the end of elementary school, however, boys pull ahead of girls at these skills even though neither sex has begun yet to experience puberty. The most likely reason is that boys participate more actively in formal and informal sports because of expectations and support from parents, peers, and society (Braddock, Sokol-Katz, Greene, & Basinger-Fleischman, 2005; Messner, Duncan, & Cooky, 2003). Puberty eventually adds to this advantage by making boys taller and stronger than girls, on average, and therefore more suited at least for sports that rely on height and strength.

In thinking about these differences, keep in mind that they refer to average trends and that there are numerous individual exceptions. Every teacher knows of individual boys who are not athletic, for example, or of particular girls who are especially restless in class. The individual differences mean, among other things, that it is hard to justify providing different levels of support or resources to boys than to girls for sports, athletics, or physical education. The differences also suggest, though, that individual students who *contradict* gender stereotypes about physical abilities may benefit from emotional support or affirmation from teachers, simply because they may be less likely than usual to get such affirmation from elsewhere.

Social Differences in Gender Roles

When relaxing socially, boys more often gravitate to large groups. Whether on the playground, in a school hallway, or on the street, boys' social groups tend literally to fill up a lot of space and often include significant amounts of roughhousing as well as organized

and "semi-organized" competitive games or sports (Maccoby, 2002). Girls, for their part, are more likely to seek and maintain one or two close friends and to share more intimate information and feelings with these individuals. To the extent that these gender differences occur, they can make girls less visible or noticeable than boys, at least in leisure play situations where children or youth choose their companions freely. As with physical differences, however, keep in mind that differences in social interactions do *not* occur uniformly for all boys and girls. There are boys with close friends, contradicting the general trend, and girls who play primarily in large groups.

Differences in social interaction styles happen in the classroom as well. Boys, on average, are more likely to speak up during a class discussion—sometimes even if not called on, or even if they do not know as much about the topic as others in the class (Sadker, 2002). When working on a project in a small co-ed group, furthermore they have a tendency to ignore girls' comments and contributions to the group. In this respect, co-ed student groups parallel interaction patterns in many parts of society, where men also have a tendency to ignore women's comments and contributions (Tannen, 2001).

Academic and Cognitive Differences in Gender

On average, girls are more motivated than boys to perform well in school, at least during elementary school. By the time girls reach high school, however, some may try to downplay their own academic ability in order to make themselves more likable to both sexes (Davies, 2005). Even if this occurs, though, it does not affect their grades: from kindergarten through twelfth grade, girls earn slightly higher average grades than boys (Freeman, 2004). This fact does not lead to similar achievement, however, because as youngsters move into high school, they tend to choose courses or subjects conventionally associated with their gender—math and

science for boys, in particular, and literature and the arts for girls. By the end of high school, this difference in course selection makes a measurable difference in boys' and girls' academic performance in these subjects.

But again, consider my caution about stereotyping: there are individuals of both sexes whose behaviors and choices run counter to the group trends. (I have made this point as well in "Preparing for Licensure: Interpreting Gender-Related Behavior" by deliberately concealing the gender of a student described.) Differences within each gender group generally are far larger than any differences between the groups. A good example is the "difference" in the cognitive ability of boys and girls. Many studies have found none at all. A few others have found small differences, with boys slightly better at math and girls slightly better at reading and literature. Still, other studies have found the differences not only are small but have been getting smaller in recent years compared to earlier studies. Collectively the findings of cognitive abilities are virtual "non-findings," and it is worth asking why gender differences have therefore been studied and discussed so much for so many years (Hyde, 2005). How do teachers influence gender roles?

Teachers often intend to interact with both sexes equally and frequently succeed at doing so. Research has found, though, that they do sometimes respond to boys and girls differently, perhaps without realizing it. Three kinds of differences have been noticed. The first is the overall amount of attention paid to each sex; the second is the visibility or "publicity" of conversations; the third is the type of behavior that prompts teachers to support or criticize students.

Attention Paid

In general, teachers interact with boys more often than with girls by a margin of 10 to 30 percent, depending on the grade level of the

students and the personality of the teacher (Measor & Sykes, 1992). One possible reason for the difference is related to the greater assertiveness of boys that I already noted; if boys are speaking up more frequently in discussions or at other times, then a teacher may be "forced" to pay more attention to them. Another possibility is that some teachers may feel that boys are especially prone to getting into mischief, so they may interact with them more frequently to keep them focused on the task at hand (Erden & Wolfgang, 2004). Still another possibility is that boys, compared to girls, may interact in a wider variety of styles and situations, so there may simply be richer opportunities to interact with them. This last possibility is partially supported by another gender difference in classroom interaction, the amount of public versus private talk.

Public Talk Versus Private Talk

Teachers have a tendency to talk to boys from a greater physical distance than when they talk to girls (Wilkinson & Marrett, 1985). The difference may be both a cause and an effect of general gender expectations, expressive nurturing is expected more often of girls and women, and a businesslike task orientation is expected more often of boys and men, particularly in mixed-sex groups (Basow & Rubenfeld, 2003; Myaskovsky, Unikel, & Dew, 2005). Whatever the reason, the effect is to give interactions with boys more "publicity." When two people converse with each other from across the classroom, many others can overhear them; when they are at each other's elbows, though, few others can overhear.

Distributing Praise and Criticism

In spite of most teachers' desire to be fair to all students, it turns

out that they sometimes distribute praise and criticism differently to boys and girls. The differences are summarized in Table 1. The tendency is to praise boys more than girls for displaying knowledge *correctly* but to criticize girls more than boys for displaying knowledge *incorrectly* (Golombok & Fivush, 1994; Delamont, 1996). Another way of stating this difference is by what teachers tend to overlook: with boys, they tend to overlook *wrong* answers, but with girls, they tend to overlook the *right* answers. The result (which is probably unintended) is a tendency to make boys' knowledge seem more important and boys themselves more competent. A second result is the other side of this coin: a tendency to make girls' knowledge *less* visible and girls themselves *less* competent.

Table 7.7.1. Gender differences in how teachers praise and criticize students

Type of response from teacher	Boys	Girls
Praises	Correct knowledge	"Good" or compliant behavior
Overlooks or ignores	"Good" or compliant behavior; *in*correct knowledge	*Mis*behavior; correct knowledge
Criticizes	*Mis*behavior	*In*correct knowledge

Gender differences also occur in the realm of classroom behavior. Teachers tend to praise girls for "good" behavior, regardless of its relevance to the content or to the lesson at hand, and tend to criticize boys for "bad" or inappropriate behavior (Golombok & Fivush, 1994). This difference can also be stated in terms of what teachers overlook: with girls, they tend to overlook behavior that is not appropriate, but with boys, they tend to overlook behavior that is appropriate. The net result, in this case, is to make girls seem better than they may really be, and also to make their "goodness" seem more important than their academic competence. By the same

token, the teacher's patterns of response imply that boys are more "bad" than they may really be.

At first glance, the gender differences in interaction can seem discouraging and critical of teachers because they imply that teachers as a group are biased about gender. But this conclusion is too simplistic for a couple of reasons. One is that like all differences between groups, interaction patterns are trends, and as such, they hide a lot of variation within them. The other is that the trends suggest what often tends in fact to happen, not what can in fact happen if a teacher consciously sets about to avoid interaction patterns like the ones I have described. Fortunately for us all, teaching does not need to be unthinking; we have choices that we can make, even during a busy class!

Cultural Differences in the Classroom

Culture is the system of attitudes, beliefs, and behaviors that constitute the distinctive way of life of a people. Although sometimes the term is also used to refer specifically to the artistic, intellectual, and other "high-brow" aspects of life, I use it here more broadly to refer to everything that characterizes a way of life—baseball games as well as symphony concerts, and McDonald's as well as expensive restaurants. In this broad sense, culture is nearly synonymous with ethnicity, which refers to the common language, history, and future experienced by a group within society. Culture has elements that are obvious, like unique holidays or customs, but also features that are subtle or easy for outsiders to overlook, like beliefs about the nature of intelligence or about the proper way to tell a story. When a classroom draws students from many cultures or ethnic groups, therefore, the students bring to it considerable diversity. Teachers need to understand that diversity—understand how students' habitual attitudes, beliefs, and behaviors differ from each other, and especially how they differ from the teacher's.

But this kind of understanding can get complicated. To organize the topic, therefore, I will discuss aspects of cultural diversity according to how directly they relate to language differences compared to differences in other social and psychological features of culture. The distinction is convenient, but it is also a bit arbitrary because, as you will see, the features of a culture overlap and influence each other.

Bilingualism: Language Differences in the Classroom

Although monolingual speakers often do not realize it, the majority of children around the world are bilingual, meaning that they understand and use two languages (Meyers-Scotton, 2005). Even in the United States, which is a relatively monolingual society, more than 47 million people speak a language other than English at home, and about 10 million of these people were children or youths in public schools (United States Department of Commerce, 2003). The large majority of bilingual students (75 percent) are Hispanic, but the rest represent more than a hundred different language groups from around the world. In larger communities throughout the United States, it is therefore common for a single classroom to contain students from several language backgrounds at once.

In classrooms as in other social settings, bilingualism exists in different forms and degrees. At one extreme are students who speak both English and another language fluently; at the other extreme are those who speak only limited versions of both languages. In between are students who speak their home (or heritage) language much better than English, as well as others who have partially lost their heritage language in the process of learning English (Tse, 2001). Commonly, too, a student may speak a language satisfactorily but be challenged by reading or writing it—though even this pattern has individual exceptions. Whatever the case, each bilingual student poses unique challenges to teachers.

Balanced or Fluent Bilingualism

The student who speaks both languages fluently has a definite cognitive advantage. As you might suspect and as research has confirmed, a fully fluent bilingual student is in a better position than

usual to express concepts or ideas in more than one way, and to be aware of doing so (Jimenez, et al. 1995; Francis, 2006). The question: "What if a dog were called a cat?" is less likely to confuse even a very young bilingual child. Nor will the follow-up question: "Could the 'cat' meow?" confuse them. Such skill in reflecting on language is a form of **metacognition**, which is defined as using language as an *object* of thought. Metacognition can be helpful for a variety of academic purposes, such as writing stories and essays, or interpreting complex text materials.

Unbalanced Bilingualism

Unfortunately, the bilingualism of many students is "unbalanced" in the sense that they are either still learning English, or else they have lost some earlier ability to use their original, heritage language—or occasionally a bit of both. The first sort of student—sometimes called an **English language learner (ELL)** or **limited English learner (LEL)**—has received the greatest attention and concern from educators, since English is the dominant language of instruction and skill and obviously helps prepare a student for life in American society. ELL students essentially present teachers with this dilemma: how to respect the original language and culture of the student while also helping the student to join more fully in the mainstream—i.e. English-speaking—culture? Programs to address this question have ranged from total immersion in English from a young age (the "sink or swim" approach) to phasing in English over a period of several years (sometimes called an *additive* approach to bilingual education). In general, evaluations of bilingual programs have favored the more additive approaches (Beykont, 2002). Both languages are developed and supported, and students ideally become able to use either language permanently, though often for different situations or purposes. A student may end up using English in the classroom or at work, for example, but continue using Spanish

at home or with friends, even though he or she is perfectly capable of speaking English with them.

Language Loss

What about the other kind of imbalance, in which a student is acquiring English but losing ability with the student's home or heritage language? This sort of bilingualism is quite common in the United States and other nations with immigrant populations (Tse, 2001). Imagine this situation: First-generation immigrants arrive, and they soon learn just enough English to manage their work and daily needs but continue using their original language at home with family and friends from their former country. Their children, however, experience strong expectations and pressure to learn and use English, and this circumstance dilutes the children's experience with the heritage language. By the time the children become adults, they are likely to speak and write English better than their heritage language, and may even be unable or unwilling to use the heritage language with their own children (the grandchildren of the original immigrants).

This situation might not at first seem like a problem for which we, as teachers, need to take responsibility, since the children immigrants, as students, are acquiring the dominant language of instruction. In fact, however, things are not that simple. Research finds that language loss limits students' ability to learn English as well or as quickly as they otherwise can. Having a large vocabulary in a first language, for example, has been shown to save time in learning vocabulary in a second language (Hansen, Umeda & McKinney, 2002). But students can only realize the savings if their first language is preserved. Preserving the first language is also important if a student has impaired skills in *all* languages and therefore needs intervention or help from a speech-language specialist. Research has found, in such cases, that the specialist

can be more effective if the specialist speaks and uses the first language as well as English (Kohnert, et al., 2005). Generally, though also more indirectly, minimizing language loss helps all bilingual students' education because preservation tends to enrich students' and parents' ability to communicate with each other. With two languages to work with, parents can stay "in the loop" better about their children's educations and support the teacher's work—for example, by assisting more effectively with homework (Ebert, 2005).

Note that in the early years of schooling, language loss can be minimized to some extent by the additive or parallel-track bilingual programs that I mentioned above. For a few years, though not forever, young students are encouraged to use *both* of their languages. In high school, in addition, some conventional foreign language classes— notably in Spanish—can be adjusted to include and support students who are already native speakers of the language alongside students who are learning it for the first time (Tse, 2001). But for heritage languages not normally offered as "foreign" languages in school, of course, this approach will not work. Such languages are especially at risk of being lost.

Cultural Differences in Language Use

Cultures and ethnic groups differ not only in languages but also in how languages are used. Since some of the patterns differ from those typical of modern classrooms, they can create misunderstandings between teachers and students (Cazden, 2001; Rogers, et al., 2005). Consider these examples: In some cultures, it is considered polite or even intelligent not to speak unless you have something truly important to say. "Chitchat," or talk that simply affirms a personal tie between people, is considered immature or intrusive (Minami, 2002). In a classroom, this habit can make it easier for a child to learn not to interrupt others, but it can also make the child seem unfriendly.

- *Eye contact* varies by culture. In many African American and Latin American communities, it is considered appropriate and respectful for a child not to look directly at an adult who is speaking to them (Torres-Guzman, 1998). In classrooms, however, teachers often expect a lot of eye contact (as in "I want all eyes on me!") and may be tempted to construe a lack of eye contact as a sign of indifference or disrespect.
- *Social distance* varies by culture. In some cultures, it is common to stand relatively close when having a conversation; in others, it is more customary to stand relatively far apart (Beaulieu, 2004). Problems may happen when a teacher and student prefer different social distances. A student who expects a closer distance than does the teacher may seem overly familiar or intrusive, whereas one who expects a longer distance may seem overly formal or hesitant.
- *Wait time* varies by culture. Wait time is the gap between the end of one person's comment or question and the next person's reply or answer. In some cultures, the wait time is relatively long—as long as three or four seconds (Tharp & Gallimore, 1989). In others it is a "negative" gap, meaning that it is acceptable, even expected, for a person to interrupt before the end of the previous comment. In classrooms the wait time is customarily about one second; after that, the teacher is likely to move on to another question or to another student. A student who habitually expects a wait time longer than one second may seem hesitant, and not be given many chances to speak. A student who expects a "negative" wait time, on the other hand, may seem overeager or even rude.
- In most non-Anglo cultures, *questions* are intended to gain information, and it is assumed that a person asking the question truly does not have the information requested (Rogoff, 2003). In most classrooms, however, teachers regularly ask test questions, which are questions to which the teacher already knows the answer and that simply assess whether a student knows the answer as well (Macbeth, 2003). The

question: "*How much is 2 + 2?*" for example, is a test question. If the student is not aware of this purpose, he or she may become confused, or think that the teacher is surprisingly ignorant! Worse yet, the student may feel that the teacher is trying deliberately to shame the student by revealing the student's ignorance or incompetence to others.

Cultural Differences in Attitudes and Beliefs

In addition to differences in language and in practices related to language, cultural groups tend to differ in various other attitudes and beliefs. Complete descriptions of the details of the differences have filled entire books and encyclopedias (see, for example, Birx, 2005). For teachers, however, one of the most important differences centers on personal beliefs about **identity**—the sense of self or of "who you are." A number of other cultural beliefs and practices can be understood as resulting from how members of a culture think about personal identity.

In white, middle-class American culture, the self tends to be thought of as unique and independent—a unitary, living source of decisions, choices, and actions that stands (or should eventually stand) by itself (Greenfield, et al., 2003; Rogoff, 2003). This view of the self is assumed by educators, for example, when students are expected to take responsibility for their own successes or failures, or when students are evaluated individually rather than as a group or team. As teachers, most of us subscribe to the idea that all students are unique and therefore take steps to individualize or differentiate instruction. Across a variety of circumstances, teachers tend to believe in an **independent self**.

Yet many non-white cultures tend to believe in something closer to an **interdependent self**, or a belief that it is relationships and responsibilities, and not uniqueness and autonomy, that defines a person (Greenfield, 1994; Greenfield, et al., 2003). From this

perspective, the most worthy person is not the one who is unusual or who stands out in a crowd. Such a person might actually be regarded as lonely or isolated. The worthy person is instead the one who gets along well with family and friends, and who meets obligations to them reliably and skillfully. At some level, of course, we *all* value interpersonal skill and to this extent think of ourselves as interdependent. And individuals *within* any given society will vary in their attitudes about personal identity. The cultural difference between individual and interdependent self is one of average tendency or emphasis, with many non-white cultures emphasizing interdependence significantly more than white middle-class society does, on average, and more than many schools in particular.

There can be consequences of the difference in how the students respond to school. Here are some of the possibilities—though keep in mind that there are also differences *among* students as individuals, whatever their background. The following are tendencies, not simple predictions:

- *Preference for activities that are cooperative rather than competitive:* Many activities in school are competitive, even when teachers try to de-emphasize the competition. Once past the first year or second year of school, students often become attentive to who receives the highest marks on an assignment, for example, or who is the best athlete at various sports or whose contributions to class discussion the most verbal recognition from the teacher (Johnson & Johnson, 1998). Suppose, in addition, that a teacher deliberately organizes important activities or assignments competitively (as in "Let's see who finishes the math sheet first."). Classroom life can then become explicitly competitive, and the competitive atmosphere can interfere with cultivating supportive relationships among students or between students and the teacher (Cohen, 2004). For students who give priority to these relationships, competition can seem confusing at best and

threatening at worst. What sort of sharing or helping with answers, the student may ask, is truly legitimate? If the teacher answers this question more narrowly than does the student, then what the student views as cooperative sharing may be seen by the teacher as laziness, "freeloading," or even cheating.

- *Avoidance of standing out publicly*: Even when we, as teachers, avoid obvious forms of competition, we may still interact frequently with students one at a time while allowing or inviting many others to observe the conversation. An especially common pattern for such conversations is sometimes called the **IRE** cycle, an abbreviation for the teacher *initiating*, a student *responding*, and the teacher then *evaluating* the response (Mehan, 1979). What is sometimes taken for granted is how often IRE cycles are witnessed publicly, and how much the publicity can be stressful or embarrassing for students who do *not* value standing out in a group but who *do* value belonging to the group. The embarrassment can be especially acute if they feel unsure about whether they have the correct knowledge or skill to display. To keep such students from "clamming up" completely, therefore, teachers should consider limiting IRE cycles to times when they are truly productive. IRE conversations may often work best when talking with a student privately, or when confirming knowledge that the student is likely to be able to display competently already, or when "choral" speaking (responding together in unison) is appropriate.
- *Interpersonal time versus clock time*: In order to function, all schools rely on fairly precise units of time as measured on clocks. Teachers typically allot a fixed number of minutes to one lesson or class, another fixed number of minutes for the next, another for recess or lunchtime, and so on. In more ways than one, therefore, being on time becomes especially valued in schools, as it is in many parts of society. Punctuality is not always conducive, however, to strong personal relationships, which develop best when individuals do not end joint activities

unilaterally or arbitrarily but allow activities to "finish themselves," so to speak—to finish naturally. If personal relationships are a broad, important priority for a student, therefore, it may take effort and practice by the student to learn the extent to which schools and teachers expect punctuality. Punctuality includes the obvious, like showing up for school when school is actually scheduled to begin. But it also includes subtleties, like starting and finishing tasks when the teacher tells students to do so, or answering a question promptly at the time it is asked rather than sometime later when the discussion has already moved on. Oppositional cultural identity

Oppositional Cultural Identity

In some cases, dominant cultural attitudes can oppress or alienate particular students to the point where they feel they have no choice but to put themselves on the margins of mainstream activity. Such students may develop an **oppositional cultural identity**, meaning that they define themselves not by who they are, but by how they *differ from* or oppose mainstream culture (Ogbu & Davis, 2003; Carter, 2005). Instead of aspiring to do well in school, for example, or to get along well with teachers, the students may aspire *not* to do well and *not* to be liked by teachers. Obviously, this sort of attitude poses problems for teachers who try to motivate the students, it also poses problems for the student's long-term success in life. Oppositional identity is especially likely in so-called **involuntary minorities**—groups that emigrated to or joined a society against their will and who may have been given few resources with which to participate in society. In the United States, for example, African-Americans and American Indians may have been involuntary minorities originally, although many present-day individuals from these groups may now feel very much a part of American culture. As cultural groups, however, their experiences have been quite different than so-called **voluntary minorities**—groups that chose to emigrate to society in order to create better lives for themselves. The latter groups are more likely to work actively to fit into their newfound culture. Learning to fit into a new culture is a challenging task itself, but on the whole, it is an easier task for teachers to work with than oppositional motivation.

Accommodating Cultural Diversity in Practice

As the comments in the previous section imply, accommodating cultural diversity involves more than adding cultural content to the curriculum—more than celebrating Mexican holidays in an American social studies class, for example, and more than discussing the history of slavery of African-Americans. These are useful actions, but they are only a starting point for truly *multicultural* education (Banks, 2009). In addition, it is important to engage students in exploring the culturally-based assumptions of whatever subject they are studying. In studying the "Westward Movement" (the settlement of the American West), for example, it is important to point out that this movement was "westward" only from the point of view of the white Americans living in the eastern United States. To the indigenous American Indians, the "west" was the center of their world; to the Mexicans, it was "north"; to the Asian laborers living in California, it was "east."

James Banks has proposed five features of a fully multicultural educational program (2009). The first two of these were mentioned in the paragraph above, but not the next three:

- Integrating *cultural content* into the curriculum wherever possible.
- Stimulating *knowledge construction* to help students understand cultural assumptions.
- *Flexible teaching strategies* that give all students access and success with learning. If some students prefer to learn cooperatively rather than independently, for example, then teachers should make provisions for cooperative learning activities.
- *Encourage prejudice reduction* among all students. This can and should happen even in classes that do not seem culturally diverse on the surface. Such classes always have diversity, even if it is not visible immediately: students' families will vary in their financial circumstances, students themselves will vary in their gender preferences, and students will vary in their

attitudes about religion, politics, and many other issues.
- *Encourage the entire school to be aware* of cultural diversity and its effects. What is the racial composition of the school staff? What are their attitudes? What school policies favor particular students unfairly?

Of all of these strategies, the most important is the third: being flexible about the choice of teaching strategies. By allowing for various styles of learning, teachers can accommodate a wide range of students, whatever their cultural backgrounds and whatever cultural background the teacher herself may have. And flexibility has an added advantage: honoring students' individuality, it avoids the danger of stereotyping students' learning needs on the basis of their cultural background.

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Chapter Summary: Student Diversity

Students differ in a multitude of ways, both individually and as groups. Individually, for example, students have a preferred learning style as well as preferred cognitive or thinking styles. They also have unique profiles or intelligence or competence that affect how and what they learn most successfully.

In addition to individual diversity, students tend to differ according to their gender, although there are numerous individual exceptions. Motor abilities, as well as motivation and experience with athletics, gradually differentiate boys and girls, especially when they reach and begin high school. Socially, boys tend to adopt relationships that are more active and wide-ranging than do girls. Academically, girls tend to be a bit more motivated to receive slightly higher marks in school. Teachers sometimes contribute to gender role differences— perhaps without intention—by paying attention to boys more frequently and more publicly in class, and by distributing praise and criticism in ways differentiated by sex.

Students also differ according to the cultures, language, and ethnic groups of their families. Many students are bilingual, with educational consequences that depend on their fluency in each of their two languages. If they have more difficulty with English, then programs that add their first language together with English have proved to be helpful. If they have more difficulty with their first language, they are at risk for language loss, and the consequences are also negative even if more hidden from teachers' views.

In addition to language differences as such, students differ according to culture in how language is used or practiced—in taking turns speaking, in eye contact, social distance, wait time, and the use of questions. Some of these differences in practice stem from cultural differences in attitudes about self-identity, with non-Anglo

culturally tending to support a more interdependent view of the self than Anglo culture or the schools. Differences in attitudes and in the use of language have several consequences for teachers. In particular—where appropriate—they should consider using cooperative activities, avoid highlighting individuals' accomplishments or failures, and be patient about students' learning to be punctual. Students with an oppositional identity may prove hard to reach, but flexibility in teaching strategies can be very helpful in reaching a wide range of students, regardless of their cultural backgrounds.

Since the 1970s support for people with disabilities has grown significantly, as reflected in the United States by three key pieces of legislation: the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, and the Individuals with Disabilities Education Act (IDEA). The support has led to new educational practices, including alternative assessments for students with disabilities, placement in the least restrictive environment, and individual educational plans.

There are several commonly used categories of disabilities. Although all of them risk stereotyping or oversimplifying children, they can also be helpful in gaining a preliminary understanding of their strengths and needs. For the purposes of education, the most frequent category is learning disabilities, which is difficulty with specific aspects of academic work. The high prevalence of learning disabilities makes this category especially ambiguous as a description of particular students. Assistance for students with learning disabilities can be framed in terms of behaviorist reinforcement, metacognitive strategies, or constructivist mentoring.

Attention deficit hyperactivity disorder (ADHD) is a problem with sustaining attention and controlling impulses. It can often be controlled with medications, but usually, it is also important for teachers to provide a structured environment for the student as well.

Intellectual disabilities (or mental retardation) are general

limitations in cognitive functioning as well as in the tasks of daily living. Contemporary experts tend to classify individuals with these disabilities according to the amount and frequency of support they need from others. Teachers can assist these students by giving more time and practice than usual, by including adaptive and functional skills among the student's learning goals, and by finding ways to include the student in the daily life of the classroom.

Behavioral disorders are conditions in which students chronically perform highly inappropriate behaviors. Students with these problems present challenges for classroom management, which teachers can meet by identifying circumstances that trigger inappropriate behaviors, by teaching interpersonal skills explicitly, and by making sure that punishments or disciplinary actions are fair and have been previously agreed upon.

Physical and sensory disabilities are significant limitations in health, hearing, or vision. The signs both of hearing loss and of vision loss can be subtle, but can sometimes be observed over a period of time. Teaching students with either a hearing loss or a vision loss primarily involves making use of the students' residual sensory abilities and ensuring that the student is included in and supported by the class as well as possible.

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INSTRUCTION

Theme: Instructional Practices

Overview of Content:

- Instructional Planning and Methods

Learning Objectives:

- Define learning objectives and why they are important
- Describe goals of learning and direct instruction, pros and cons
- Explain how discovery learning and expository teaching foster learning
- Describes techniques based on cognitive apprenticeships

Instructional Management

Educational psychologists focus much attention on identifying what successful teachers do to promote student learning. By analyzing the classroom behavior of effective teachers, researchers have identified certain regularly occurring patterns of teacher behavior. These patterns of expert practice are evident regardless of whether the subject is reading, science, social studies, math, art, or any other subject.

Successful teachers demonstrate a pattern of expert practice that we will refer to as instructional management. This includes two broad components of teaching skill: (1) expertise in planning for instruction and (2) expertise in delivering instruction. Before teaching a lesson, successful teachers make important planning decisions about their goals and objectives. These goals and objectives give learners a purpose or reason for the activities they were pursuing. They also made it easier to gauge the learners' progress. Finally, successful teachers and their learners are able to achieve their goals and objectives because of expert patterns of practice in delivering instruction.

As you will learn in this chapter, the effective delivery of instruction includes four general categories of teaching skills: (1) structuring, (2) modeling, (3) coaching, and (4) fading. One of the goals as a beginning teacher will be to build successful patterns of practice in the classroom. These will involve the learning climate created, the classroom management procedures established, the goals and objectives selected, and the teaching
activities of structuring, modeling, coaching, and fading employed to achieve a positive impact on your learners.

By carefully studying this chapter and observing patterns of expert practice during your field placements and student teaching, you will be able to build successful patterns of practice. When these activities become enriched with an understanding of learner

assessment (to be discussed in the future modules), you will have acquired the patterns of expert practice of an effective teacher.
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Instructional Planning

Instructional planning, the systematic selection of educational goals and objectives, and their design for use in the classroom. We will divide this purpose into four parts, and discuss them one at a time. First is the problem of selecting general goals to teach; where can a teacher find these, and what do they look like? Second is the problem of transforming goals into specific objectives, or statements concrete enough to guide daily activity in class; what will students actually *do* or *say* in order to learn what a teacher wants them to learn? The third is the problem of balancing and relating goals and objectives to each other; since we may want students to learn numerous goals, how can we combine or integrate them so that the overall classroom program does not become fragmented or biased? Fourth is the challenge of relating instructional goals to students' prior experiences and knowledge.

The Relevance of Educational Goals

Educational goals provide a sense of mission and purpose. The more aware you are of your mission and purpose in teaching an area of content, the more you will be able to inspire your students to learn it. Your ability to articulate goals conveys to learners your sense of purpose, from which they can make a commitment to learning. This is why goals are important—they energize and motivate students to become actively engaged in and committed to the learning process. Goals help teachers articulate "Why am I teaching this?"

At the most general or abstract level, the goals of education include important philosophical ideas like "developing individuals to their fullest potential" and "preparing students to be productive members of society." Few teachers would disagree with these ideas in principle, though they might disagree about their wording or

about their relative importance. As a practical matter, however, teachers might have trouble translating such generalities into specific lesson plans or activities for the next day's class. What does it mean, concretely, to "develop an individual to his or her fullest potential"? Does it mean, for example, that a language arts teacher should ask students to write an essay about their personal interests, or does it mean that the teacher should help students learn to write as well as possible on *any* topic, even ones that are not of immediate interest? What exactly should a teacher do, from day to day, to "prepare students to be productive members of society" as well? Answers to questions like these are needed to plan instruction effectively. But the answers are not obvious simply by examining statements of general educational goals.

Goal statements, although written for the teacher, are expressed from the learner's point of view. In other words, goals identify what your students will learn from your instruction. For example, the statement "The teacher will show students examples of logical arguments" would fail as an educational goal because it describes what you will do, not what your students will learn. "Learners will acquire the ability to construct a convincing argument" qualifies as a goal statement because it identifies what is expected of your students.

How do you choose goals for learners? What is the best way to find proper goals, given the diversity and complexity that exist across subjects and grades? Several approaches to formulating educational goals have been developed to help you. One approach comes from the work of Tyler (1974).

Tyler's Goal Development Approach

Tyler's approach to generating educational goals has had a major influence on curriculum development over the past three decades. Tyler believes that as society becomes more complex there are

more things for people to learn. But the time available to learn this ever-expanding amount of knowledge and skills continually decreases. Consequently, educators must make informed choices about which goals are worth teaching. Tyler identified five factors to consider when a teacher establishes priorities for what students should learn. First, goals must include:

- the subject matter we know enough about to teach (subject matter mastery)
- societal concerns, which represent what is valued in both the society at large and the local community
- personal interests of the students, and the abilities and knowledge they bring to school.

Second, these goals must be refined to match

- your school and community's educational philosophy
- what instructional theory and research tell us can be taught.

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https://edpsych.pressbooks.sunycreate.cloud/?p=117#oembed-1

Video 8.2.1. *The Tyler Method for Curriculum Design* reviewed.

National and State Learning Standards

Some (but not all) of the work of transforming such general purposes into more precise teaching goals and even more precise objectives has been performed by broad US organizations that represent educators and other experts about particular subjects or types of teaching (Riley, 2002). The groups have proposed national standards, which are summaries of what students can reasonably be expected to learn at particular grade levels and in particular subject areas. In the United States, in addition, all state governments create state standards that serve much the same purpose: they express what students in the state should (and hopefully can) learn at all grade levels and in all subjects.

Because they focus on grade levels and subject areas, general statements of educational standards tend to be a bit more specific than the broader philosophical goals we discussed above. As a rule of thumb, too, state standards tend to be more comprehensive than national standards, both in coverage of grade levels and of subjects. The difference reflects the broad responsibility of states in the United States for all aspects of public education; national organizations, in contrast, usually assume responsibility only for a particular subject area or a particular group of students. Either type of standard provides a first step, however, toward transforming the grandest purposes of schooling (like developing the individual or preparing for society) into practical classroom activities. But they provide a first step only. Most statements of standards do not make numerous or detailed suggestions of actual activities or tasks for students, though some might include brief classroom examples—enough to clarify the meaning of a standard, but not enough to plan an actual classroom program for extended periods of time. For these latter purposes, teachers rely on more detailed

documents, the ones often called *curriculum frameworks* and *curriculum guides*.

National and State Curriculum Standards

Education World maintains a comprehensive list of national and state curriculum standards, including Common Core standards, voluntary national education standards for the major subject areas, national standards for specific populations, and state standards by subject.

Curriculum Frameworks and Curriculum guides

The terms curriculum framework and curriculum guide sometimes are used almost interchangeably, but for convenience, we will use them to refer to two distinct kinds of documents. The more general of the two is the curriculum framework, which is a document that explains how content standards can or should be organized for a particular subject and at various grade levels. Sometimes this information is referred to as the scope and sequence of a curriculum. A curriculum framework document is like a standards statement in that it does not usually provide a lot of detailed suggestions for daily teaching. It differs from a standards statement, though, in that it analyzes each general standard in a curriculum into more specific skills that students need to learn, often a dozen or more per standard. The language or terminology of a framework statement also tends to be somewhat more concrete than a standards statement, in the sense that it is more likely to name behaviors of students—things that a teacher might see them do or hear them say. Sometimes, but not always, it may suggest ways for

assessing whether students have in fact acquired each skill listed in the document. Exhibit 1 shows a page from a curriculum framework published by the California State Board of Education (Curriculum Development and Supplemental Materials Committee, 1999). In this case, the framework explains the state standards for learning to read, and the excerpt in Exhibit 1 illustrates how one particular standard, that "students speak and write with a command of English conventions appropriate to this grade level," is broken into nine more specific skills. Note that the excerpt names observable behaviors of students (what they do or say); we will discuss this feature again, more fully, in the next part of this chapter, because it is helpful in classroom planning. In spite of this feature, though, the framework document does not lay out detailed activity plans that a teacher could use on a daily basis.

Exhibit 1: An Excerpt from Reading/Language Arts Framework for California Public Schools

Comments	Written and oral English language conventions, third grade
More general standards statement	Students write and speak with a command of standard English conventions appropriate to this grade level.

More specific or concrete framework statements → (stated as relatively specific skills or behaviors)

Sentence Structure

1.1 Understand and be able to use complete and correct declarative, interrogative, imperative, and exclamatory sentences in writing and speaking.

Grammar

1.2 Identify subjects and verbs that are in agreement and identify and use pronouns, adjectives, compound words, and articles correctly in writing and speaking.

1.3 Identify and use past, present, and future verb tenses properly in writing and speaking.

1.4 Identify and use subjects and verbs correctly in speaking and writing simple sentences.

Punctuation

1.5 Punctuate dates, city and state, and titles of books correctly.

1.6 Use commas in dates, locations, and addresses and for items in a series.

Capitalization

1.7 Capitalize geographical names, holidays, historical periods, and special events correctly.

Spelling

1.8 Spell correctly one-syllable words that have blends, contractions, compounds, orthographic patterns, and common homophones.

1.9 Arrange words in alphabetical order

Teachers' need for detailed activity suggestions is more likely to

be met by a curriculum guide, a document devoted to graphic descriptions of activities that foster or encourage the specific skills explained in a curriculum framework document. The descriptions may mention or list curriculum goals served by an activity, but they are also likely to specify materials that a teacher needs, time requirements, requirements for grouping students, drawings or diagrams of key equipment or materials, and sometimes even suggestions for what to say to students at different points during the activity. In these ways, the descriptions may resemble lesson plans. Since classroom activities often support more than one specific skill, activities in a curriculum guide may be organized differently than they might be in a framework document. Instead of highlighting only one standard at a time, as the framework document might, activities may be grouped more loosely—for example, according to the dominant purpose or goal of an activity ("Activities that encourage the practice of math facts") or according to a dominant piece of equipment or material ("Ten activities with tin cans"). Exhibit 2 shows a description of a kindergarten-level activity about "autumn leaves" that might appear in a curriculum guide. Note that the activity meets several educational objectives at once—tracing shapes, knowledge of leaves and of colors, and descriptive language skill. Each of these skills may reflect a different curriculum standard.

EXHIBIT 2: SAMPLE CURRICULUM GUIDE ACTIVITY

Curriculum guides provide graphic descriptions of activities that can be used fairly directly in the classroom. Although they are relevant to standards and framework

statements, they often are not organized around standards and objectives as such.

Activity: Autumn Leaves

Level: Kindergarten

Themes and Curriculum Connections: trees, autumn, color naming, color comparisons, size comparisons, functions of leaves, growth, the life cycle. See also Standards #xx–yy.

Best time to do it: Fall (October), or whenever leaves are available

Materials needed: (1) small paper (6 × 6 inches); (2) access to leaves; (3) white glue; (4) felt pens or colored pencils

What to do: Give one piece of the small paper to each child. Invite children to color the sheet so that the entire sheet is decorated. Invite children to choose one leaf. Place leaf under the colored (decorated) paper and trace the shape of the leaf lightly in pencil. Then invite children to cut out the colored paper in the shape that has been traced of the leaf.

Cautions: (1) Some children may need individual help with tracing or cutting. (2) Try to use leaves that are still somewhat pliable,

because some very old leaves (dried out) may crumble when traced.

Things to talk about: Are some leaves bigger than others? Do they change shape as they grow, or only their size? How do leaves benefit trees? How many different colors can real leaves be?

From Educational Goals to Classroom Accomplishments

Broad educational goals can provide direction for unit and lesson planning, communicate the importance of your instruction to administrators and parents, and energize your learners to higher levels of commitment and performance. They can also provide a practical framework around which to organize and sequence your instruction. While goals answer the question "Why am I teaching this?" they do not specify what or how you will teach on any given day. Goals give you little direction as to what strategies you might use to achieve them and do not indicate when—or even if—they are met. A satisfactory answer to these questions requires the preparation of lesson objectives.

Objectives: Giving Goals a Direction

As we have seen, identifying educational goals is the first step in unit and lesson planning. In the course of your teaching, you will be responsible for preparing and managing extended sequences of instruction, called units or modules, and day-by-day activities, called lessons. Units comprise interrelated sequences of lessons, which may cover one, two, or more weeks of instruction. Lessons represent the content for a single class day.

Content outlines are useful for identifying topics to be covered in a unit or lesson. However, they typically do not provide information about the more
fundamental issue of what your students must do with what they have learned. In other words, will you expect your students to recall important facts, such as definitions of weathering and erosion? Or will you expect your students to master such concepts as fault, plate tectonics, and continental drift? Or is the purpose of your unit to teach students to acquire important generalizations concerning the relationship between plate tectonics, faults,
and earthquakes and use these generalizations to problem solve?

Deciding what you want your students to accomplish during a lesson or unit of instruction requires answering the following questions:

- What knowledge or content (facts, concepts, principles, rules) is essential for learner understanding of the subject matter?
- What intellectual skills are necessary for the learner to use this knowledge or content?
- What habits of mind or attitudes are important for learners to perform successfully with this knowledge or content?

In the next section, we will explore a method for making decisions about curriculum, goals, and objectives.

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Understanding by Design

Understanding by design offers a framework for designing courses and content units called "Backward Design." Instructors typically approach course design in a "forward design" manner, meaning they consider the learning activities (how to teach the content), develop assessments around their learning activities, then attempt to draw connections to the learning goals of the course. In contrast, the backward design approach has instructors consider the learning goals of the course first. These learning goals embody the knowledge and skills instructors want their students to have learned when they leave the course. Once the learning goals have been established, the second stage involves consideration of assessment. The backward design framework suggests that instructors should consider these overarching learning goals and how students will be assessed prior to consideration of how to teach the content. For this reason, backward design is considered a much more intentional approach to course design than traditional methods of design.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=118#oembed-1

Video 8.3.1. *Understanding by Design* explained by creator Grant Wiggins. This is the first of 2 videos of this lecture. The second video follows the end of this one.

This teaching guide will explain the benefits of incorporating backward design. Then it will elaborate on the three stages that backward design encompasses. Finally, an overview of a backward

design template is provided with links to blank template pages for convenience.

The Benefits of Using Backward Design

> *Our lessons, units, and courses should be logically inferred from the results sought, not derived from the methods, books, and activities with which we are most comfortable. Curriculum should lay out the most effective ways of achieving specific results… in short, the best designs derive backward from the learnings sought* (Wiggins & McTighe, 1998).

In *Understanding by Design*, Wiggins and McTighe argue that backward design is focused primarily on student learning and understanding. When teachers are designing lessons, units, or courses, they often focus on the activities and instruction rather than the outputs of the instruction. Therefore, it can be stated that teachers often focus more on teaching rather than learning. This perspective can lead to the misconception that learning is the activity when, in fact, learning is derived from a careful consideration of the meaning of the activity.

As previously stated, backward design is beneficial to instructors because it innately encourages intentionality during the design process. It continually encourages the instructor to establish the purpose of doing something before implementing it into the curriculum. Therefore, backward design is an effective way of providing guidance for instruction and designing lessons, units, and courses. Once the learning goals, or desired results, have been identified, instructors will have an easier time developing assessments and instruction around grounded learning outcomes.

The incorporation of backward design also lends itself to transparent and explicit instruction. If the teacher has explicitly

defined the learning goals of the course, then they have a better idea of what they want the students to get out of learning activities. Furthermore, if done thoroughly, it eliminates the possibility of doing certain activities and tasks for the sake of doing them. Every task and piece of instruction has a purpose that fits in with the overarching goals and goals of the course.

As the quote below highlights, teaching is not just about engaging students in the content. It is also about ensuring students have the resources necessary to understand. Student learning and understanding can be gauged more accurately through a backward design approach since it leverages what students will need to know and understand during the design process in order to progress.

"*In teaching students for understanding, we must grasp the key idea that we are coaches of their ability to play the 'game' of performing with understanding, not tellers of our understanding to them on the sidelines.*"

The Three Stages of Backward Design

"*Deliberate and focused instructional design requires us as teachers and curriculum writers to make an important shift in our thinking about the nature of our job. The shift involves thinking a great deal, first, about the specific learnings sought, and the evidence of such learnings, before thinking about what we, as the teacher, will do or provide in teaching and learning activities.*"

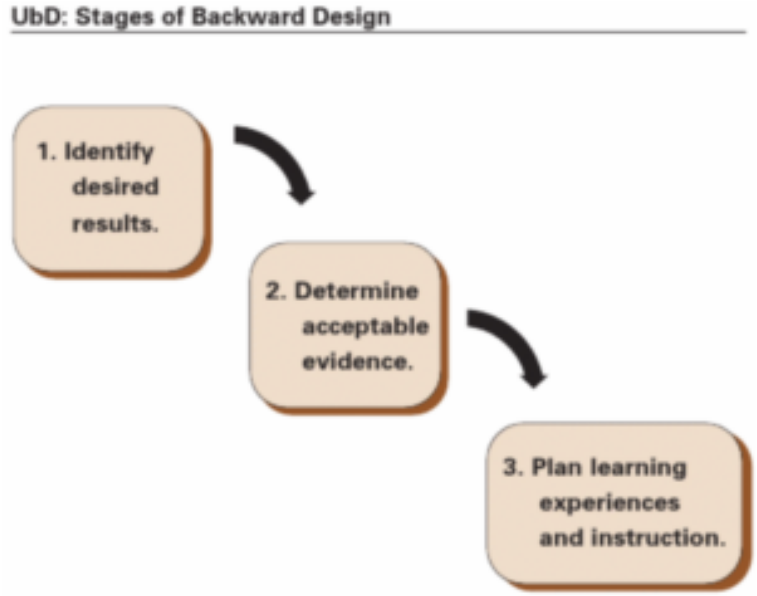

Figure 8.3.1. Stages of backward design.

Stage One: Identify Desired Results

In the first stage, the instructor must consider the learning goals of the lesson, unit, or course. Wiggins and McTighe provide a useful process for establishing curricular priorities. They suggest that the instructor ask themselves the following three questions as they progressively focus on the most valuable content:

What should participants hear, read, view, explore or otherwise encounter?

This knowledge is considered knowledge worth being familiar with. Information that fits within this question is the lowest priority

content information that will be mentioned in the lesson, unit, or course.

What knowledge and skills should participants master?

The knowledge and skills at this substage are considered important to know and do. The information that fits within this question could be the facts, concepts, principles, processes, strategies, and methods students should know when they leave the course.

What are big ideas and important understandings participants should retain?

The big ideas and important understandings are referred to as enduring understandings because these are the ideas that instructors want students to remember sometime after they've completed the course.

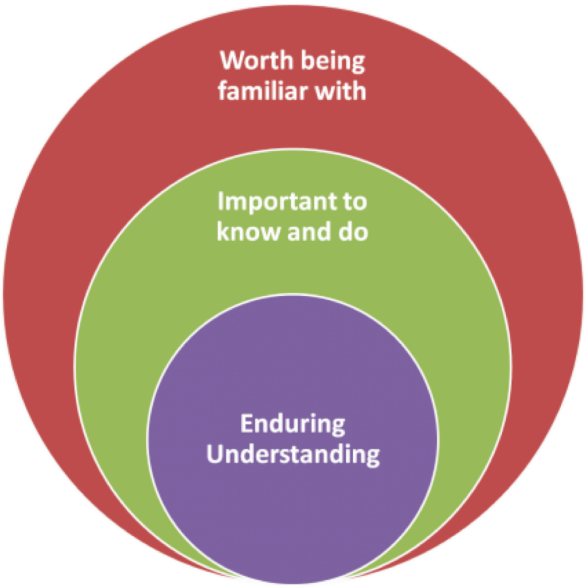

Figure 8.3.2. Curriculum priorities to consider when planning goals.

The figure above illustrates the three ideas. The first question

listed above has instructors consider the knowledge that is worth being familiar with which is the largest circle, meaning it entails the most information. The second question above allows the instructor to focus on more important knowledge, the knowledge, and skills that are important to know and do. Finally, with the third question, instructors begin to detail the enduring understandings, overarching learning goals, and big ideas that students should retain. By answering the three questions presented at this stage, instructors will be able to determine the best content for the course. Furthermore, the answers to question #3 regarding enduring understandings can be adapted to form concrete, specific learning goals for the students; thus, identifying the desired results that instructors want their students to achieve.

Stage Two: Determine Acceptable Evidence

The second stage of backward design has instructors consider the assessments and performance tasks students will complete in order to demonstrate evidence of understanding and learning. In the previous stage, the instructor pinpointed the learning goals of the course. Therefore, they will have a clearer vision of what evidence students can provide to show they have achieved or have started to attain the goals of the course. Consider the following two questions at this stage:

1. How will I know if students have achieved the desired results?
2. What will I accept as evidence of student understanding and proficiency?

At this stage, it is important to consider a wide range of assessment methods in order to ensure that students are being assessed over the goals the instructor wants students to attain. Sometimes, the assessments do not match the learning goals, and it becomes a

frustrating experience for students and instructors. Use the list below to help brainstorm assessment methods for the learning goals of the course.

- Term papers.
- Short-answer quizzes.
- Free-response questions.
- Homework assignments.
- Lab projects.
- Practice problems.
- Group projects.
- Among many others…

Stage Three: Plan Learning Experiences and Instruction

The final stage of backward design is when instructors begin to consider how they will teach. This is when instructional strategies and learning activities should be created. With the learning goals and assessment methods established, the instructor will have a clearer vision of which strategies would work best to provide students with the resources and information necessary to attain the goals of the course. Consider the questions below:

1. What enabling knowledge (facts, concepts, principles) and skills (processes, procedures, strategies) will students need in order to perform effectively and achieve desired results?
2. What activities will equip students with the needed knowledge and skills?
3. What will need to be taught and coached, and how should it best be taught, in light of performance goals?
4. What materials and resources are best suited to accomplish these goals?

Leverage the various instructional strategies listed below:

- Large and/or group discussion
- Interactive lecturing and think-pair-shares
- Flipped classroom
- Cooperative learning (including team-based and project-based learning)
- Guided note-taking
- Guided inquiry for problem-solving

The Backward Design Template

A link to the blank backward design template is provided here (https://jaymctighe.com/resources/), and it is referred to as UbD Template 2.0. The template walks individuals through the stages of backward design. However, if you need the template with descriptions of each section, see the figure below. There is also a link to the document containing the template with descriptions provided below which can be downloaded for free.

<table>
<tr><th colspan="3">Stage 1 – Desired Results</th></tr>
<tr><td rowspan="5">ESTABLISHED GOALS

The enduring understandings and learning goals of the lesson, unit, or course.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…

Refers to how students will transfer the knowledge gained from the lesson, unit, or course and apply it outside of the context of the course.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Students will understand that…

Refers to the big ideas and specific understandings students will have when the complete the lesson, unit, or course.</td><td>ESSENTIAL QUESTIONS

Refers to the provocative questions that foster inquiry, understanding, and transfer of learning. These questions typically frame the lesson, unit, or course and are often revisited. If students attain the established goals, they should be able to answer the essential question(s).</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…

Refers to the key knowledge students will acquire from the lesson, unit, or course.</td><td>Students will be skilled at…

Refers to the key skills students will acquire from the lesson, unit, or course.</td></tr>
<tr><th colspan="3">Stage 2 – Evidence and Assessment</th></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td rowspan="2">Refers to the various types of criteria that students will be evaluated on.</td><td colspan="2">PERFORMANCE TASK(S):

Refers to the authentic performance task(s) that students will complete to demonstrate the desired understandings or demonstrate they have attained the goals. The performance task(s) are typically larger assessments that coalesce various concepts and understandings like large projects or papers.</td></tr>
<tr><td colspan="2">OTHER EVIDENCE:

Refers to other types of evidence that will show if students have demonstrated achievement of the desired results. This includes quizzes, tests, homework, etc. This is also a good point to consider incorporating self-assessments and student reflections.</td></tr>
<tr><th colspan="3">Stage 3 – Learning Plan</th></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instruction

This stage encompasses the individual learning activities and instructional strategies that will be employed. This includes lectures, discussions, problem-solving sessions, etc.</td></tr>
</table>

Figure 8.3.3. [Backward design template with descriptions].

What is Backward Design?

[Chapter 1: What is Backward Design?] in Understanding by Design by Grant Wiggins and Jay McTighe provides more details about how the backward design process.

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Learning Objectives

Given curriculum frameworks and guides, how do you choose and formulate actual learning objectives? Basically, there are two approaches: either start by selecting content or topics that you want students to know (the cognitive approach) or start with what you want students to do (the behavioral approach). In effect, the cognitive approach moves from the general to the specific, and the behavioral approach does the opposite. Each approach has advocated, as well as inherent strengths and problems. In practice, teachers often combine or alternate between them in order to give students some of the advantages of each.

From General to Specific: Selecting Content Topics

The cognitive approach assumes that teachers normally have a number of long-term, general goals for students, and it begins with those goals. It also assumes that each student work toward long-term, general goals along different pathways and using different styles of learning. Because of these assumptions, it is necessary to name indicators, which are examples of specific behaviors by which students might show success at reaching a general learning goal. But it is neither desirable nor possible for a list of indicators to be complete—only for it to be representative (Gronlund, 2004). Consider this example from teaching middle-school biology. For this subject you might have a general goal like the following, with accompanying indicators:

Example: Goals to Indicators

Goal: *The student will understand the nature and purpose of photosynthesis.*

Indicators:

1. explains the purpose of photosynthesis and steps in the process
2. diagrams steps in the chemical process
3. describes how plant photosynthesis affects the animal world
4. writes a plan for how to test leaves for the presence of photosynthesis
5. makes an oral presentation and explains how the experiment was conducted

Using a strictly cognitive approach to planning, therefore, a teacher's job has two parts. First, she must identify, find, or choose a manageable number of general goals—perhaps just a half dozen or so. (Sometimes these can be taken or adapted from a curriculum framework document such as discussed earlier.) Then the teacher must think of a handful of specific examples or behavioral indicators for each goal—just a half dozen or so of these as well. The behavioral indicators clarify the meaning of the general goal but are not meant to be the only way that students might show success at learning. Then, at last, thoughtful planning for individual lessons or activities can begin. This approach works especially well for learning goals that are relatively long-term—goals that take many lessons, days, or weeks to reach. During such long periods of teaching, it is impossible to specify the exact, detailed behaviors that every student can or should display to prove that he or she has reached

a general goal. It is possible, however, to specify general directions toward which all students should focus their learning and explain the nature of the goals with a sample of well-chosen indicators or examples (Popham, 2002).

The cognitive, general-to-specific approach is reasonable on the face of it, and in fact, probably describes how many teachers think about their instructional planning. But critics have argued that indicators used as examples may not in fact clarify the general goal enough; students, therefore, end up unexpectedly—as Casey Stengel said at the start of this chapter—"someplace else." Given the general goal of understanding photosynthesis described above, for example, how are we to know whether the five indicators that are listed really allow a teacher to grasp the full meaning of the goal? Put differently, how *else* might a student show understanding of photosynthesis, and how is a teacher to know that a student's achievement is s a legitimate display of understanding? To some educators, grasping the meaning of goals from indicators is not as obvious as it should be, and in any case, is prone to misunderstanding. The solution, they say, is not to start planning with general goals, but with specific behaviors that identify students' success.

From Specific to General: Behavioral Objectives

Compared to the cognitive approach, the behavioral approach to instructional planning reverses the steps in planning. Instead of starting with general goal statements accompanied by indicator examples, it starts with the identification of specific behaviors—concrete actions or words—that students should perform or display as a result of instruction (Mager, 2005). Collectively, the specific behaviors may describe a more general educational goal, but unlike the indicators used in the cognitive approach, they are not a mere sampling of the possible specific

outcomes. Instead, they represent all the intended specific outcomes. Consider this sampling of behavioral objectives:

Example: Objectives to Steps

Objectives: Learning to use in-line roller blade skates (beginning level)

1. Student ties boots on correctly.
2. Student puts on safety gear correctly, including helmet, knee and elbow pads.
3. Student skates 15 meters on level ground without falling.
4. Student stops on demand within a three-meter distance, without falling.

The objectives listed are not merely a representative sample of how students can demonstrate success with roller-blading. Instead, they are behaviors that every student should acquire in order to meet the goal of using roller blades as a beginner. There simply are no other ways to display learning of this goal; getting 100 percent on a written test about rollerblading, for example, would not qualify as success with this goal, though it might show success at some other goal, such as verbal knowledge about rollerblading. Even adding other skating behaviors (like "Student skates backward" or "Student skates in circles") might not qualify as success with this particular goal, because it could reasonably be argued that the additional skating behaviors are about skating at an advanced level, not a beginning level.

In the most commonly used version of this approach, originated by Robert Mager (1962, 2005), a good behavioral objective should have three features. First, it should specify a behavior that can

in fact be observed. In practice, this usually means identifying something that a student does or says, not something a student thinks or feels. Compare the following examples; the one on the left names a behavior to be performed, but the one on the right names a thinking process that cannot, in principle, be seen:

Behavioral Objective	**Not Behavioral Object**
The student will make a list of animal species that live in the water but breathe air and a separate list of species that live in the water but do not require air to breathe.	The student will understand the difference between fish and mammals that live in the water.

The second feature of a good behavioral objective is that it describes the conditions of performance of the behavior. What are the special circumstances to be provided when the student performs the objective? Consider these two examples:

Special Condition of Performance *is* Specified	**A Special Condition of Performance is Not Specified**
Given a list of 50 species, the student will circle those that live in water but breathe air and underline those that live in water but do not breathe air.	After three days of instruction, the student will identify species that live in water but breathe air, as well as species that live in water but do not breathe air.

The objective on the left names a special condition of performance—that the student will be given a particular kind of list to work from—which is not part of the instruction itself. The objective on the right appears to name a condition—"three days of instruction." But the condition really describes what the teacher will do (she will instruct), not something specific to students' performance.

The third feature of a good behavioral objective is that it specifies a minimum level or degree of acceptable performance. Consider these two examples:

Specifies Minimum Level	Does Not Specify Minimum Level
Given a list of 50 species, the student will circle all of those that live in water but breathe air and underline all of those that live in water but do not breathe air. The student will do so within fifteen minutes.	The student will circle names of species that live in water but breathe air and underline those that live in water but do not breathe air.

The objective on the left specifies a level of performance—100 percent accuracy within 15 minutes. The objective on the right leaves this information out (and incidentally it also omits the condition of performance mentioned on the left).

Behavioral objectives have obvious advantages because of their clarity and precision. They seem especially well suited for learning that by their nature they can be spelled out explicitly and fully, such as when a student is learning to drive a car, to use safety equipment in a science laboratory, or install and run a particular computer program. Most of these goals, as it happens, also tend to have relatively short learning cycles, meaning that they can be learned as a result of just one lesson or activity, or of just a short series of them at most. Such goals tend not to include the larger, more abstract goals of education. In practice, both kinds of goals—the general and the specific—form a large part of education at all grade levels.

Finding the Best in Both Approaches

When it comes to teaching and learning the large or major goals, then, behavioral objectives can seem unwieldy. How, a teacher might ask, can you spell out *all* of the behaviors involved in a general goal like *becoming a good citizen*? How could you name in advance the numerous conditions under which good citizenship might be displayed, or the minimum acceptable level of good citizenship expected in each condition? Specifying these features seems

impractical at best, and at times even undesirable ethically or philosophically. (Would we really want any students to become "minimum citizens"?) Because of these considerations, many teachers find it sensible to compromise between the cognitive and behavioral approaches. Here are some features that are often part of a compromise:

- When planning, think about BOTH long-term, general goals AND short-term, immediate objectives. A thorough, balanced look at most school curricula shows that they are concerned with the general as well as the specific. In teaching elementary math, for example, you may want students to learn general problem-solving strategies (a general goal), but you may also want them to learn specific math facts (a specific objective). In teaching Shakespeare's plays in high school, you may want students to be able to compare the plays critically (a general goal), but doing so may require that they learn details about the characters and plots of the major plays (a specific objective). Since general goals usually take longer to reach than specific objectives, instructional planning has to include both time frames.
- Plan for what students do, not what the teacher does. This idea may seem obvious, but it is easy to overlook it when devising lesson plans. Consider that example again about teaching Shakespeare. If you want students to learn the details about Shakespeare's plays, it is tempting to plan objectives like "Summarize the plot of each play to students," or "Write and hand out to students an outline of the plays." Unfortunately, these objectives describe only what the teacher does, and makes the assumption (often unwarranted) that students will remember what the teacher says or puts in writing for them. A better version of the same objective should focus on the actions of students, not of teachers—for example, "Students will write a summary, from memory, of each of the major plays of Shakespeare." This version focuses on what students do

instead of what the teacher does. (Of course, you may still have to devise activities that help students to reach the objective, such as providing guided practice in writing summaries of plays.)

- To ensure diversity of goals and objectives when planning, consider organizing goals and objectives by using a systematic classification scheme of educational objectives. At the beginning of this section, we stated that there is a need, when devising goals and objectives, for both the specific and the general. Actually, a more accurate statement is that there is a need for goals and objectives that refer to a variety of cognitive processes and that have varying degrees of specificity or generality. One widely used classification scheme that does so, for example, is one proposed 50 years ago by Benjamin Bloom (1956) and revised recently by his associates (Anderson & Krathwohl, 2001). We describe this system, called a taxonomy of objectives, in the next section.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=119#oembed-1

Video 8.4.1. *4Ms* tells us that a great lesson objective should be manageable, measurable, made first, and most important on the path to mastery.

Taxonomies of Educational Objectives

When educators have proposed taxonomies of educational

objectives, they have tended to focus on one of three areas or domains of psychological functioning: either students' cognition (thought), students' feelings and emotions (affect), or students' physical skills (psychomotor abilities). Of these three areas, they have tended to focus the most attention on cognition. The taxonomy originated by Benjamin Bloom, for example, deals entirely with cognitive outcomes of instruction.

Bloom's Taxonomy

In its original form, **Bloom's Taxonomy** of educational objectives referred to forms of cognition or thinking, which we discussed in a previous chapter. To reiterate, the table below summarizes the levels and offers two kinds of examples—simple ones based on the children's story Goldilocks *and the Three Bears*, and complex ones more typical of goals and objectives used in classrooms. The levels form a loose hierarchy from simple to complex thinking, at least when applied to some subjects and topics. When planning for these subjects it can, therefore, be helpful not only for ensuring diversity among learning objectives but also for sequencing materials. In learning about geography, for example, it may sometimes make sense, to begin with, information about specific places or societies (knowledge and comprehension), and work gradually toward comparisons and assessments among the places or societies (analysis and synthesis).

Table 8.4.1. Bloom's taxonomy of objectives: cognitive domain

Type or level of learning	Simple example	Classroom example
Knowledge: recall of information, whether it is simple or complex in nature	"Name three things that Goldilocks did in the house of the three bears."	"List all of the planets of the solar system.""State five key features of life in the middle ages."
Comprehension: grasping the meaning of information, by interpreting it or translating it from one form to another	"Explain why Goldilocks preferred the little bear's chair."	"Convert the following arithmetic word problem to a mathematical equation.""Describe how plants contribute to the welfare of animal life."
Application: using information in new, concrete situations	"Predict some of the things Goldilocks might have used if she had entered your house."	"Illustrate how positive reinforcement might affect the behavior of a pet dog.""Use examples from the plot to illustrate the theme of novel."
Analysis: breaking information into its components to understand its structure	"Select the part of Goldilocks and the Three Bears where you think Goldilocks felt most comfortable."	"Compare the behavior of domestic dogs with the behavior of wolves.""Diagram the effects of weather patterns on plant metabolism."
Synthesis: putting parts of information together into a coherent whole	"Tell how the story would have been different if it had been three fishes."	"Design an experiment to test the effects of gravity on root growth.""Write an account of how humans would be different if life had originated on Mars instead of Earth."
Evaluation: judging the value of information for a particular purpose	"Justify this statement: Goldilocks was a bad girl."	"Appraise the relevance of the novel for modern life.""Assess the value of information processing theory for planning instruction."

Such a sequence does *not* work well, however, for all possible topics or subjects. To learn certain topics in mathematics, for example, students may sometimes need to start with general ideas (like

"What does it mean to multiply?") than with specific facts (like "How much is 4 × 6?") (Egan, 2005). At other times, though, the reverse sequence may be preferable. Whatever the case, a taxonomy of cognitive objectives, like Bloom's, can help to remind teachers to set a variety of objectives and to avoid relying excessively on just one level, such as the simple recall of factual knowledge (Notar, et al., 2004).

Bloom's Taxonomy Revised

A few years ago two of Benjamin Bloom's original colleagues, Linda Anderson and David Krathwohl, revised his taxonomy so as to clarify its terms and make it more complete (Anderson & Krathwohl, 2001; Marzano, 2006). The resulting categories are summarized and compared to the original categories in Table 1. As the chart shows, several categories of objectives have been renamed and a second dimension added that describes the kind of thinking or cognitive processing that may occur. The result is a much richer taxonomy than before since every level of the objectives can now take four different forms. *Remembering*, for example, can refer to four different kinds of memory: memory for facts, for concepts, for procedures, or for metacognitive knowledge. The tables below give examples of each of these kinds of memory.

Table 8.4.2. Bloom's taxonomy of cognitive objectives—revised

Original term from Bloom's Taxonomy (1956)	Revised term emphasizing cognitive processing (2001)
Knowledge	Remembering
Comprehension	Understanding
Application	Applying
Analysis	Analyzing
Evaluation	Evaluating
Synthesis	Creating

Table 8.4.3. New additions to Bloom's taxonomy

New Dimension: Types of Knowledge Learned (2001)	Example of Cognitive Process Remembering Combined with Possible Types of Knowledge
factual knowledge	**Memory for facts:** recalling the names of each part of a living cell
conceptual knowledge	**Memory for concepts:** recalling the functions of each part of a living cell
procedural knowledge	**Memory for procedures:** recalling how to view a cell under a microscope
metacognitive knowledge	**Memory for metacognition:** recalling not the names of the parts, but a *technique* for remembering the names of the parts of a living cell

The revision to Bloom's Taxonomy distinguishes between cognitive processes (left-hand column in table 2) and types of knowledge learned (right-hand column in table 3). The original version has terms similar to the cognitive processing terms in the revised version. According to the revised version, any type of knowledge (from the right-hand column in table 3) can, in principle, occur with any type of cognitive processing (left-hand column in table 2).

Taxonomies of Affective and Psychomotor Objectives

Although taxonomies related to affect, or the feelings and emotions of students, are used less commonly than cognitive taxonomies for planning instruction, various educators have constructed them. One of the most widely known was also published by colleagues of Benjamin Bloom and classifies effect according to how committed a student feels toward what he is learning (Krathwohl, Bloom, & Masia, 1964/1999). Table 8.4.4 summarizes the categories and gives brief examples. The lowest level, called *receiving*, simply involves a willingness to experience new knowledge or activities. Higher levels involve embracing or adopting experiences in ways that are increasingly organized and that represent increasingly stable forms of commitment.

Table 8.4.4. Taxonomies of objectives: affective domain and psychomotor domain

Affective Domain	Psychomotor Domain
Receiving: Willingness to attend to particular experience	**Imitation:** repeating a simple action that has been demonstrated
Responding: willingness to participate actively in an experience	**Manipulation:** practice of an action that has been imitated but only learned partially
Valuing: perception of experience as worthwhile	**Precision:** quick, smooth execution of an action that has been practiced
Organization: coordination of valued experiences into partially coherent wholes	**Articulation:** execution of an action not only with precision, but also with modifications appropriate to new circumstances
Characterization by a value complex: coordination of valued experiences and of organized sets of experiences into a single comprehensive value hierarchy	**Naturalization:** incorporation of an action into the motor repertoire, along with experimentation with new motor actions

Taxonomies related to abilities and skills that are physical, or psychomotor, have also been used less widely than affective

taxonomies, with the notable exception of one area of teaching where they are obviously relevant: physical education. As you might expect, taxonomic categories of motor skills extend from simple, brief actions to complex, extended action sequences that combine simpler, previously learned skills smoothly and automatically (Harrow, 1972; Simpson, 1972). One such classification scheme is shown in Table 4. An example of a very basic psychomotor skill might be imitating the action of throwing a ball when modeled by someone else; an example of the latter might be performing a 10-minute gymnastics routine that the student has devised for himself or herself. Note, though, that many examples of psychomotor skills also exist outside the realm of physical education. In a science course, for example, a student might need to learn to operate laboratory equipment that requires using delicate, fine movements. In art classes, students might learn to draw, and in music they might learn to play an instrument (both are partly motor skills). Most first graders are challenged by the motor skills of learning to write. For students with certain physical disabilities, furthermore, motor skill development is an important priority for the student's entire education.

The Learning Objectives Builder

This Learning Objectives Builder can assist teachers with composing learning objectives according to Bloom's taxonomy.

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- Teach Like a Champion Technique 7--4Ms. **Provided by**: Kaizen Teaching. **Retrieved from**: https://youtu.be/2dP5lGmO8UU. **License**: *All Rights Reserved*

Differentiated Instruction

So far in this discussion, we have ignored the obvious variety among students. Yet their diversity is a reality that every teacher recognizes. Whatever goals and plans we make, some students learn the material sooner or better than others. For any given goal or objective, some students need more time than others in order to learn. And any particular teaching strategy will prove more effective with some students than others. Effective teaching requires **differentiated instruction**—providing different materials, arrangements, and strategies to different students. The differentiation can include unique structural arrangements in the school, such as special tutoring for individuals or special classes for small groups needing particular extra help. Differentiation can also include extra attention or coaching within a classroom for individual students or small groups (Tomlinson, 2006; Goddard, Goddard, & Tschannen-Moran, 2007).

One or more interactive elements has been excluded from this version of the text. You can view them online here:

https://edpsych.pressbooks.sunycreate.cloud/?p=120#oembed-1

Video 8.5.1. *Differentiating Instruction: It's Not as Hard as You Think* provides an introduction to differentiation in instruction.

Differentiation is commonly used in "heterogeneous grouping"—an educational strategy in which students of different abilities, learning needs, and levels of academic achievement are grouped together. In heterogeneously grouped classrooms, for example, teachers vary instructional strategies and use more flexibly designed lessons to engage student interests and address

distinct learning needs—all of which may vary from student to student. The basic idea is that the primary educational objectives—making sure all students master essential knowledge, concepts, and skills—remain the same for every student, but teachers may use different instructional methods to help students meet those expectations.

Teachers who employ differentiated instructional strategies will usually adjust the elements of a lesson from one group of students to another so that those who may need more time or a different teaching approach to grasp a concept get the specialized assistance they need, while those students who have already mastered a concept can be assigned a different learning activity or move on to a new concept or lesson.

In more diverse classrooms, teachers will tailor lessons to address the unique needs of special-education students, high-achieving students, and English-language learners, for example. Teachers also use strategies such as **formative assessment**—periodic, in-process evaluations of what students are learning or not learning—to determine the best instructional approaches or modifications needed for each student.

Differentiation techniques may also be based on specific student attributes, including ***interest*** (what subjects inspire students to learn), ***readiness*** (what students have learned and still need to learn), or ***learning style*** (the ways in which students tend to learn the material best)

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=120#oembed-2

Video 8.5.2. *Differentiating Instruction: How to Plan Your*

Lessons provides suggestions for including differentiation in lesson planning.

The Debate on Equity

Differentiation plays into ongoing debates about equity and "academic tracking" in public schools. One major criticism of the approach is related to the relative complexities and difficulties entailed in teaching diverse types of students in a single classroom or educational setting. Since effective differentiation requires more sophisticated and highly specialized instructional methods, teachers typically need adequate training, mentoring, and professional development to ensure they are using differentiated instructional techniques appropriately and effectively.

Some teachers also argue that the practical realities of using differentiation—especially in larger classes comprising students with a wide range of skill levels, academic preparation, and learning needs—can be prohibitively difficult or even infeasible. Yet other educators argue that this criticism stems, at least in part, from a fundamental misunderstanding of the strategy. In her book *How to Differentiate Instruction in Mixed-Ability Classrooms*, the educator and writer Carol Ann Tomlinson, who is considered an authority on differentiation, points out a potential source of confusion, "Differentiated instruction is not the 'Individualized Instruction' of the 1970s."

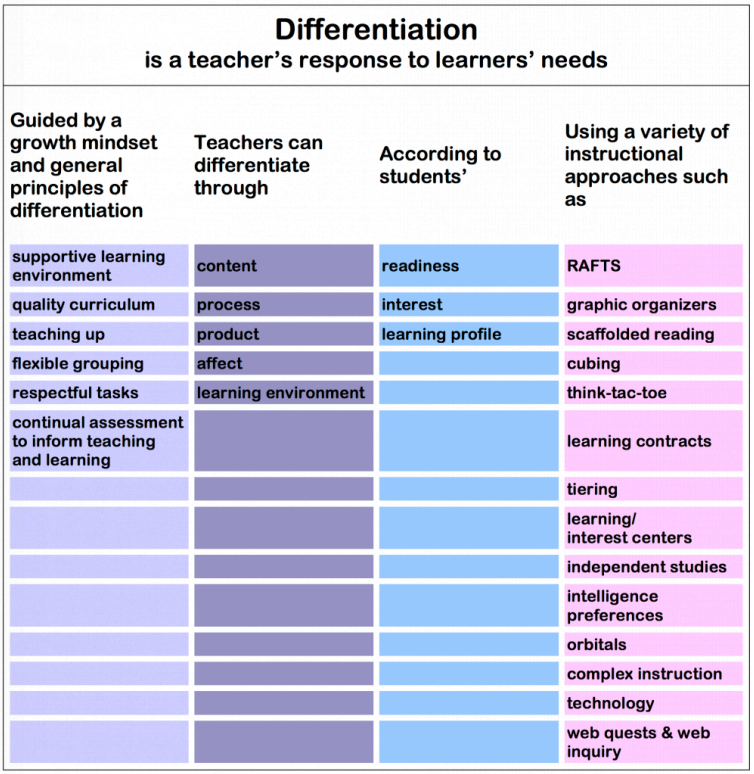
In other words, differentiation is the practice of varying instructional techniques in a classroom to effectively teach as many students as possible, but it does not entail the creation of distinct courses of study for every student (i.e., individualized instruction). The conflation of "differentiated instruction" and "individualized instruction" has likely contributed to ongoing confusion and debates about

differentiation, particularly given that the terms are widely and frequently used interchangeably (Myths and Misconceptions, n.d).

Differentiated Instruction and Implication for Universal Design for Learning

To differentiate instruction is to recognize students' varying background knowledge, readiness, language, preferences in learning, and interests; and to react responsively. As Tomlinson notes in her recent book *Differentiated Classroom: Responding to the Needs of All Learners* (2014), teachers in a differentiated classroom begin with their current curriculum and engaging instruction. Then they ask, what will it take to *alter or modify* the curriculum and instruction so that each learner comes away with the knowledge, understanding, and skills necessary to take on the next important phase of learning. Differentiated instruction is a process of teaching and learning for students of differing abilities in the same class. Teachers, based on characteristics of their learners' readiness, interest, and learning profile, may adapt or manipulate various elements of the curriculum (content, process, product, affect/environment). These are illustrated in the table below which presents the general principles of differentiation by showing the key elements of the concept and the relationships among those elements.

Table 8.5.1. Principles of differentiation by key elements



Adapted with permission from Carol Tomlinson: Differentiation Central ***Institutes on Academic Diversity*** *in the* ***Curry School of Education*** *at the* ***University of Virginia*** *(September 2014).*

Identifying Components/Features

While Tomlinson and most recognize there is no magic or recipe for making a classroom differentiated, they have identified guiding principles, considered the "Pillars that Support Effective

Differentiation": Philosophy, Principles, and Practices. The premise of each is as follows:

The *Philosophy* of differentiation is based on the following tenets:

- recognizing diversity is normal and valuable,
- understanding every student has the capacity to learn,
- taking responsibility to guide and structure student success,
- championing every student entering the learning environment and assuring equity of access

The *Principles* identified that shape differentiation include

- creating an environment conducive to learning
- identifying a quality foundational curriculum
- informing teaching and learning with assessments
- designing instruction based on assessments collected
- creating and maintaining a flexible classroom

Teacher *Practices* are also essential to differentiation, highlighted as

- *proactive planning* to address student profiles
- *modifying instructional approaches* to meet student needs
- *teaching up* (students should be working just above their individual comfort levels)
- *assigning respectful tasks* responsive to student needs—challenging, engaging, purposeful
- *applying flexible grouping* strategies (e.g., stations, interest groups, orbital studies)

Content

- *Several elements and materials are used to support instructional content.* These include acts, concepts, generalizations or principles, attitudes, and skills. The variation seen in a

differentiated classroom is most frequently in the manner in which students gain access to important learning. Access to content is seen as key.

- *Align tasks and objectives to learning goals.* Designers of differentiated instruction view the alignment of tasks with instructional goals and objectives as essential. Goals are most frequently assessed by many state-level, high-stakes tests and frequently administered standardized measures. Objectives are frequently written in incremental steps resulting in a continuum of skills-building tasks. An objectives-driven menu makes it easier to find the next instructional step for learners entering at varying levels.
- *Instruction is concept-focused and principle-driven.* Instructional concepts should be broad-based, not focused on minute details or unlimited facts. Teachers must focus on the concepts, principles, and skills that students should learn. The content of instruction should address the same concepts with all students, but the degree of complexity should be adjusted to suit diverse learners.
- *Clarify key concepts and generalizations.* Ensure that all learners gain powerful understandings that can serve as the foundation for future learning. Teachers are encouraged to identify essential concepts and instructional foci to ensure that all learners comprehend.

Process

- *Flexible grouping is consistently used.* Strategies for flexible grouping are essential. Learners are expected to interact and work together as they develop knowledge of new content. Teachers may conduct whole-class introductory discussions of content big ideas followed by small group or paired work. Student groups may be coached from within or by the teacher

to support the completion of assigned tasks. Grouping of students is not fixed. As one of the foundations of differentiated instruction, grouping and regrouping must be a dynamic process, changing with the content, project, and ongoing evaluations.

- *Classroom management benefits students and teachers.* To effectively operate a classroom using differentiated instruction, teachers must carefully select organization and instructional delivery strategies. In her text, How to Differentiate Instruction in Mixed-Ability Classrooms (2001), Carol Tomlinson identifies 17 key strategies for teachers to successfully meet the challenge of designing and managing differentiated instruction.
- *Emphasize critical and creative thinking as a goal in lesson design.* The tasks, activities, and procedures for students should require that they understand and apply meaning. Instruction may require support, additional motivation; and varied tasks, materials, or equipment for different students in the classroom.

Products

- *Initial and ongoing assessment of student readiness and growth are essential.* Meaningful pre-assessment naturally leads to functional and successful differentiation. Incorporating pre- and ongoing assessment informs teachers so that they can better provide a menu of approaches, choices, and scaffolds for the varying needs, interests, and abilities that exist in classrooms of diverse students. Assessments may be formal or informal, including interviews, surveys, performance assessments, and more formal evaluation procedures.
- *Use assessment as a teaching tool to extend rather than merely measure instruction.* Assessment should occur before, during,

and following the instructional episode; and it should be used to help pose questions regarding student needs and optimal learning.

- *Students are active and responsible explorers.* Teachers respect that each task put before the learner will be interesting, engaging, and accessible to essential understanding and skills. Each child should feel challenged most of the time.
- *Vary expectations and requirements for student responses.* Items to which students respond may be differentiated so that different students are able to demonstrate or express their knowledge and understanding in a variety of ways. A well-designed student product allows varied means of expression and alternative procedures and offers varying degrees of difficulty, types of evaluation, and scoring.

Affect/Environment

- *Developing a learning environment.* Establish classroom conditions that set the tone and expectations for learning. Provide tasks that are challenging, interesting, and worthwhile to students.
- *Engaging all learners is essential.* Teachers are encouraged to strive for the development of lessons that are engaging and motivating for a diverse class of students. Vary tasks within instruction as well as across students. In other words, an entire session for students should not consist of all lecture, discussion, practice, or any single structure or activity.
- *Provide a balance between teacher-assigned and student-selected tasks.* A balanced working structure is optimal in a differentiated classroom. Based on pre-assessment information, the balance will vary from class to class as well as lesson to lesson. Teachers should ensure that students have choices in their learning.

The following instructional approach to teaching mathematics patterns has several UDL features (see Table 8.5.2). Through the use of clearly stated goals and the implementation of flexible working groups with varying levels of challenge, this lesson helps to **break down instructional barriers**. We have identified additional ways to **reduce barriers** in this lesson even further by employing the principles of UDL teaching methods and differentiated instruction. We provide recommendations for employing teaching methods of UDL to support this lesson in Table 8.5.3. Note that we are not making generalized recommendations for making this lesson more UDL, but instead are focusing on ways that differentiated instruction, specifically, can help achieve this goal.

Table 8.5.2. UDL elements in a differentiated instruction mathematics lesson

UDL Guideline/ Checkpoint	Differentiated Instruction Features
Provide multiple examples.	The teacher provides multiple examples throughout the lesson with multiple models, practice activities, and additional math problems.
Highlight critical features.	The teacher highlights critical features of the mathematics by stopping and calculating, checking in with students, and modeling behavior.
Provide multiple media and formats.	The teacher supports understanding by identifying patterns not only in text but also in the environment of the classroom, school, etc.
Support background context.	Teachers analyze or pre-test students for key pre-skills and background knowledge.
Provide ongoing, relevant feedback.	In cooperative groups, students may receive feedback from the teacher and from peers.
Offer choices of content and tools.	Students are assigned to one of three groups tiered by difficulty; all students are working on the same task but with varying supports.
Offer adjustable levels of challenge.	Varied supports in the working groups alter the level of independence and difficulty in solving the task.

Source: Hall, Vue, Meyer, 2004.

Table 8.5.3. UDL strategies to further minimize lesson barriers in a differentiated instruction lesson plan for mathematics

Barrier	UDL Strategy
Deducting/ constructing numeric functions.	Provide different demonstrations or models of how to use the tools employed in the lesson. Provide scaffolds and prompt students in use of number patterns.
Students write rules for mathematical patterns.	Provide alternative formats for students to express their interpretation of visual and representational patterns and the mathematical implications. For example, speaking, creating a diagram, numerical representations.
Creating number patterns.	Consider background knowledge for students entering this mathematical problem. What range of supports could be made available to provide the informational knowledge so that students can focus on the problem-solving component?

Source: Hall, Vue, Meyer, 2004.

Training in Differentiated Instruction

The IRIS Center of Peabody College, Vanderbilt University provides a training module for those that wish to learn more about *Differentiated instruction: Maximizing the learning of all students.*

- Educational Psychology. **Authored by**: Kelvin Seifert and Rosemary Sutton. **Provided by**: The Saylor Foundation. **Retrieved from**: https://courses.lumenlearning.com/educationalpsychology. **License**: CC BY: Attribution
- Instructional Methods, Strategies and Technologies to Meet the Needs of All Learners . **Authored by**: Paula Lombardi. **Retrieved from**: https://granite.pressbooks.pub/teachingdiverselearners/chapter/differentiated-instruction-2/. **License**: CC BY-NC-SA: Attribution-NonCommercial-ShareAlike

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- Differentiating Instruction: Itu2019s Not as Hard as You Think. **Provided by**: Education Week. **Retrieved from**: https://youtu.be/h7-D3gi2lL8. **License**: *All Rights Reserved*
- Differentiating Instruction: How to Plan Your Lessons. **Provided by**: Education Week. **Retrieved from**: https://youtu.be/rumHfC1XQtc. **License**: *All Rights Reserved*

Students as a Resource for Instructional Goals

The discussion of instructional planning so far has described goals and objectives as if they are selected primarily by educators and teachers, and not by students themselves. The assumption may be correct in many cases, but there are problems with it. One problem is that choosing goals and objectives *for* students, rather than by students, places a major burden on everyone involved in education—curriculum writers, teachers, and students. The curriculum writers have to make sure that they specify standards, goals, and objectives that are truly important for students to learn (what if it really does *not* matter, for example, whether a science student learns about the periodic table of the elements?). Teachers have to make sure that students actually become motivated to learn the specified goals and objectives, even if the students are not motivated initially. Students have to master pre-set goals and objectives even if they might not have chosen them personally. Some critics of education have argued that these requirements can be serious impediments to learning (Kohn, 2004). The problems are widespread and especially noticeable in two forms of teaching. One is with the youngest students, who may especially lack patience with an educational agenda set by others (Kohn, 1999; Seitz, 2006). The other is with culturally diverse classrooms, where students and their families may hold a variety of legitimate, but unconventional expectations about what they should learn (J. Banks & C. Banks, 2005).

In response to concerns like these, some educators advocate planning instruction around goals set or expressed either by students themselves or by the cultures or communities with which students identify. Their suggestions vary in detail but can be organized into two broad categories: (1) emergent curriculum and (2) multicultural and anti-bias curriculum.

Emergent Curriculum

An **emergent curriculum** is one that explicitly builds on interests expressed by students, rather than goals set by curriculum writers, curriculum documents, or teachers. As you might suspect, therefore, instructional planning for an emergent curriculum does not have the same meaning that the term has had in the chapter up to now. Instead, since an emergent curriculum by definition unfolds spontaneously and flexibly, students' interests may be predictable, but usually not very far in advance (Peterson, 2002). Suppose, for example, that a first-grade teacher plans a unit around Halloween, and that as one of the activities for this unit she reads a book about Halloween. In listening to the book, however, the students turn out to be less interested in its Halloween content than in the fact that one of the illustrations in the book shows a picture of a full moon partially hidden by clouds. They begin asking about the moon: why it is full sometimes but not other times, why it rises in different places each month, and whether the moon really moves behind clouds or whether the clouds actually do the moving. The teacher encourages their questions and their interest in moon astronomy. Over the next days or weeks, she arranges further activities and experiences to encourage students' interest: she sets aside her original plans about Halloween and finds books about the moon and about how the solar system works. She invites a local amateur astronomer to visit the group and talk about his observations of the moon. Several children build models of the moon out of paper maché. Some find books describing trips of the space shuttles to the moon. Others make a large mural depicting a moonscape. And so on; the original goals about Halloween are not so much rejected, as set aside or forgotten in favor of something more immediately interesting and motivating.

While these activities could in principle happen because of recommendations from a curriculum document, the key point about emergent curriculum is that they happen for a very different reason:

these activities happen and the goals emerge because the children *want* them. A teacher's challenge is therefore not to plan activities that match predetermined curriculum goals or objectives but to respond flexibly and sensitively as students' interests become known and explicit. Teachers' responsiveness is facilitated by two practices that are especially prominent when a teacher adopts an emergent approach to curriculum. The first is careful, continuous *observation of students*. The teacher watches and listens, and may keep informal written records of students' comments and activities. The information allows her to respond more effectively to the interests they express, and at the same time, it provides a type of assessment of students' progress—information about what the students are actually learning.

A second strategy that facilitates teachers' success is *curriculum webbing*, a process of brainstorming connections among initiatives suggested by students and ideas suggested by the teacher. In some cases, webs can be created jointly with students by brainstorming with them about where their current interests may lead. In other cases, they can be created independently by the teacher's own reflections. In still others, when a classroom has more than one adult responsible for it, they can be created jointly with fellow teachers or teacher assistants. The latter approach works especially well in preschool, kindergartens, or special education classrooms, which often have more than one adult responsible for the class (Vartuli & Rohs, 2006).

To some, emergent curriculum may seem like a formula for curriculum and management disasters. But the approach has often proved quite successful, particularly in early childhood education and the earliest grade levels of elementary school (Seitz, 2006; Wurm, 2005). Something akin to emergent curriculum is quite possible, in principle, even with older students. In Chapter 8, for example, we described a high school program in which students began with problems and experiences that were personally relevant, and discussed the problems with classmates to formulate research problems which they then studied more formally and systematically

(Hawkins, 2006). In essence, this strategy created an emergent curriculum analogous to the ones described above for young children. What the high school students studied was not predetermined, but emerged from their own expressed interests.

Multicultural and Anti-Bias Education

Culture is an all-encompassing set of values, beliefs, practices, and customs of a group or community—it is a total way of life. Cultures may be shared widely, even by much if not all of an entire nation, or they may be shared by relatively few, such as a small community within a large city. Sometimes the term *culture* is even applied to the way of life of an individual family or of a specialized group in society; some might argue, for example, that there is a culture of schooling shared by teachers, though not necessarily by all students.

Because culture by definition touches on all aspects of living, it is likely to affect students' perspectives about school, their ways of learning, and their motivations to learn. The differences go beyond obvious differences in holidays, language, or food preferences. In some cultures, for example, individuals keep good eye contact with someone to whom they are speaking, and expect the same from others. In other cultures, such behavior is considered intrusive or overly aggressive, and avoiding eye contact while speaking is considered more respectful. Or another example: in some cultures, it is expected that individuals will be punctual (or on time), whereas in others punctuality is considered overly compulsive, and a more casual approach to time is the norm. Students regularly bring differences like these to school, where they combine with expectations from teachers and other school staff and contribute indirectly to differences in achievement and satisfaction among students.

To be fully effective, therefore, instructional planning has to take

into account the diversity in students' cultural backgrounds, whether the differences are observable or subtle. Planning also has to work deliberately to reduce the social biases and prejudices that sometimes develop about cultural differences. **Multicultural education** and **anti-bias education** are two terms referring to these purposes. Their meanings often overlap significantly, depending on the context or on who is using the terms. Generally, though, the first term—multicultural education— has somewhat more to do with understanding the differences among cultures. The latter term—anti-bias education —has more to do with overcoming social prejudices and biases resulting from cultural differences. For convenience in this chapter, we will use the single term *multicultural education* to refer to both understanding differences and overcoming prejudices.

Fully effective multicultural education has several features. The most obvious and familiar one is **content integration**: the curriculum uses examples and information from different cultures to illustrate various concepts or ideas already contained in the curriculum (Vavrus, 2002). In studying holidays, for example, an elementary school teacher includes activities and information about Kwanzaa as well as Christmas, Hanukkah, or other holidays happening at about the same time. In studying the US Civil War, another example, a middle-years teacher includes material written from the perspective of African-American slaves and Southern landowners. In teaching language arts, students learn the basic vocabulary of any non-English languages spoken by some members of the class.

But there is more to multicultural education than integrating content from diverse cultures. Among other features, it also requires an **equity pedagogy**, which is an effort to allow or even encourage, a variety of learning styles—styles in which students may have become skillful because of their cultural backgrounds (Crow, 2005; C. Banks & J. Banks, 1995). In elementary language arts, for example, there may be more than one "best" way to tell a story. Should a student necessarily have to tell it alone and standing in

front of the whole class, or might the student tell it jointly with a friend or in a smaller group? In learning to write a story, is legitimate variety also possible there? Should a written story necessarily begin with a topic sentence that announces what the story is about, or can it save a statement of topic for the ending or even leave it out altogether in order to stimulate readers to think? The best choice is related in part to the nature and purpose of the story, of course, but partly also to differences in cultural expectations about storytelling. Choosing a story form also points toward another feature of multicultural education, **the knowledge construction process**, which is the unstated, unconscious process by which a cultural group creates knowledge or information. The popular media, for example, often portray Hispanic Americans in ways that are stereotypical, either subtly or blatantly (Lester & Ross, 2003). A fully multicultural curriculum finds a way to call these images to the attention of students and engage them in thinking about how and why the images oversimplify reality.

Yet there is even more to fully multicultural education. In addition to content integration, equity pedagogy, and knowledge construction, it fosters **prejudice reduction**, or activities, discussions, and readings that identify students' negative evaluations of cultural groups (Jacobson, 2003; J. Banks & C. Banks, 2004). The activities and discussions can of course take a somewhat philosophical approach—examining how students feel in general, what experiences they remember having involving prejudice, and the like. But the activities and discussions can also take a more indirect and subtle form, as when a teacher periodically speaks in a student's native language as a public sign of respect for the student. Gestures and discussions like these are especially effective if they contribute to the fifth element of multicultural education, **empowering the school and social structure**, in which all teachers and staff members find ways to convey respect for cultural differences, including even during extra-curricular and sports activities. A sports team or a debate club should not be limited to students from one cultural background and exclude those from

another—or more subtly, accept everyone but give the more desirable roles only to individuals with particular social backgrounds. To the extent that cultural respect and inclusion are school-wide, teaching and learning both become easier and more successful, and instructional planning, in particular, becomes more relevant to students' needs.

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Delivering Instruction

In the previous sections, you learned about the importance of specifying goals and objectives for your learners. We pointed out that goals energize you and your students to achieve high degrees of effort and learning. We discussed how objectives specify what students are expected to do to demonstrate learning.

There is another important use for goals and objectives: they can determine your choice of instructional methods. Simply stated, instructional methods are patterns of practice that recur in classrooms time and again. They include, for example, the methods of direct (or didactic)
instruction, indirect (or inquiry) instruction, and self-directed (or self-regulated) instruction. Each of these general methods includes certain specific teaching skills, among which are structuring, modeling, coaching, and fading.

For instance, if your objective is to have students acquire facts (for example, names and dates of battles of the Civil War), rules (for forming possessives), or action sequences (for focusing a microscope), you will most likely use direct instruction, which involves some questioning, clarifying, and explaining. But if your objective is to teach concepts (for example, photosynthesis), patterns (global warming), or abstractions (environmental responsibility), you will most likely use indirect instruction, which involves constructivist teaching methods. If, however, your objective is to teach strategies for learning (for example, a model for learning to solve equations that can be used time and again), you will most likely adopt the method of self-directed instruction, which incorporates the skills of metacognition (thinking about thinking), subvocal rehearsal, guided practice, and self-evaluation.

Regardless of the instructional method you are using, you will want to be familiar with structuring, modeling, coaching, and fading.

In the next section, we will study the teaching skills of structuring, modeling, coaching, and fading. We will demonstrate how successful teachers use these skills to capture student attention, convey purpose, communicate information, keep lessons moving at a brisk and lively pace, and provide opportunities for transferring what has been learned to new and different contexts.

Structuring

Structuring is the process of getting learners ready to learn by selecting, organizing, and previewing the content to be presented. Structuring is that part of a lesson during which the teacher exerts the most control over the learning process. During structuring, it is essential that the teacher be skilled at capturing the attention of learners and focusing it on the outcome of the lesson. If not fully alert, learners will find it difficult to remember the information given, understand the goal of the lesson, or participate in the instructional process—all of which are essential for learning and transfer to occur.

How do you gain a learner's attention? Your voice, your actions, and your visual displays have to compete with hundreds of other stimuli that also are vying for your learners' attention. How can you get students to attend? What does it mean to "pay attention"? Learners who pay attention usually demonstrate several skills.

- They orient themselves to you and what you direct them to (for example, the overhead projector, the blackboard, the text).
- They focus their attention on the relevant aspects of what they are attending to (for example, the problem you are describing, the responses of another student, the picture in the text).
- They ignore distracting stimuli (for example, another student or the sounds of a nearby classroom).

- They remain alert during the lesson (for example, they maintain their engagement with the lesson despite a desire to return to a more passive state).

Structuring focuses learners on the first two of the skills above. These involve (1) focusing attention by directing the eyes, ears, and body posture of learners to a relevant stimulus and (2) holding their attention long enough to establish a learning set. We will explore the third and fourth attention-gaining skills under the expert practice of coaching. For now, let's turn to the first two skills: focusing and holding your learners' attention.

Focusing Attention

Before you can communicate the purpose or objective of a lesson, you must focus the eyes and ears of your learners. This is difficult at the start of class if your learners are taking out materials, finishing their homework, asking questions of one another, or catching up on the latest gossip with their friends.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=122#oembed-1

Video 8.7.1. *The Hook* suggests techniques for getting students' attention and motivate them to become engaged with the lessons.

Research on attention has focused on four properties of instructional stimuli that cause learners to make an attending response, such as shifting one's body posture, changing

the direction of a gaze, scanning the visual field, or holding a fixed stare (Solso, 1988). From this research, we can identify four appeals that can be used to make instructional content more attractive to learners. They are (1) psychophysical appeal, (2) emotional appeal, (3) discrepancy appeal, and (4) commanding stimuli appeal.

Psychophysical Appeal. A psychophysical appeal is any variation in the color, size, intensity, or pitch of stimuli in your learners' visual field that causes them to make an attending response. The most accessible and efficient stimuli for you to vary are those coming from your own body: your voice, gestures, posture, movement, and facial expressions. You can most efficiently focus your learners' attention by changing your voice inflection, moving as you talk, and varying your posture or gestures.

Emotional Appeal. Just as we have emotional responses associated with our names, learners have emotional responses to certain sights, sounds, words, and smells. The skillful teacher uses the emotional appeal of these stimuli to focus learners' attention by calling on them by name, commenting from time to time on a unique article of their clothing, using words in the student's second or native language, and introducing certain sights, sounds, and smells that may relate to the topic of a lesson.

Discrepancy Appeal. Our attention is often drawn to stimuli that make a discrepancy appeal by means of the element of surprise—something novel or unique grabs our attention. The history teacher who dresses up in an authentic costume to illustrate a period in history, the science teacher who creates an unusual noise or smell at the start of an experiment, the math teacher who begins by presenting an unsolvable problem, the language teacher who deliberately misspells a word to be used in the day's lesson, or the speech teacher who stages a shouting match with a student before a lesson on listening skills to demonstrate inattention—all are using the property of discrepancy to focus the attention of learners.

Commanding Stimuli Appeal. Teachers often use commanding stimuli appeal to get learners to comply with a request. Statements

such as "Now listen closely" or "All books and pens away," when delivered assertively, are likely to be followed. Some teachers have their students vote on a code word during the first week of school, which when spoken assertively by the teacher gets everyone to stop what they are doing and look at the teacher.

Holding Attention. The expert practice of structuring involves not only focusing the attention of learners but also giving them something to focus on. This is accomplished by building a learning set. Hunter (1982) refers to this phase of the lesson as the anticipatory set. Its purpose is to make the goal or objective of the lesson relevant to the learners, to put the lesson into a context the learners can relate to, and to get their minds off other distracting stimuli. During this time learners recall past learning by drawing a picture, summarizing something they saw or heard, reading a short passage, or by writing down an idea—all with the intent of relating past with present learning.

Anticipatory sets often take the form of advance organizers (Ausubel, 1968). Advance organizers give learners an overview of what is to come that helps them store, label, and package the content for retention and later use. For example, "Listen to this story and think of the three things the duckling did."

Activating Prior Knowledge

Another way to connect curriculum goals to students' experience is by **activating prior knowledge**, a term that refers to encouraging students to recall what they know already about new material being learned. Various formats for activating prior knowledge are possible. When introducing a unit about how biologists classify animal and plant species, for example, a teacher can invite students to discuss how they already classify different kinds of plants and animals. Having highlighted this informal knowledge, the teacher can then explore how the same species are classified by biological scientists,

and compare the scientists' classification schemes to the students' own schemes. The activation does not have to happen orally, as in this example; a teacher can also ask students to write down as many distinct types of animals and plants that they can think of, and then ask students to diagram or map their relationships—essentially creating a *concept map* (Gurlitt, et al., 2006). Whatever the strategy used, activation helps by making students' prior knowledge or experience conscious and therefore easier to link to new concepts or information.

Anticipating Preconceptions of Students

Ironically, activating students' prior knowledge can be a mixed blessing if some of the prior knowledge is misleading or downright wrong. Misleading or erroneous knowledge is especially common among young students, but it can happen at any grade level. A kindergarten child may think that the sun literally "rises" in the morning, since she often hears adults use this expression, or that the earth is flat because it obviously *looks* flat. But a high school student may mistakenly believe that large objects (a boulder) fall faster than small ones (a pebble), or that a heavy object dropped (not thrown) from a moving car window will fall straight down instead of traveling laterally alongside the car while it falls.

Because misconceptions are quite common among students and even among adults, teachers are more effective if they can **anticipate preconceptions of students** wherever possible. The task is twofold. First, the teacher must know or at least guess students' preconceptions as much as possible in advance, so that she can design learning activities to counteract and revise their thinking. Some preconceptions have been well-documented by educational research and therefore can in principle be anticipated easily—though they may still sometimes take a teacher by surprise during a busy activity or lesson (Tanner & Allen, 2005; Chiu & Lin, 2005). Table 1 lists a few of these common preconceptions. Others

may be unique to particular students, however, and a teacher may only be able to learn from them through experience—by listening carefully to what students say and write and by watching what they do. A few preconceptions may be so ingrained or tied to other, more deeply held beliefs that students may resist giving them up, either consciously or unconsciously. It may be hard, for example, for some students to give up the idea that girls are less talented at math or science than boys, even though research generally finds this is not the case (Hyde & Linn, 2006).

Table 8.7.1 Several misconceptions about science

Misconception	What to do
Stars and constellations appear in the same place in the sky every night.	Ask students to observe carefully the locations of a bright star once a week for several weeks.
The world is flat, circular like a pancake.	Use a globe or ball to find countries located over the horizon; use computer software (e.g. Global Earth) to illustrate how a round Earth can look flat up close.
Dinosaurs disappeared at the same time that human beings appeared and because of human activity.	Construct a timeline of major periods of Darwinian evolution.
Rivers always flow from North to South.	Identify rivers that flow South to North (e.g. the Red River in North Dakota and Canada); talk about how Southern locations are not necessarily "lower."
Force is needed not only to start an object moving, but to keep it moving.	Explain the concept of *inertia*; demonstrate inertia using low-friction motion (e.g. with a hovercraft or dry-ice puck).
Volume, weight, and size are identical concepts.	Have students weigh objects of different sizes or volumes, and compare the results.
Seasons happen because the Earth changes distance from the sun.	Explain the tilt of Earth's axis using a globe and light as a model; demonstrate reduced heating of surfaces by placing similar surfaces outdoors at different angles to the sun's rays.

Sources: Chi, 2005; D. Clark, 2006; Slotta & Chi, 2006; Owens, 2003.

The second task when anticipating preconceptions is to treat

students' existing knowledge and beliefs with respect even when they do include misconceptions or errors. This may seem obvious in principle, but it needs remembering when students persist with misconceptions in spite of a teacher's efforts to teach alternative ideas or concepts. Most of us—including most students—have reasons for holding our beliefs, even when the beliefs do not agree with teachers, textbooks, or other authorities, and we appreciate having our beliefs treated with respect. Students are no different from other people in this regard. In a high school biology class, for example, some students may have personal reasons for not agreeing with the theory of evolution associated with Charles Darwin. For religious reasons, they may support explanations of the origins of life that give a more active, interventionist role to God (Brumfiel, 2005). If their beliefs disagree with the teacher's or the textbook, then the disagreement needs to be acknowledged respectfully. For some students (and perhaps some teachers), expressing fundamental disagreement respectfully may feel awkward, but it needs to be done nonetheless.

Modeling

Once your learners' attention is on you, you have the opportunity to model what your students are about to learn. The term *modeling* can mean either a demonstration of the desired behavior or representation of an important theory, idea, or object. Each of these meanings can link curriculum goals with students' prior knowledge and experience.

Modeling as a Demonstration

In the first meaning, **modeling** refers to performing or

demonstrating a desired new behavior or skill, as when a teacher or classmate demonstrates polite behaviors or the correct solution to a math problem. In this case, we say that the teacher or classmate *models* the desired behavior, either deliberately or in the course of other ongoing activity. Students observe the modeled behavior and (hopefully) imitate it themselves. Research repeatedly shows that modeling desired behaviors is an effective way to learn new behaviors, especially when the model is perceived as important (like the teacher), similar to the learner (like a student's best friend), or has a warm, positive relationship with the learner (like the teacher or the student's friend) (Bandura, 2002; Gibson, 2004). Modeling in this sense is sometimes also called *observational learning*. It has many of the same properties as classic operant conditioning, except that reinforcement during observational learning is witnessed in others rather than experienced by the learner directly. Watching others being reinforced is sometimes called *vicarious reinforcement*. The idea is that if, for example, a student observes a classmate who behaves politely with the teacher and then sees that classmate receive praise for the behavior (vicarious reinforcement), the student is more likely to imitate the polite behavior that he saw. As in classic operant conditioning, furthermore, if the student observes that politeness by classmates is ignored (extinction or no reinforcement), then the student is much less likely to imitate the politeness. Worse yet, if the student observes that negative behaviors in others lead to positive consequences (like attention from peers), then the student may imitate the negative behaviors (Rebellon, 2006). Cursing and swearing, and even bullying or vandalism, can be reinforced vicariously, just as can more desired behaviors.

Modeling—in this first sense of a demonstration—connects instructional goals to students' experiences by presenting real, vivid examples of behaviors or skills in a way that a student can practice directly, rather than merely talk about. There is often little need, when imitating a model, to translate ideas or instructions from the

verbal form into action. For students struggling with language and literacy, in particular, this feature can be a real advantage.

Modeling as a Simplified Representation

In the second meaning of modeling, a **model** is a simplified representation of a phenomenon that incorporates the important properties of the phenomenon. Models in this sense may sometimes be quite tangible, direct copies of reality; when I was in fourth grade growing up in California, for example, we made scale models of the Spanish missions as part of our social studies lessons about California history. But models can also be imaginary, though still based on familiar elements. In a science curriculum, for example, the behavior of gas molecules under pressure can be modeled by imagining the molecules as ping pong balls flying about and colliding in an empty room. Reducing the space available to the gas by making the room smaller, causes the ping pong balls to collide more frequently and vigorously, and thereby increases the pressure on the walls of the room. Increasing space has the opposite effect. Creating an actual room full of ping pong balls may be impractical, of course, but the model can still be imagined.

Modeling in this second sense is not about altering students' behavior, but about increasing their understanding of a newly learned idea, theory, or phenomenon. The model itself uses objects or events that are already familiar to students—simple balls and their behavior when colliding—and in this way supports students' learning of new, unfamiliar material. Not every new concept or idea lends itself to such modeling, but many do: students can create models of unfamiliar animals, for example, or medieval castles, or of ecological systems. Two-dimensional models—essentially drawings—can also be helpful: students can illustrate literature or historical events, or make maps of their own neighborhoods. The

choice of model depends largely on the specific curriculum goals which the teacher needs to accomplish at a particular time.

Coaching

Coaching is that stage of the instructional process during which the learner converts memories into actions as a result of the modeling process. This is the aspect of instruction we usually think of as teaching. Coaching is the most physically and mentally demanding of the four teaching activities and typically takes up the most time in a lesson. Effective coaching requires:

- establishing accountability
- providing opportunities for practice
- guiding practice by prompting and questioning
- motivating.

Establishing Accountability

The following extract from a student teacher's diary describes a common teaching problem:

> *School seems to mean so little for many of my kids. They can do the work but they just sit there and wait to be reminded or threatened. Take Bart. He comes into class, looks at me when I'm giving the class assignment, but then sits and does nothing until I remind him to get to work. He works for a while and then stops until the next reminder. What work he does is about 25 percent correct. During discussions he never listens to what anyone else is saying. I have about five or six Barts in every one of my eighth-grade classes.* (Beth, student teacher)

This excerpt describes what many beginning teachers encounter when it is time for practice or classwork. It is tempting to assume, like Beth, that the problem is motivation: the students just don't care. Research by Kounin (1970) and Emmer, Evertson, Clements, and Worsham (1994), however, point us in another direction. They suggest that incomplete, sloppy, or missed assignments and an "I don't care" attitude may reflect the teacher's failure to make learners feel accountable during the coaching stage of the lesson.

Accountability is the degree to which teachers communicate to learners the classwork they are expected to complete during a specific period of time. The more learners are told what they are responsible for, the greater the accountability for learning. From research by Emmer et al. (1994), we learn that there are three aspects to accountability: (1) communication, (2) monitoring, and (3) feedback. The accompanying box, Establishing Accountability, details the steps you can take.

Toward the end of Beth's student teaching, she became much more skilled at establishing accountability. Here is an excerpt from her cooperating teacher's evaluation of her performance during her last week of student teaching:

> *Beth, like many new teachers, tended to hide immediately after giving an assignment. She would sit at her desk and avoid even looking at students. She hoped that the students would begin work immediately and everyone would know exactly what to do. She hadn't developed the skill of anticipating problems and giving clear step-by-step directions. No sooner would she sit down than students would swarm to her desk with questions about what they were expected to do. As time passed, she learned to move about the room during the work activity, question learners who were having problems, and encourage those who were doing well. Now, even when the class is working quietly, she continues to move about the room encouraging, praising, and prompting.*

Providing Opportunities For Practice

The purpose of practice is to engage learners actively in the learning process. During structuring and modeling, students listen, observe, covertly
rehearse, or make brief responses to your questions as you check for understanding. But they have not yet had the opportunity to practice and master the skills you modeled, the information you conveyed, or the problem-solving techniques you demonstrated. During the coaching phase of instruction, learners begin to practice the objectives of their lesson.

Practice has historically been associated with drills (Ornstein, 1992) and direct instructional methods (Borich, 1996). It has been strongly emphasized in behavioristic approaches to learning that stress the importance of building stimulus-response connections (Hilgard & Bower, 1981). Mastery learning and errorless learning methods also incorporate extensive practice and drill (Bloom, 1981).

However, practice is essential for accomplishing the goals of any instructional method—direct, indirect, or self-directed. Depending on the instructional method used and the desired objective, practice can take many forms. During direct instruction, practice may take the form of repeating multiplication tables or letters of the alphabet. It may also involve independent seatwork and the use of workbooks. Practice during indirect instruction may occur when the teacher places learners in small groups to solve science or math problems cooperatively. It may also occur when students complete problem-solving handouts and worksheets. During self-directed learning, practice may take the form of reciprocal teaching within the naturally occurring dialogue of the classroom. It may also involve completing extended projects and investigations at a learning center, at home, or in
the library.

Regardless of the type of practice activity used, there are several guidelines for promoting effective practice:

- Students should understand the reasons for practice. Practice often turns into busy work, which can create boredom, frustration, and noncompliance. Learners should approach classroom practice with the enthusiasm experienced by an athlete in training. This is more likely to occur if (1) the purpose of the practice has been made known to learners ("We will need to be proficient at solving these problems in order to go on to our next activity") and (2) practice occurs during as well as after new learning ("Let's stop right here, so you can try some of these problems yourselves").
- Effective practice is delivered in a manner that is brief, non-evaluative, and supportive. Eliciting practice involves more than simply saying "OK. Take out your books, turn to page 78, and answer questions 1, 3, 7, and 9. You have 20 minutes." Rather, your introduction to a practice activity should accomplish three objectives: (1) inform the learners that they are going to practice something they are capable of succeeding at ("You've done part of this before, so this shouldn't be much different"), (2) dispel anxiety about doing the task through the use of nonevaluative and non-threatening language ("You've got part of it right, Anita; now, think some more and you'll have it"), and (3) let the learners know that you will be around to monitor their work and support their efforts ("I will be around to help, so let me know if you have a problem").
- Practice should be designed to ensure success. Practice makes perfect only when it is done correctly. If your learners are making many math, punctuation, or problem-solving mistakes, practice is making imperfect. Design your practice to produce as few errors as possible. For example, worksheets should be developed to ensure that at least 80 to 90 percent of the problems are completed correctly.
- Practice should be arranged to allow students to receive feedback. As we learned earlier in our discussion of modeling, feedback exerts a powerful effect on learning.

Develop procedures and routines for rapid checking of work so that learners know as soon as possible
how well they are performing. Having peers correct one another's practice is an efficient way to give feedback. Also, having answer sheets handy so that learners can check their own work can be a simple and effective means of providing feedback.

- Practice should have the qualities of progress, challenge, and variety. Kounin (1970) found that the key to preventing learners from becoming bored was to design practice opportunities that allow them to see that they are making progress ("Don't forget to check your answers with the key on the board"). In addition, practice should be introduced in a challenging and enthusiastic manner ("This will really test your understanding with some new and interesting kinds of problems"). Finally, practice exercises should include a variety of examples and situations.

Guided Practice, Independent Practice, and Homework

We typically think of practice as a solitary activity during which learners master skills that have been explained or demonstrated by the teacher. This type of practice is often referred to as independent practice. However, other forms of practice involve the active participation of both teacher and learners, whether one-to-one or in groups. This type of practice is called guided practice. Much of this task involves helping students to make the transition from supervised learning to self-regulated learning—or put differently, from practice that is relatively guided to practice that is relatively independent.

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Guided Practice

When students first learn a new skill or a new set of ideas, they are especially likely to encounter problems and make mistakes that interfere with the very process of learning. In figuring out how to use a new software program, for example, a student may unknowingly press the wrong button that prevents further functioning of the program. In translating sentences from Spanish into English in a language class, for another example, a student might misinterpret one particular word or grammatical feature. This one mistake may cause many sentences to be translated incorrectly, and so on. So students initially need **guided practice**—opportunities to work somewhat independently, but with a teacher or other expert close at hand to prevent or fix difficulties when they occur. In general, educational research has found that guided practice helps all learners, especially those who are struggling (Bryan & Burstein, 2004: Woodward, 2004). A first-grade child has difficulty in decoding printed words, for example, benefits from guidance more than one who can decode easily. But both students benefit in the initial stages of learning, since both may make more mistakes then. Guided practice, by its nature, sends a dual message to students: it is important to learn new material well, but it is also important to become able to use learning *without* assistance, beyond the lesson where it is learned and even beyond the classroom.

Guided practice is much like the concepts of the *zone of proximal*

development (or ZPD) and *instructional scaffolding* that we discussed in connection with Vygotsky's theory of learning. In essence, during guided practice, the teacher creates a ZPD or scaffold (or framework) in which the student can accomplish more with partial knowledge or skill than the student could accomplish alone. But whatever its name—guided practice, a ZPD, or a scaffold—ensuring the success of guidance depends on several key elements: focusing on the task at hand, asking questions that break the task into manageable parts, reframing or restating the task so that it becomes more understandable, and giving frequent feedback about the student's progress (Rogoff, 2003). Combining the elements appropriately takes sensitivity and improvisational skill—even artfulness—but these very challenges are among the true joys of teaching.

Independent Practice

As students gain facility with a new skill or new knowledge, they tend to need less guidance and more time to consolidate (or strengthen) their new knowledge with additional practice. Since they are less likely to encounter mistakes or problems at this point, they begin to benefit from **independent practice**—opportunities to review and repeat their knowledge at their own pace and with fewer interruptions. At this point, therefore, guided practice may feel less like help than like an interruption, even if it is well-intentioned. A student who already knows how to use a new computer program, for example, may be frustrated by waiting for the teacher to explain each step of the program individually. If a student is already skillful at translating Spanish sentences into English in a language class, it can be annoying for the teacher to "help" by pointing out minor errors that the student is likely to catch for herself.

By definition, the purpose of independent practice is to provide more self-regulation of learning than what comes from guided practice. It implies a different message for students than what is

conveyed by guided practice, a message that goes beyond the earlier one: that it is now time to take more complete responsibility for own learning. When all goes well, independent practice is the eventual outcome of the zone of proximal development created during the earlier phase of guided practice described above: the student can now do on his or her own, what originally required assistance from someone else. Or stated differently, independent practice is a way of encouraging *self-determination* about learning. In order to work independently, a student must set his or her own direction and monitor his or her own success; by definition, no one can do this for the student.

Homework

The chances are that you already have experienced many forms of homework in your own educational career. The widespread practice of assigning review work to do outside of school is a way of supplementing scarce time in class and providing independent practice for students. Homework has generated controversy throughout most of its history in public education, partly because it encroaches on students' personal and family-oriented time, and partly because research finds no consistent benefits of doing homework (Gill & Schlossman, 2004; Kohn, 2004). In spite of these criticisms, though, parents and teachers tend to favor homework when it is used for two main purposes. One purpose is to review and practice material that has already been introduced and practiced at school; a sheet of arithmetic problems might be a classic example. When used for this purpose, the amount of homework is usually minimal in the earliest grades, if any is assigned at all. One educational expert recommends only ten minutes per day in first grade at most, and only gradual increases in amount as students get older (Cooper & Valentine, 2001).

The second purpose of supporting homework is to convey the idea of schoolwork being the "job" of childhood and youth. Just

as on an adult job, students must complete homework tasks with minimal supervision and sometimes even minimal training. Doing the tasks, furthermore, is a way to get ahead or further along in the workplace (for an adult) or at school (for a child). One study in which researchers interviewed children about these ideas, in fact, found that children do indeed regard homework as work in the same way that adults think of a job (Cornu & Xu, 2004). In the children's minds, homework tasks were not "fun," in spite of teachers' frequent efforts to make them fun. Instead, they were jobs that needed doing, much like household chores. When it came to homework, children regarded parents as the teachers' assistants—people merely carrying out the wishes of the teacher. Like any job, the job of doing homework varied in stressfulness; when required at an appropriate amount and level of difficulty, and when children reported having good "bosses" (parents and teachers), the job of homework could actually be satisfying in the way that many adults' jobs can be satisfying when well-done.

Motivating Learners

Successful groups of learners, no less than successful teams of athletes, demand that their coaches be skilled motivators. The expert practice of coaching, therefore, requires that teachers be skilled at motivating learners. The learning that is elicited and strengthened during guided practice must be maintained, generalized, and transferred outside of practice. Your knowledge of motivation acquired and your ability to instill it in your learners will help this take place.

Fading

Although all four teaching activities include elements of transfer of learning, fading is the event that most directly achieves it. The expert practice of fading, whether used during direct, indirect, or self-directed instruction, involves two steps:

1. The removal of any external supports required to activate learning (for example, prompts and reinforcers).
2. The provision of independent practice that promotes transfer.

Prompt Fading

The teaching of many action sequences, such as testing a hypothesis, forming correct letters in handwriting, tying knots, focusing a microscope, or dissecting a frog, frequently requires prompts to guide correct responses. Likewise, prompts are frequently required to help learners develop oral language proficiency, essay writing, and problem-solving skills. These prompts may be verbal, gestural, or physical.

You can fade verbal prompts by gradually using fewer words or shorter explanations, allowing more time for learner response, or lowering the sound of your voice as the student begins to work more skillfully and independently. We often fade gestural prompts by gradually shortening the length of the gesture from a full arm sweep, for example, to a short pointing response. Physical prompts can be faded by slowly moving your assistance from hand-over-hand to guiding the wrist, to lightly touching the forearm, to lightly tapping the elbow. Delaying the fading of prompts can lead to prompt dependency. Conversely, removing prompts too soon can create frustration and anxiety in the learner.

Reinforcer Fading

The purpose of reinforcer fading is to gradually transfer the motivation for performing a skill from extrinsic reinforcers (such as food, tokens, stickers, and praise) to intrinsic reinforcers. It is more desirable and natural for learners to read because they enjoy it than because their parents give them a dollar for every book they read. Likewise, we want learners to keep the classroom neat and to play sports or musical instruments for the enjoyment of the activity rather than to obtain a grade.

Providing Independent Practice That Promotes Transfer

The following first-person account describes one of the most vexing problems in teaching: how to help students demonstrate their learning in new situations and settings.

> *Yesterday afternoon I had the most frustrating experience. I was walking to the subway after school and I ran into Gabriel, one of my ESL (English as a Second Language) students. We had just spent the last two days drilling the future tense of "going to," as in "What are you going to do tomorrow?" So I said, "Gabriel, what are you going to do tonight?" And do you know what he said after two days of drill and practice? "I went to finish my homework tonight." Not "want" ...but "went." He completely mixed up the past and future tenses. I don't know how these kids are ever going to learn this stuff.* (Author, personal experience)

Transfer of learning is the phrase used to describe this problem. Teachers want their students to transfer their learning, or generalize it from the classroom to the world outside the classroom.

Of what value is learning how to speak or write grammatically correct English, solve math problems, type with accuracy, read poetry, plan a menu, or use logic if these skills are practiced only in a classroom under the guidance of a teacher?

Transfer of learning is a central concern whether you are engaged in direct, indirect, or self-directed instruction—that is, whether you want learners to acquire facts, rules, and action sequences; concepts, patterns, and abstractions; or learn how to learn. Regardless of which instructional method you choose or what the goal or objective of instruction is, effective instruction should culminate in the learner's demonstrating her learning in a new or different context.

The purpose of guided practice during coaching is to help learners acquire new intellectual, social, and motor skills. The purpose of independent practice during fading is to help learners transfer those skills to real-world contexts. Achieving this goal requires teachers to design independent practice with transfer in mind. Independent practice that promotes transfer should:

- emphasize mastery by beginning after learners have mastered the original task that has been modeled for them
- have real-world similarity by being completed under the same time constraints and with the same distractions that exist in the real world
- provide variety by giving learners as many different examples and situations as possible on which to practice, using a variety of sources, such as fiction, editorials, poetry, and magazines
- offer flexibility by changing the conditions, locations, and peers under which practice occurs
- promote self-direction by asking learners to identify examples where they can use their skills, such as measurement, punctuation, money management, scientific inquiry, and classifying objects, and to monitor their own progress.

In the chapters ahead we will present several means by which you

can determine the degree to which you have acquired the expert practices of structuring, modeling, coaching, and fading.
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Direct Instruction: Lecture

Lecture is "more or less continuous expositions by a speaker who wants the audience to learn something" (Bligh, 2000. p. 4); most likely a culmination of the lecturer's own interpretation and insights on years of study, research, and experience (Sutherland, 1976). Historically, before the wide availability of written information, lecture was the primary means of transmitting knowledge from expert to student. The popularity and persistence of lecture may be due to the value of lecture that is not easily replicated using another method (Webster, 2015).

Lectures are an effective way to quickly present a large amount of information that can be tailored to the needs of the student, even a large audience, while maintaining control of the learning experience and conveying information that may not otherwise be available to the student. Lecturers can promote interest in a topic through their enthusiasm during the lecture, which allows the lecturer to model how professionals in their discipline think and solve problems. Finally, lectures may also appeal to students that learn by listening and keeps the environment low-risk for the student by not requiring their participation (Cashin, 1985).

Is Lecture a Passive or Active Process?

Despite the prevalence of lectures, educators have long been in search of a superior method of instruction due to the perceived weaknesses of this method. One of the most common criticisms of lecture has been that students are passive recipients of information, empty vessels, waiting for the lecturer to give them the information that they need to know (Vivekananthamoorthy et al., 2010); however, Webster (2015) suggests that lecture is not a passive experience, students are not empty vessels, and the lecturer's voice is not the

only voice present during a lecture. The student's previous experiences and perspectives also contribute to the processing of the information presented in the lecture.

From the constructivist perspective, every student enters a lecture with their own experiences and knowledge; context, previous experience, and knowledge will inform students' expectations, interpretations, and acceptance of any lecture (Wandersee, Mintzes, & Novak, 1994). Vygotsky (1986) claims that learners are constantly referring to their own framework for understanding the world as they face new experiences and information. These students are not passively soaking up information, but are engaging in internal activity where students are making meaning from words, fitting new information into their current schema, making evaluations regarding the value of the information, and determining whether to accept the information presented (Webster, 2015). Dewey (2015) and Vygotsky (1986) both argued that ideas or concepts cannot actually be transmitted from one person to the next, and lecturers can only indirectly educate students by transmitting facts or information; students must construct concepts by thinking about and grappling with the information. These are not passive processes but require significant internal activity.

The Purpose of Lecture

What the lecturer anticipates the student to actually learn during a lecture can vary. In general, there are four possible learning objectives: acquiring information, promoting thought, changing attitudes or beliefs, and performing behavioral skills. While lecture is often used to meet these objectives, lecture has not been found to be the most effective method in all cases. Bligh (2000) provided a review of the research comparing lecture to several other methods, including programmed learning, discussion, reading and

independent study, inquiry, and audio/TV/computer-assisted learning, in meeting these objectives. No method emerged as clearly superior.

Acquiring Information

Dubin and Taveggia's (1968) review of over ninety comparison studies established that lecture may be as effective as any other method in helping learners acquire information, but it is not more effective. However, programmed learning did show some promise of being more effective. This method involves arranging learning into small steps with self-paced activity and student proctors providing early feedback on performance via discussion. The method also incorporates individual support for the learner with personal contact, and progress to the next learning unit only occurs after demonstrated mastery of the previous one (Bligh, 2000).

Promoting Thought

Lecture has been found to be less effective than other methods of promoting thought. Instead, discussion tends to be superior for this objective (Dubin & Taveggia, 1968). While lecture may be suitable for transmitting knowledge of the principles necessary for thought, this method alone is not teaching students how to practically solve problems or apply principles (Corman, 1957). Lectures have also been ineffective in promoting flexibility and creativity (Cabral-Pini, 1995), open-mindedness (Tillman, 1993), diversity of ideas (Gist, 1989), and promoting depth in questioning (Lam, 1984-1985). Bligh (2000) suggests that lecture may be less effective for promoting thought because the listener's role is passive. During a lecture, the listener is putting effort into selecting important information from

the lecture, perhaps finding meaning from the material and writing notes for later review. This does not leave much time for more complex cognitive tasks during the lecture. Siegel, Siegel, Capretta, Jones, and Bekowitz, (1963) found statistically significant differences in the amount of time spent on active versus passive thought between lecture and discussion students. During discussion, students spent 8.3% of their time solving problems and synthesizing information, while lecture students only did this 1% of the time. Lecture students spent much more time in passive thought (36.8%) and on irrelevant thoughts (31%) versus students participating in discussion (20.3% and 14.5% respectively). Bligh (2000) claims that if students are going to learn to think we must create experiences in which they can practice thinking, such as asking questions, providing students problems to solve, practice critical thinking, and analyze situations. Traditional lecture might convey the information needed for thought but it does not require students to think deeply or apply what is being transmitted.

Changing Attitudes of Beliefs

Lecture also has not been shown to be effective in influencing learners' attitudes; this outcome has been demonstrated by the discussion method and has been well established for a long time (i.e. Lewin, 1943). This method is especially effective when the discussion leads to some consensus among the group members (Pennington, Haravey, & Bass, 1958; Mitnick & McGinnies, 1958). Bligh (2000) suggests the power of conformity within group discussions as an influencing factor (e.g. Asch, 1951). Group identity or opportunity for discussion is often lacking in a lecture setting (Abercromie, 1978). Further, simulations (Dresner, 1989-1990) and role-plays (Culbertson, 1957) have also been found to be more effective than lecture at influencing attitudes. Each of these

methods involves studens' active participation, as opposed to passive listening.

Teaching Behavioral Skills

Finally, lecture is ineffective for teaching behavioral skills (Bligh, 2000). While there is often an informational component to teaching behavioral skills, eventually the students will need to practice the skills to become proficient. Traditional lecture, even observations and demonstrations, may provide important knowledge pertinent to performing the skill, but these methods do not provide an opportunity to practice the skills being taught; a fundamental aspect of successful skill-building. In many cases, a combination of lecture and practice was the most effective method for teaching behavioral skills (Bligh, 2000).

While lecture may be effective for transmitting information, it has not been found to be effective for teaching students to think, changing attitudes, or teaching behavioral skills. The transmission of information is important but knowledge alone is not useful if students cannot use and apply it. The transmission of information rarely is or should be the sole objective of a course. As lecture has not emerged as a superior method of instruction for meeting all course objectives, is there another method that could prove to be superior?

- A Controlled Study of Team-Based Learning in a Community College General Psychology . **Authored by**: Nicole Arduini-Van Hoose. **Provided by**: University at Albany, State University of New York. **License**: *All Rights Reserved*

Active Learning

In their seminal work, *Active Learning: Creating Excitement in the Classroom*, compiled in 1991 for the Association for the Study of Higher Education and the ERIC Clearinghouse on Higher Education, Bonwell and Eison (1991) defined strategies that promote active learning as "instructional activities involving students in doing things and thinking about what they are doing." Approaches that promote active learning focus more on developing students' skills than on transmitting information and require that students do something—read, discuss, write—that requires higher-order thinking. They also tend to place some emphasis on students' explorations of their own attitudes and values.

This definition is broad, and Bonwell and Eison explicitly recognize that a range of activities can fall within it. They suggest a spectrum of activities to promote active learning, ranging from very simple (e.g., pausing lecture to allow students to clarify and organize their ideas by discussing with neighbors) to more complex (e.g., using case studies as a focal point for decision-making). In their book, *Scientific Teaching*, Handelsman, Miller, and Pfund (2007) also note that the line between active learning and formative assessment is blurry and hard to define; after all, teaching that promotes students' active learning asks students to do or produce something, which then can serve to help assess understanding.

"Instructional activities involving students in doing things and thinking about what they are doing."
Bonwell and Eison, 1991

"Active learning implies that students are engaged in their own learning. Active teaching strategies have students do something other than taking notes or following directions… they participate in activities… [to] construct new knowledge and build new scientific skills."
Handelsman et al., 2007

"Active learning engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work."
Freeman et al., 2014

"Students' efforts to actively construct their knowledge."
Carr et al., 2015

The National Survey of Student Engagement (NSSE) and the Australasian Survey of Student Engagement (AUSSE) provides a very simple definition: active learning involves "students' efforts to actively construct their knowledge." This definition is supplemented by the items that the AUSSE uses to measure active learning: working with other students on projects during class; making a presentation; asking questions or contributing to discussions; participating in a community-based project as part of a course; working with other students outside of class on assignments; discussing ideas from a course with others outside of class; tutoring peers (reported in Carr et al., 2015).

Freeman and colleagues collected written definitions of active learning from >300 people attending seminars on active learning, arriving at a consensus definition that emphasizes students' use of higher-order thinking to complete activities or participate in discussion in class (Freeman et al., 2014). Their definition also notes the frequent link between active learning and working in groups.

Thus **active learning** is commonly defined as activities that students do to construct knowledge and understanding. The activities vary but require students to do higher-order thinking. Although not always explicitly noted, metacognition—students' thinking about their own learning—is an important element, providing the link between activity and learning.

The Theoretical Basis for Active Learning

Constructivist learning theory emphasizes that individuals learn

through building their own knowledge, connecting new ideas and experiences to existing knowledge and experiences to form new or enhanced understanding (Bransford et al., 1999). The theory, developed by Piaget and others, posits that learners can either assimilate new information into an existing framework or can modify that framework to accommodate new information that contradicts prior understanding. Approaches that promote active learning often explicitly ask students to make connections between new information and their current mental models, extending their understanding. In other cases, teachers may design learning activities that allow students to confront misconceptions, helping students reconstruct their mental models based on more accurate understanding. In either case, approaches that promote active learning promote the kind of cognitive work identified as necessary for learning by constructivist learning theory.

Active learning approaches also often embrace the use of cooperative learning groups, a constructivist-based practice that places particular emphasis on the contribution that social interaction can make. Lev Vygotsky's work elucidated the relationship between cognitive processes and social activities and led to the sociocultural theory of development, which suggests that learning takes place when students solve problems beyond their current developmental level with the support of their instructor or their peers (Vygotsky, 1978). Thus active learning approaches that rely on group work rest on this sociocultural branch of constructivist learning theory, leveraging peer-peer interaction to promote students' development of extended and accurate mental models.

Evidence for the Effectiveness of Active Learning

The evidence that active learning approaches help students learn more effectively than transmissionist approaches in which

instructors rely on "teaching by telling" is robust and stretches back more than thirty years (see, for example, Bonwell and Eison, 1991). Here, we will focus on two reports that review and analyze multiple active learning studies.

Freeman and colleagues conducted a meta-analysis of 225 studies comparing "constructivist versus exposition-centered course designs" in STEM disciplines (Freeman et al., 2014). They included studies that examined the design of class sessions (as opposed to out-of-class work or laboratories) with at least some active learning versus traditional lecturing, comparing failure rates and student scores on examinations, concept inventories, or other assessments. They found that students in traditional lectures were 1.5 times more likely to fail than students in courses with active learning (odds ratio of 1.95, $Z = 10.4$, $P<<0.001$). Further, they found that on average, student performance on exams, concept inventories, or other assessments increased by about half a standard deviation when some active learning was included in the course design (weighted standardized mean difference of 0.47, $Z = 9.781$, $P<<0.001$). These results were consistent across disciplines: they observed no significant difference in the effects of active learning in biology, chemistry, computer science, engineering, geology, math, physics, and psychology courses. They performed two analyses examining the possibility that the results were due to a publication bias (i.e., a bias toward publishing studies with larger effects), finding that there would have to be a large number of unpublished studies that observed no difference between active learning and lecturing to negate their findings: 114 reporting no difference on exam or concept inventory performance and 438 reporting no difference in failure rate. The authors conclude that the evidence for the benefits of active learning are very strong, stating that, "If the experiments analyzed here had been conducted as randomized controlled trials of medical interventions, they may have been stopped for benefit—meaning that enrolling patients in the control condition might be discontinued because the treatment being tested was clearly more beneficial" (Freeman et al., 2014).

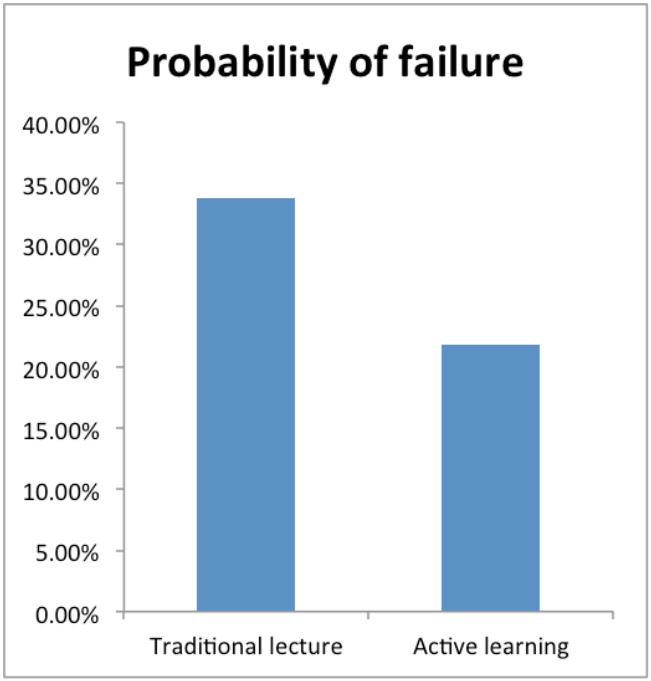


Figure 8.9.1. Probability of failure, lecture versus active learning.

These results support other, earlier reviews (e.g., Hake, 1998; Prince, 2004; Springer et al., 1999). In one such review, Ruiz-Primo and colleagues examined published studies examining the effects of active learning approaches in undergraduate biology, chemistry, engineering, and physics courses (Ruiz-Primo et al., 2011). They identified 166 studies that reported an effect size when comparing the effects of an innovation (i.e., active learning approaches) to traditional instruction that did not include the innovation. Overall, they found that inclusion of the active learning approaches improved student outcomes (mean effect size = 0.47), although there are important caveats to consider. First, the authors coded the active learning activities as conceptually oriented tasks, collaborative learning activities, technology-enabled activities,

inquiry-based projects, or some combination of those four categories, and important differences existed within the categories (for example, technology-assisted inquiry-based projects on average did not produce positive effects). Second, more than 80% of the studies included were quasi-experimental rather than experimental, and the positive benefits (average effect size = 0.26) were lower for the experimental studies in which students were randomly assigned to a treatment group. Finally, many of the studies did not control for pre-existing knowledge and abilities in the treatment groups. Nonetheless, the review does provide qualified support for the inclusion of active learning approaches in instruction.

While the two reviews reported focus on STEM disciplines and no similar reviews exist for the humanities and social sciences, the bulk of the evidence suggests that active learning approaches are effective across disciplines (Ambrose et al, 2010; Bonwell and Eison, 1991; Chickering and Gamson, 1987).

Inclusiveness in Active Learning

In addition to the evidence that active learning approaches promote learning for all students, there is some evidence that active learning approaches are an effective tool in making classrooms more inclusive. Haak and colleagues examined the effects of active learning for students in the University of Washington's Educational Opportunity Program (EOP) who were enrolled in an introductory biology course (Haak et al., 2011). Students in the EOP are educationally or economically disadvantaged, are typically the first in their families to attend college, and include most underrepresented minority students at the University of Washington. Previous work had demonstrated that the researchers could predict student grades in the introductory biology course based on their college GPA and SAT verbal score; students in the

EOP had a mean failure rate of ~22% compared to a mean failure rate of ~10% for students not in the EOP. When multiple highly structured approaches to promote active learning were incorporated into the introductory biology course, all students in the course benefited, but students in the EOP demonstrated a disproportionate benefit, reducing the achievement gap to almost half of the starting level. Given the pressing need to make U.S. college classrooms more inviting and productive spaces for students from all backgrounds, these results provide another compelling reason to incorporate active learning approaches into course design.

Lorenzo, Crouch, and Mazur also investigated the impact of active learning approaches on the difference in male and female performance in introductory physics classes (2006). They found that the inclusion of active engagement techniques benefited all students, but had the greatest impact on female students' performance. In fact, when they included a "high dose" of active learning approaches, the gender gap was eliminated. This result supports earlier work suggesting that women particularly benefit from active learning approaches (Laws et al., 1999; Schneider, 2001).

Active Learning Techniques

Brief, Easy Supplements for Lectures

The pause procedure. Pause for two minutes every 12 to 18 minutes, encouraging students to discuss and rework notes in pairs. This approach encourages students to consider their understanding of the lecture material, including its organization. It also provides an opportunity for questioning and clarification and has been shown to significantly increase learning when compared to lectures without

pauses (Bonwell and Eison, 1991; Rowe, 1980; 1986; Ruhl, Hughes, & Schloss, 1980).

Retrieval practice. Pause for two or three minutes every 15 minutes, having students write everything they can remember from the preceding class segment. Encourage questions. This approach prompts students to retrieve information from memory, which improves long-term memory, ability to learn subsequent material, and ability to translate information to new domains. (Brame and Biel, 2015; see also the CFT's guide to test-enhanced learning)

Demonstrations. Ask students to predict the result of a demonstration, briefly discussing with a neighbor. After the demonstration, ask them to discuss the observed result and how it may have differed from their prediction; follow up with instructor explanation. This approach asks students to test their understanding of a system by predicting an outcome. If their prediction is incorrect, it helps them see the misconception and thus prompts them to restructure their mental model.

Think-pair-share. Ask students a question that requires higher-order thinking (e.g., application, analysis, or evaluation levels within Bloom's taxonomy). Ask students to think or write about an answer for one minute, then turn to a peer to discuss their responses for two minutes. Ask groups to share responses and follow up with instructor explanation. By asking students to explain their answers to a neighbor and to critically consider their neighbor's responses, this approach helps students articulate newly formed mental connections.

Peer instruction with ConcepTests. This modification of the think-pair-share involves personal response devices (e.g., clickers). Pose a conceptually based multiple-choice question. Ask students to think about their answers and vote on a response before turning to a neighbor to discuss. Encourage students to change their answers after discussion, if appropriate, and share class results by revealing a graph of student responses. Use the graph as a stimulus for class discussion. This approach is particularly well-adapted for large classes and can be facilitated with a variety of tools (e.g., Poll

Everywhere, TopHat, TurningPoint). More information is available in the CIRTL MOOC *An Introduction to Evidence-Based College STEM Teaching*. (*Fagen et al.*, 2002; *Crouch and Mazur*, 2001)

Minute papers. Ask students a question that requires them to reflect on their learning or to engage in critical thinking. Have them write for one minute. Ask students to share responses to stimulate discussion or collect all responses to inform future class sessions. Like the think-pair-share approach, this approach encourages students to articulate and examine newly formed connections. (Angelo and Cross, 1993; Handelsman et al., 2007)

Questions to promote reflection on learning

- What was most challenging for you in this material?
- What was the key concept?
- What would you like to know?

Questions to promote critical thinking

- Describe the connection between today's lecture and your life outside the classroom.
- Describe how your personal bias might affect your interpretation of the material presented today.

From Handelsman et al., 2007.

Activities to Replace Some Lecture

Strip sequence. Give students the steps in a process on strips of paper that are jumbled; ask them to work together to reconstruct the proper sequence. This approach can strengthen students' logical thinking processes and test their mental model of a process. (Handelsman et al., 2007) An example from Aarhus University is provided below.

Example strip sequence from Aarhus University *Organize the following events that occur during respiration in the correct order. Specify on your final sequence the names of the major steps to which these events correspond. If an event does not occur during respiration, eliminate it.*
O_2 is reduced to H_2O.
Polymers are digested into monomers.
The oxygen atom of H_2O is lost as waste in CO_2.
A lot of ATP molecules are made.
CO_2 is released as a waste product during oxidation of pyruvate.
Protons go from the intermembrane space to the matrix.
Pyruvate is transported into the mitochondrion.
NADH gives away its electrons and a proton gradient is created.
ATP molecules are formed in the cytosol and NAD^+ is reduced.

Figure 8.9.2. Example strip sequence.

Concept map. Concept maps are visual representations of the relationships between concepts. Concepts are placed in nodes (often, circles), and the relationships between indicated by labeled arrows connecting the concepts. To have students create a concept map, identify the key concepts to be mapped in small groups or as a whole class. Ask students to determine the general relationship between the concepts and to arrange them two at a time, drawing arrows between related concepts and labeling with a short phrase to describe the relationship. By asking students to build an external representation of their mental model of a process, this approach helps students examine and strengthen the organization within the model. Further, it can emphasize the possibility of multiple "right" answers. More information and a tool to do online concept mapping can be found at the Institute for Human & Machine Cognition. (Novak and Canas, 2008).

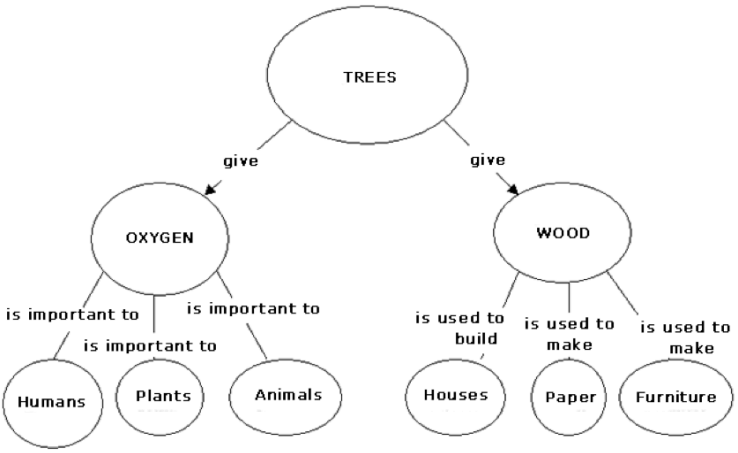


Figure 8.9.3. Example concept map.

Mini-maps. Mini-maps are like concept maps, but students are given a relatively short list of terms (usually 10 or fewer) to

incorporate into their map. To use this approach, provide students a list of major concepts or specific terms and ask them to work in groups of two or three to arrange the terms in a logical structure, showing relationships with arrows and words. Ask groups to volunteer to share their mini-maps and clarify any confusing points. Mini-maps have many of the same strengths as concept maps but can be completed more quickly and thus can serve as part of a larger class session with other learning activities. (Handelsman et al., 2007)

Categorizing grids. Present students with a grid made up of several important categories and a list of scrambled terms, images, equations, or other items. Ask students to quickly sort the terms into the correct categories in the grid. Ask volunteers to share their grids and answer questions that arise. This approach allows students to express and thus interrogate the distinctions they see within a field of related items. It can be particularly effective at helping instructors identify misconceptions. (Angelo and Cross, 1993)

Student-generated test questions. Provide students with a copy of your learning goals for a particular unit and a figure summarizing Bloom's taxonomy (with representative verbs associated with each category). Challenge groups of students to create test questions corresponding to your learning goals and different levels of the taxonomy. Consider having each group share their favorite test question with the whole class or consider distributing all student-generated questions to the class as a study guide. This approach helps students consider what they know as well as the implications of the instructor's stated learning goals. (Angelo and Cross, 1993)

Decision-making activities. Ask students to imagine that they are policy-makers who must make and justify tough decisions. Provide a short description of a thorny problem, ask them to work in groups to arrive at a decision, and then have groups share out their decisions and explain their reasoning. This highly engaging technique helps students critically consider a challenging problem and encourages them to be creative in considering solutions. The "real-world" nature of the problems can provide incentive for students to dig deeply into the problems. (Handelsman et al., 2007)

Example for a biology class
(from Handelsman et al., 2007)

You are the head of a major blood bank, and there is a worldwide blood shortage. You are offered a shipment of blood that might be contaminated with a new retrovirus that has not been well studied. Will you allow the blood to be used? Why? What would you like to know before you make your decision?

Content, form, and function outlines. Students in small groups are asked to carefully analyze a particular artifact—such as a poem, a story, an essay, a billboard, an image, or a graph—and identify the "what" (the content), the "how" (the form), and the function (the why). This technique can help students consider the various ways that meaning is communicated in different genres. (Angelo and Cross, 1993)

Case-based learning. Much like decision-making activities, case-based learning presents students with situations from the larger world that require students to apply their knowledge to reach a conclusion about an open-ended situation. Provide students with a case, asking them to decide what they know that is relevant to the case, what other information they may need, and what impact their decisions may have, considering the broader implications of their decisions. Give small groups (3-5) of students time to consider responses, circulating to ask questions, and provide help as needed. Provide opportunities for groups to share responses; the greatest value from case-based learning comes from the complexity and variety of answers that may be generated. More information and collections of cases are available at the National Center for Case

Study Teaching in Science, the Case Method Website of UC-Santa Barbara, and World History Sources.

Discussion Techniques

Many faculty members dispense with lecture altogether, turning to discussion to prompt the kinds of thinking needed to build understanding. Elizabeth Barkley provides a large collection of discussion techniques focused on different learning goals, ranging from lower-level to higher-level thinking (Barkley, 2010). The CFT's Joe Bandy has summarized some of the most useful of these techniques.

Other Approaches

There are other active learning pedagogies, many of which are highly structured and have dedicated websites and strong communities. These include team-based learning (TBL), process-oriented guided inquiry learning (POGIL), peer-led team learning, and problem-based learning (PBL). Further, the flipped classroom model is based on the idea that class time will be spent with students engaged in active learning.

Flipped Classroom

Flipped classroom has become something of a buzzword in the last several years, driven in part by high profile publications in *The New York Times* (Fitzpatrick, 2012); *The Chronicle of Higher Education* (Berrett, 2012); and *Science* (Mazur, 2009); In essence, "flipping the classroom" means that students gain first exposure to new material outside of class, usually via reading or lecture videos, and then use class time to do the harder work of assimilating that knowledge, perhaps through problem-solving, discussion, or debates.

In terms of Bloom's revised taxonomy (2001), this means that students are doing the lower levels of cognitive work (gaining knowledge and comprehension) outside of class, and focusing on the higher forms of cognitive work (application, analysis, synthesis, and/or evaluation) in class, where they have the support of their peers and instructor. This model contrasts with the traditional model in which "first exposure" occurs via lecture in class, with students assimilating knowledge through homework; thus the term *flipped classroom.*

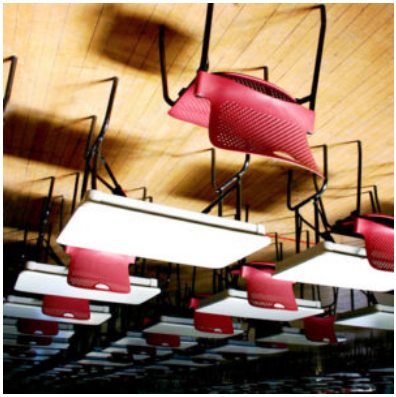
To ensure that students do the preparation necessary for productive class time, some proponents propose an assignment-based model in which students produce work (writing, problems, etc.) prior to class. The students receive productive feedback through the processing activities that occur during class, reducing the need for the instructor to provide extensive written feedback on the students' work.

One or more interactive elements has been excluded from this version of the text. You can view them online

here:
https://edpsych.pressbooks.sunycreate.cloud/?p=125#oembed-1

Video 8.10.1. *The Flipped Classroom Model* explains the process of flipping the classroom.

Inverted Classroom



Maureen Lage, Glenn Platt, and Michael Treglia described a similar approach as the **inverted classroom**, and reported its application in an introductory economics course in 2000. Lage, Platt, and Treglia initiated their experiment in response to the observation that the traditional lecture format is incompatible with some learning styles. To make their course more compatible with their students' varied learning styles, they designed an inverted classroom in which they provided students with a variety of tools to gain first exposure to material outside of class: textbook readings, lecture videos,

Powerpoint presentations with voice-over, and printable Powerpoint slides.

To help ensure student preparation for class, students were expected to complete worksheets that were periodically but randomly collected and graded. Class time was then spent on activities that encouraged students to process and apply economics principles, ranging from mini-lectures in response to student questions to economic experiments to small group discussions of application problems. Both student and instructor response to the approach was positive, with instructors noting that students appeared more motivated than when the course was taught in a traditional format.

Peer Instruction

Eric Mazur and Catherine Crouch describe a modified form of the flipped classroom that they term **peer instruction** (2001). Like the approaches described by Walvoord and Anderson and Lage, Platt, and Treglia, the peer instruction (PI) model requires that students gain first exposure prior to class, and use assignments (in this case, quizzes) to help ensure that students come to class prepared. Class time is structured around alternating mini-lectures and conceptual questions. Importantly, the conceptual questions are not posed informally and answered by student volunteers as in traditional lectures; instead, all students must answer the conceptual question, often via "clickers", or handheld personal response systems, that allow students to answer anonymously and that allow the instructor to see (and display) the class data immediately. If a large fraction of the class (usually between 30 and 65%) answers incorrectly, then students reconsider the question in small groups while instructors circulate to promote productive discussions. After discussion, students answer the conceptual question again. The instructor provides feedback, explaining the correct answer, and following up

with related questions if appropriate. The cycle is then repeated with another topic, with each cycle typically taking 13-15 minutes.

Mazur and colleagues have published results suggesting that the PI method results in significant learning gains when compared to traditional instruction (2001). In 1998, Richard Hake gathered data on 2084 students in 14 introductory physics courses taught by traditional methods (defined by the instructor as relying primarily on passive student lectures and algorithmic problem exams), allowing him to define an average gain for students in such courses using pre/post-test data. Hake then compared these results to those seen with interactive engagement methods, defined as "heads-on (always) and hands-on (usually) activities which yield immediate feedback through discussion with peers and/or instructors" (Hake p. 65) for 4458 students in 48 courses. He found that students taught with interactive engagement methods exhibited learning gains almost two standard deviations higher than those observed in the traditional courses (0.48 +/- 0.14 vs. 0.23 +/- 0.04). Assessment of classes taught by the PI method provides evidence of even greater learning gains, with students in PI courses exhibiting learning gains ranging from 0.49 to 0.74 over eight years of assessment at Harvard University (Crouch and Mazur, 2001). Interestingly, two introductory physics classes taught by traditional methods during the assessment period at Harvard show much lower learning gains (0.25 in a calculus-based course in 1990 and 0.40 in an algebra-based course in 1999).

Carl Wieman and colleagues have also published evidence that flipping the classroom can produce significant learning gains (Deslauriers et al., 2011). Wieman and colleagues compared two sections of a large-enrollment physics class. The classes were both taught via interactive lecture methods

for the majority of the semester and showed no significant differences prior to the experiment. During the twelfth week of the semester, one section was "flipped," with the first exposure to new material occurring prior to class via reading assignments and quizzes, and class time devoted to small group discussion of clicker questions and questions that required written responses. Although class discussion was supported by targeted instructor feedback, no formal lecture was included in the experimental group. The control section was encouraged to read the same assignments prior to class and answered most of the same clicker questions for summative assessment but was not intentionally engaged in active learning exercises during class. During the experiment, student engagement increased in the experimental section (from 45 +/- 5% to 85 +/- 5% as assessed by four trained observers) but did not change in the control section. At the end of the experimental week, students completed a multiple-choice test, resulting in an average score of 41 +/- 1% in the control classroom and 74 +/- 1% in the "flipped" classroom, with an effect size of 2.5 standard deviations. Although the authors did not address the retention of the gains over time, this dramatic increase in student learning supports the use of the flipped classroom model.

Theoretical Basis

How People Learn, the seminal work from John Bransford, Ann Brown, and Rodney Cocking, reports three key findings of the science of learning, two of which help explain the success of the flipped classroom. Bransford and colleagues assert that

> *To develop competence in an area of inquiry, students must: a) have a deep foundation of factual knowledge, b) understand facts and ideas in the context of a conceptual framework, and*

> c) *organize knowledge in ways that facilitate retrieval and application* (Bransford et al., 2000, p. 16).

By providing an opportunity for students to *use* their new factual knowledge while they have access to immediate feedback from peers and the instructor, the flipped classroom helps students learn to correct misconceptions and organize their new knowledge such that it is more accessible for future use. Furthermore, the immediate feedback that occurs in the flipped classroom also helps students recognize and think about their own growing understanding, thereby supporting Bransford and colleagues' third major conclusion:

> A '*metacognitive*' *approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them* (Bransford et al., 2000, p. 18).

Although students' thinking about their own learning is not an inherent part of the flipped classroom, the higher cognitive functions associated with class activities, accompanied by the ongoing peer/instructor interaction that typically accompanies them, can readily lead to the metacognition associated with deep learning.

Key Elements of the Flipped Classroom

1. Provide an opportunity for students to gain first exposure prior to class.

The mechanism used for first exposure can vary, from simple textbook readings to lecture videos to podcasts or screencasts.

Content can be created by the instructor or found online on YouTube, the Khan Academy, MIT's OpenCourseWare, Coursera, or other similar sources. The pre-class exposure doesn't have to be high-tech, however; in the Deslauriers, Schelew, and Wieman study described above, students simply completed pre-class reading assignments.

2. Provide an incentive for students to prepare for class.

In all the examples cited above, students completed a task associated with their preparation and that task was associated with points. The assignment can vary; the examples above used tasks that ranged from online quizzes to worksheets to short writing assignments, but in each case, the task provided an incentive for students to come to class prepared by speaking the common language of undergraduates: points. In many cases, grading for completion rather than effort can be sufficient, particularly if class activities will provide students with the kind of feedback that grading for accuracy usually provides.

3. Provide a mechanism to assess student understanding.

The pre-class assignments that students complete as evidence of their preparation can also help both the instructor and the student assess understanding. Pre-class online quizzes can allow the instructor to practice Just-in-Time Teaching (JiTT; Novak et al., 1999), which basically means that the instructor tailors class activities to focus on the elements with which students are struggling. If automatically graded, the quizzes can also help

students pinpoint areas where they need help. Pre-class worksheets can also help focus student attention on areas with which they're struggling and can be a departure point for class activities, while pre-class writing assignments help students clarify their thinking about a subject, thereby producing richer in-class discussions. Importantly, much of the feedback students need is provided in class, reducing the need for instructors to provide extensive commentary outside of class (Walvoord and Anderson, 1998). In addition, many of the activities used during class time (e.g., clicker questions or debates) can serve as informal checks of student understanding.

4. Provide in-class activities that focus on higher-level cognitive activities.

If the students gained basic knowledge outside of class, then they need to spend class time to promote deeper learning. Again, the activity will depend on the learning goals of the class and the culture of the discipline. For example, Lage, Platt, and Treglia described experiments students did in class to illustrate economic principles (2000), while Mazur and colleagues focused on student discussion of conceptual "clicker" questions and quantitative problems focused on physical principles (2001). In other contexts, students may spend time in class engaged in debates, data analysis, or synthesis activities. The key is that students are using class time to deepen their understanding and increase their skills at using their new knowledge.

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Just-In-Time Teaching (JiTT)

Just-in-Time Teaching (JiTT) is a teaching and learning strategy designed to promote the use of class time for more active learning. Developed by Gregor Novak and colleagues, JiTT relies on a feedback loop between web-based learning materials and the classroom (Novak et al., 1999). Students prepare for class by reading from the textbook or using other resources posted to the web and by completing assignments (called WarmUps and Puzzles) online. These assignments often have complex answers; students' work outside class serves as preparation for more complete work in class. The students' answers are delivered to the instructor a few hours before class starts, allowing the instructor to adapt the lesson as needed. Importantly, JiTT allows the instructor to create an interactive classroom environment that emphasizes active learning and cooperative problem-solving.

Types of JiTT Activities

WarmUps are short, web-based assignments designed for students to complete before receiving instruction on a topic. They prompt students to think about the upcoming lesson and to answer a few simple questions before class to prepare them to develop more complex answers in cooperative groups in class. Class time can focus on the points for which students need more help, and it can be structured around specific student responses, allowing an element of personalization. An example from Biology is shown here.

Puzzles are short, web-based assignments that are designed to help structure a wrap-up session on a topic that has already been covered in a class. They provide closure and often integrate concepts. An example from Mathematics is shown here.

GoodFors are enrichment essays that help students connect the class to the real world, help keep material fresh, and are starters for classroom discussion. An example from Physics is shown here.

The goal of the JiTT assignments is for students to come to class prepared, engaged, and motivated.

The Theoretical Basis for JiTT

Kathleen Marrs and Gregor Novak suggest that Just-in-Time Teaching incorporates three major elements that are important for helping students learn (2004).

1) **Just-in-Time Teaching incorporates active learning approaches**. By moving the "content-transfer" element of the course to pre-class preparation and focusing class time on cooperative problem solving, JiTT encourages the active learning approaches that have been found to promote learning (National Research Council (NRC), 2000; Hake (1998); Paulson 1999, Udovic et al., 2002).

2) **Just-in-Time Teaching provides structured opportunities for students to actively construct new knowledge from prior knowledge**.

This theory of learning, termed "constructivism," was developed by Piaget and others, and posits that learners build new understandings on existing attitudes, experiences, and knowledge (Kujawa and Huske, 1995). Pre-existing misconceptions can serve as barriers to the development of new, more accurate mental models. Effective learning requires that students uncover and address preexisting knowledge and misconceptions. Just-in-Time Teaching incorporates this element regularly through the use of the

WarmUps, which can help reveal misconceptions and prior knowledge and help focus class activities on the elements that need the most thought.

3) **Just-in-Time Teaching provides prompt feedback**. *How People Learn* notes that the best learning environments are assessment-centered, and emphasizes that formative assessment is particularly valuable for learners because it provides opportunities for learners to adjust or clarify their thinking prior to a summative assessment (such as a graded exam). This is a key element of JiTT, occurring during essentially every class meeting through instructor responses to the WarmUps that students submit in preparation for the class.

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Team-Based Learning (TBL)

Team-based learning (TBL) is a model of classroom instruction similar to that of a 'flipped classroom' in that the students' first introduction to the fundamental material is done outside of the classroom (Demetry, 2010). For example, students are expected to grasp the essential concepts from the assigned readings or videos prior to coming to class. The class time is spent clarifying and applying the information that they learned outside of class. However, TBL differs from other flipped-classroom models in that the application exercises are done through team interactions, guided by the instructor, around specific problems. Another difference is that each unit of study must begin with an assessment of students' understanding of the prepared content, and is followed by an ordered method for structuring class time.

TBL is a model for course instruction, not just a teaching strategy that can be employed on occasion (Fink, 2004). TBL creator, Larry Michaelsen (2004), suggests that this model requires a paradigm shift in how an instructor approaches teaching, as embracing TBL often results in significant changes to instructional objectives, views on how learning occurs, and expectations for the instructor and student roles. Instructors move away from emphasizing content coverage toward the application of course concepts. They are no longer the masters of content, responsible for the distribution of knowledge, but instead act as designers and managers of student learning experiences. Their instructional planning focuses on designing application exercises that require students to solve problems, make decisions, and engage in team discussions. Consequently, students need to be engaged and accountable for their own learning inside and outside of the classroom, rather than focusing on memorizing content disbursed by the instructor.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=127#oembed-1

Video 8.12.1. *Team-Based Learning* explains the process of implementing this model.

Principles of Team-Based Learning

Michaelsen (2004) believes that this shift in emphasis will occur under the four essential principles of TBL. These principles include the following: proper team formation and management; student accountability, both individual and team; use of team activities to promote learning and team development; and frequent and immediate feedback on student learning.

Team Formation and Management

Teams should be permanent and large enough to bring diversity to the team decision-making process; Michaelsen's (2004) recommendation is five to seven members per team. Team formation is managed by the instructor in class so that it is transparent to the students and done in a way that will break up any previously established subgroups, as perceived favoritism of other teams or previously established relationships may interfere with the development of team cohesiveness. To make teams more evenly matched and better prepared to solve problems together, student

talents and resources, as well as liabilities, should be distributed among the teams (Michaelsen, 2004).

Student Accountability

Student accountability is established by constructing systems for monitoring the quality of individual and team contributions and building in mechanisms for consequences that are dependent upon that quality of work. This includes graded individual readiness assurance tests (iRATs) and team readiness assurance tests (tRATs), team performance on application activities and summative assessments, and assessment of a team member's contributions and performance by the teammates (Birmingham & McCord, 2004).

Use of Team Activities

Team activities are not only meant to assist students in exploring and learning course concepts but also encourage group cohesion and the development of communication and teamwork among members. Well-designed activities will promote discussion and shared decision-making for more complex and well-developed answers (Michaelsen & Knight, 2004). Michaelsen (2004) recommends that all team activities adhere to the '4S' framework; activities should be significant problems, the same problem, require a specific choice, and choices should be reported spontaneously. Significant problems are meaningful to students and complex enough to promote team discussion. All teams should work on the same problem at the same time to elicit greater team investment in class-wide discussions and debriefings, as well as, gain a deeper understanding through comparison and critique of the other teams' choices. Problems should have specific choices with a clearly-

defined answer. Finally, teams should present their choices to the class simultaneously, encouraging team accountability for their choices and preventing teams from changing their choice after hearing from other teams. Simultaneous reporting may also create an atmosphere of engagement through anticipation, excitement, and competition.

Frequent and Immediate Feedback

Frequent and immediate feedback is essential for team-based learning for two reasons. First, feedback is important for learning and retaining content. Second, feedback is important for group development. From the beginning, teams will need feedback to gauge how effectively they work together, which team strategies work and which do not, and their understanding of the concepts that they are discussing (Michaelsen, 2004).

Team-Based Learning Process

TBL requires students to work together in teams on a three-part sequenced set of learning activities: a preparation phase, application phase, and assessment phase. In the preparation phase, students are engaging with materials outside of class to introduce the concept, followed by the completion of the individual readiness assurance test (iRAT) and the team readiness assurance test (tRAT), and finally, brief instruction on challenging concepts needing clarification. During the application phase, students are asked to apply concepts to make predictions, solve problems and create explanations for complex problems. Finally, during the assessment phase, a final problem is presented to the students to assess their mastery of the concepts (Fink, 2004).

1. Preparation Phase

The preparation phase or readiness assurance process (RAP) begins prior to the start of each module or unit of study and is meant to confirm that the students are prepared with the fundamental knowledge necessary for the application phase. Students are assigned specific materials to prepare them with the essential concepts for that module. The assigned materials may be readings, videos, or audio recordings, which are to be completed outside of class time and prior to the first class for which the content was applied. On the first day of class for that module, students complete a two-part readiness assurance test (RAT); a brief multiple-choice assessment of students' comprehension of the assigned content. The first part of the RAT is the individual readiness assurance test (iRAT), done independently. The second part of the RAT is the team readiness assurance test (tRAT), a team test that is comprised of the same set of questions as the iRAT. The two scores are then averaged together for a single RAT score (the weights of the scores may vary by course) (Michaelsen, 2004).

Immediate feedback is an important aspect of the TBL model, thus the tRAT utilizes a method for immediate feedback. One popular tool for immediate team feedback is the immediate feedback assessment technique (IF-AT). The IF-AT (see Figure1) is a card with squares that can be scratched off by the students. Each row of squares corresponds to a test item number and the multiple-choice options, A-B-C-D. The team discusses the question, agrees upon an answer and then a team member scratches their selection to find out whether their choice was correct or not. If the team's choice was incorrect then they may choose a second, third, or even fourth answer for partial credit. This encourages students to continue to discuss the material that they did not understand to find the correct answer, rather than getting the item wrong and just moving on without any further clarification.

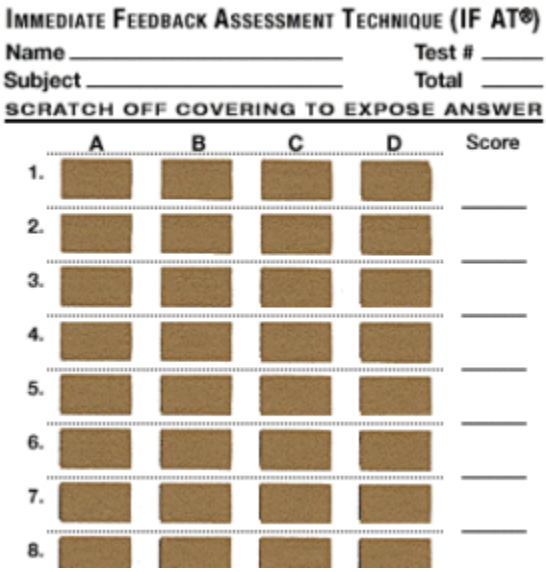

Figure 8.12.1. Immediate feedback assessment technique (IF-AT) scratch card for tRAT. From IF-AT Demonstration: Step 1, by Epstein Educational Enterprises, 2009, http://www.epsteineducation.com/home/demo/demo1.htm. Reprinted with permission.

Once the RAT process is complete, the team may decide to appeal any questions they missed that they believe should be correct. The appeal process requires the team to justify the reason for the appeal, as well as find and cite the correct answer in a written appeal to the instructor. This encourages further review of the material. Appeals are reviewed by the instructor after class, and RAT scores may be adjusted if the appeal is approved.

As the teams turn in their IF-AT cards, the instructor will examine the tRAT answers to look for continued difficulties with understanding concepts. The issues are reviewed in a brief corrective instruction that follows the completion of the RAT. Once

assured that students have an understanding of the material for the module, the team application activities may begin.

2. Application Phase

Where the readiness assurance process is estimated to take fifty to seventy minutes, the application activities should be significantly longer, typically three to five hours. The design of the application activities should follow the '4S' framework highlighted by Michaelsen (2004). The teams should be given a *significant* problem, the *same* problem, with a *specific* choice, and they should be *simultaneously* reporting their answers. Activities start out simple and become more complex as students build upon previous experiences. Again, an important aspect of the application process includes constant and specific feedback to the teams regarding their responses. Sometimes this feedback comes from the instructor, but often the feedback comes from teammates or other teams. When students have the opportunity to share, compare, and defend their answers they get feedback as to whether their answer is correct and justified. Students also get to witness how others solve problems and consider alternative ways to approach a problem.

3. Assessment Phase

The last phase of the module is assessment. These assessments may be administered to the team or individual students and might include graded problems to solve, traditional exams, peer evaluations, or other forms of assessment. Once the three phases are complete, the entire process can begin again with a new module.

Michaelsen (2004) suggests dividing a course into five to seven modules.

Effects of TBL on Learning Outcomes

A number of studies have examined the effectiveness of TBL in meeting course objectives and learning outcomes. Several studies have found improvements in pretest-posttest outcomes, student learning through team interaction, and higher test scores for TBL students when compared to other instructional methods. However, not all studies have corroborated that TBL is a superior instructional method, but have confirmed that TBL is at least as effective as other methods.

There are documented differences in the level and types of engagement of students in TBL classes. Instructors have observed that students appear more engaged with each other than with a comparison lecture-only course (Hunt et al., 2003). It is not to say that there is no engagement in lecture classes. Kelly et al. (2005) found that students in lecture had significantly more interactions with their teachers than students in TBL classes, while students in TBL courses had significantly more learner-to-learner interactions. Compared to Problem-Based Learning (PBL), students in TBL courses had significantly more interactions with their instructors than students in PBL courses. The students in the TBL group also perceived their level of engagement to be higher, rating their individual and team members' engagement as high (Bick et al., 2009). Similar differences have been found in student-rated engagement in class between TBL and lectures courses, with TBL students rating engagement as significantly higher (Clark et al., 2008).

Participation in TBL has also been found to positively influence students' attitudes toward teamwork. The exception to this trend was among students who were the top academic performers.

Students who have been highly successful in traditional academic settings were found to have more negative attitudes about TBL (Epsey, 2010).

Effects of TBL on Course Evaluation

Course satisfaction is a broad category and can be qualified in many different ways. Most often, studies have collected student-reported levels of satisfaction on course evaluation items. Overall, student attitudes about TBL have been positive (Haberyan, 2007). Many students have responded to TBL with high satisfaction (Abdelkhalek, Hussein, Gibbs, & Hamdy, 2010), even rating the TBL methodology as excellent (Touchet & Coon, 2005). Beatty et al. (2009) reported that 91% of students felt that TBL helped improve their understanding of course content and 93% of students encouraged continued use of TBL. Students reported that TBL helped them improve critical and independent thinking skills (McInerney & Fink, 2003). When comparing students in TBL classes to students in lecture classes, TBL students rated classroom engagement, perceptions of effectiveness, and enjoyment significantly higher (Levine et al., 2004). Feingold et al. (2008) found that students felt that TBL helped them learn how to apply concepts in clinical situations, how to become more accountable students, and how to learn through discussion. Participants in Kühne-Eversmann & Fischer's (2013) study rated the interactivity and team-based discussions as reasons for their learning and also anticipated that the course would influence their behavior. In fact, participants did show an increase in specific course-taught behaviors, while the control group showed a decline in the same behaviors.

Not all course evaluation reports have been positive about TBL. Lancaster and Strand (2001) compared student perceptions of the course and the instructor and found no difference between the TBL and lecture students. Letassy et al. (2008) found higher course

evaluations for the lecture group over the TBL group. Focus group interviews indicated that students felt that their team members were not enthusiastic about TBL (Hunt et al., 2003). Student interviews also found that students were uncomfortable with the RAT testing process and were concerned about the impact of team grading on their scores (Feingold et al., 2008).
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Experiential and Applied Learning

Experiential learning is the *active engagement of students in learning through doing, and reflecting on those activities.* This experience and reflection enable them to apply theoretical and abstract concepts to practical contexts. Experiential learning takes various shapes and takes place in various settings.

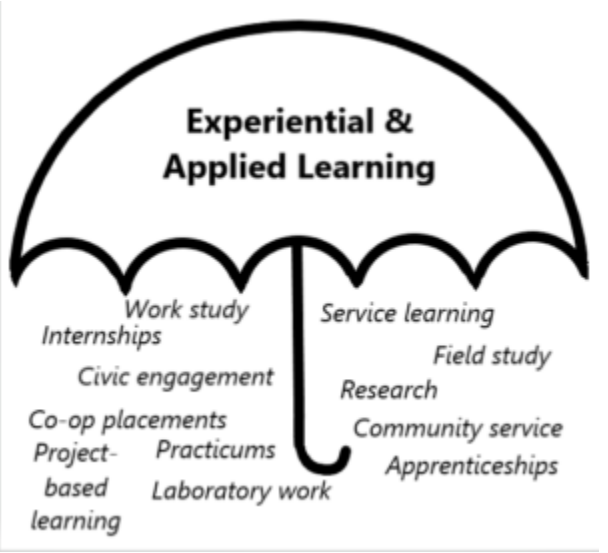

Figure 8.13.1. Experiential design models.

Learning that is considered "experiential" contains all the following elements: reflection, critical analysis, and synthesis, and opportunities for students to take initiative, make decisions, and be accountable for the results. It provides opportunities for students to engage intellectually, creatively, emotionally, socially, or physically.

There are several benefits to employing experiential learning:

- **Increases student motivation to learn.** When students are engaged in learning experiences that they see the relevance of, and the product has more significance than a grade, they have increased motivation to learn and produce a more thoughtful product. Experiential learning stimulates academic inquiry to enrich and apply the content students are learning, as well as encountering authentic opportunities for applying their learning to motivate students.
- **Produces more autonomous learners.** To solve problems and complete tasks in unfamiliar situations in a real-world context, students need to figure out what they know, what they do not know, and how to learn it.

- **Reflection deepens learning.** Students transfer their previous learning to new contexts, master new concepts, principles, and skills, as well as articulate how they developed this mastery.

- **Most transferable and marketable skills are forged in "real world" settings.** Real-world competencies such as civic engagement, teamwork, and leadership that most employers look for in candidates, are best practiced in the "real world" not sitting in a classroom. These skills need to be practiced in many different settings. They are not "remembered" but instilled by using and honing them through practice.

Experiential Learning Design Principals

Experiential learning focuses on learners reflecting on their experience of doing something, so as to gain conceptual insight as well as practical expertise. Kolb's experiential learning model suggests four stages in this process: active

experimentation, concrete experience, reflective observation, and abstract conceptualization.

- **Activity.** Do something–anything, in fact. Run a meeting, give a presentation, and have a difficult conversation. (One of the most valuable aspects of this model is the way in which it allows us to turn every experience into a learning opportunity.
- **Reflect.** Look back on your experience and assess the results. Determine what happened, what went well, and what didn't.
- **Conceptualize.** Make sense of your experience. Seek to understand *why* things turned out as they did. Draw some conclusions and make some hypotheses.
- **Apply.** Put those hypotheses to the test. Don't simply *re-act*. Instead, have a conscious plan to do things differently to be more effective. And begin the cycle again.

There are parallels between the experiential learning cycle as we typically define it (based on Kolb's work), and Roger Greenaway's Active Reviewing Cycle, and Chris Argyris and David Schon's work on Theories of Action. These models aren't identical, but they're similar enough that they can be overlaid on a 4-stage cycle.

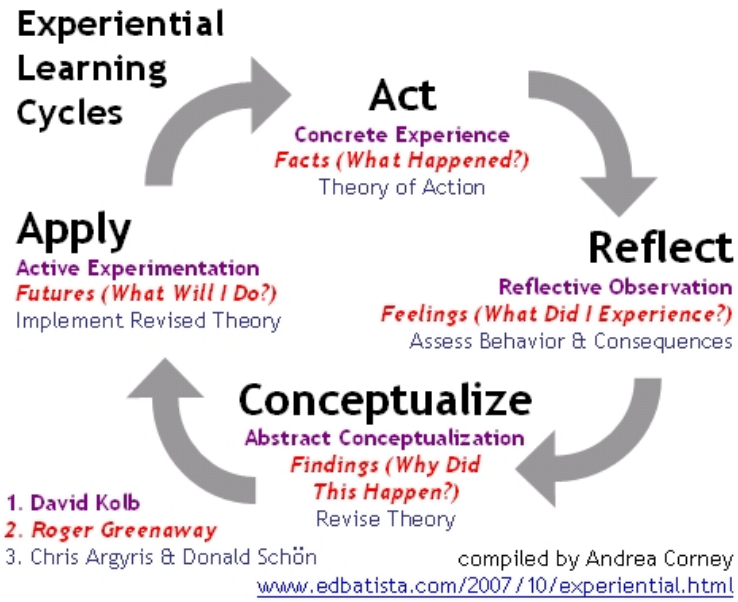

Figure 8.13.2. An integrated model of experiential learning cycles.

Experiential Learning Design Models

There are many options for including experiential and applied learning in the classroom and out. We will review a few design models.

Community Engagement

Community engagement pedagogies, often called "service learning," are ones that combine learning goals and community service in

ways that can enhance both student growth and the common good. In the words of the National Service Learning Clearinghouse, it is "a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities." Or, to quote Vanderbilt University's Janet S. Eyler (winner of the 2003 Thomas Ehrlich Faculty Award for Service Learning) and Dwight E. Giles, Jr., it is

> *a form of experiential education where learning occurs through a cycle of action and reflection as students. . . seek to achieve real objectives for the community and deeper understanding and skills for themselves. In the process, students link personal and social development with academic and cognitive development. . . experience enhances understanding; understanding leads to more effective action.*

Typically, community engagement is incorporated by way of a project that has both learning and community action goals. This project is designed via collaboration between faculty and community partners, such as non-governmental organizations or government agencies. The project asks students to apply course content to community-based activities. This gives students experiential opportunities to learn in real-world contexts and develop skills of community engagement while affording community partners opportunities to address significant needs. Vanderbilt University's Sharon Shields has argued that service-learning is "one of the most significant teaching methodologies gaining momentum on many campuses."Indeed, when done well, teaching through community engagement benefits students, faculty, communities, and institutions of higher education. Below are some of the benefits that education researchers and practitioners have associated with community-engaged teaching.

Student Benefits of Community Engagement

- **Learning Outcomes.** Students experience a positive impact on academic learning, improved ability to apply what they have learned in "the real world," gains in the complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development, as well as improved ability to understand complexity and ambiguity.
- **Personal Outcomes.** Students gain a greater sense of personal efficacy, personal identity, spiritual growth, and moral development, as well as greater interpersonal development, particularly the ability to work well with others and build leadership and communication skills.
- **Social Outcomes.** These experiences reduce stereotypes and increase greater inter-cultural understanding, improve social responsibility and citizenship skills, as well as increase the likelihood of involvement in community service after graduation
- **Career Development.** Students make connections with professionals and community members for learning and career opportunities and greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.
- **Relationship with the Institution.** Students have stronger relationships with faculty, greater satisfaction with college, and improved graduation rates.

As you might suspect, though, making service learning successful is not automatic. For one thing, service-learning lends itself well only to certain curriculum areas (for example, community studies or social studies). For another, some students may initially resist service-learning, wondering whether it benefits them personally as students (Jones, Gilbride-Brown, & Gasiorski, 2005). Also, some service projects may inadvertently be invented only to benefit students, without adequate consultation or advice from community members. Bringing food hampers to low-income families may seem

like a good idea to middle-class students or instructors, but some families may perceive this action less as a benefit than as an act of charity which they therefore resent. But none of these problems are insurmountable. Evaluations generally find that service-learning, when done well, increases students' sense of moral empowerment as well as their knowledge of social issues (Buchanan, Baldwin, & Rudisill, 2002). Like many other educational practices, insuring success with service learning requires doing it well.

Problem-Based Learning

The earliest form of systematized problem-based learning (PBL) was developed in 1969 by Howard Barrows and colleagues in the School of Medicine at McMaster University in Canada, from where it has spread to many other universities, colleges, and schools. This approach is increasingly used in subject domains where the knowledge base is rapidly expanding and where it is impossible for students to master all the knowledge in the domain within a limited period of study. Working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to the resolution of the problem. The role of the instructor (usually called a tutor in classic PBL) is critical in facilitating and guiding the learning process.

Usually, PBL follows a strongly systematized approach to solving problems, although the detailed steps and sequence tend to vary to some extent, depending on the subject domain. The following is a typical example:

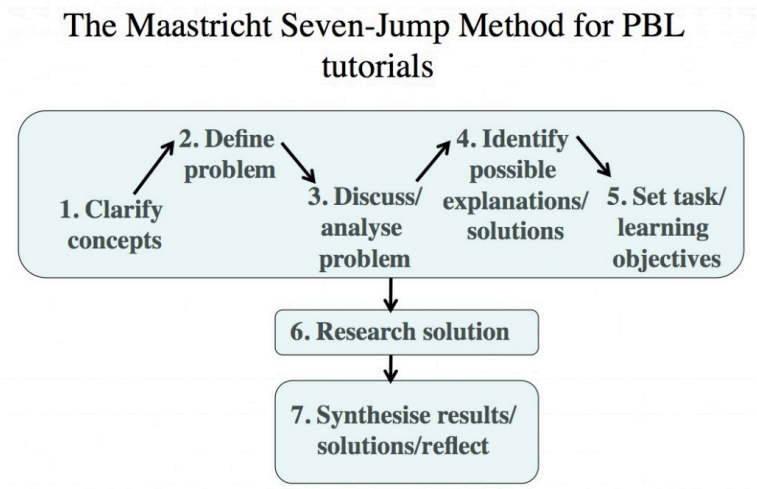

Figure 8.13.2. Problem-based learning method (derived from Gijeselaers, 1995).

Traditionally, the first five steps would be done in a small face-to-face class tutorial of 20-25 students, with the sixth step requiring either individual or small group (four or five students) private study, with the seventh step being accomplished in a full group meeting with the tutor. However, this approach also lends itself to blended learning in particular, where the research solution is done mainly online, although some instructors have managed the whole process online, using a combination of synchronous web conferencing and asynchronous online discussion.

Developing a complete problem-based learning curriculum is challenging, as problems must be carefully chosen, increasing in complexity and difficulty over the course of study, and problems must be chosen so as to cover all the required components of the curriculum. Students often find the problem-based learning approach challenging, particularly in the early stages, where their foundational knowledge base may not be sufficient to solve some of the problems. (The term 'cognitive overload' has been used to

describe this situation.) Others argue that lectures provide a quicker and more condensed way to cover the same topics. Assessment also has to be carefully designed, especially if a final exam carries heavy weight in grading, to ensure that problem-solving skills, as well as content coverage, are measured.

However, research (see, for instance, Strobel and van Barneveld, 2009) has found that problem-based learning is better for long-term retention of material and developing 'replicable' skills, as well as for improving students' attitudes towards learning. There are now many variations on the 'pure' PBL approach, with problems being set after initial content has been covered in more traditional ways, such as lectures or prior reading, for instance.

Apprenticeships

Apprenticeship is a particular way of enabling students to learn by doing. Learning by doing is particularly common in teaching motor skills, such as learning to ride a bike or play a sport, but examples can also be found in education, such as vocational training, practicums, internships, and laboratory study. It is often associated with vocational training where a more experienced tradesman or journeyman models behavior, the apprentice attempts to follow the model, and the journeyman provides feedback. Besides learning motor or behavioral skills, students may also learn how to think like an expert through cognitive apprenticeship. Like motor-skill or behavior apprenticeships, cognitive apprenticeships also involve an experienced person modeling cognitive and metacognitive skills, the student practicing those skills, and the expert providing feedback.

Key Features of Apprenticeship

Schön (1983) argues that apprenticeship operates in '*situations of practice that…are frequently ill-defined and problematic, and characterized by vagueness, uncertainty and disorder*'. Learning in apprenticeship is not just about learning to do (active learning), but also requires an understanding of the contexts in which the learning will be applied. In addition, there is a social and cultural element to learning, understanding, and embedding the accepted practices, customs, and values of experts in the field.

Pratt and Johnson (1998) identify the characteristics of a master practitioner, whom they define as '*a person who has acquired a thorough knowledge of and/or is especially skilled in a particular area of practice*'. Master practitioners:

1. *possess great amounts of knowledge in their area of expertise, and are able to apply that knowledge in difficult practice settings*;
2. *have well-organized, readily accessible schemas (cognitive maps) which facilitate the acquisition of new information*;
3. *have well-developed repertoires of strategies for acquiring new knowledge, integrating and organizing their schemas, and applying their knowledge and skills in a variety of contexts….*;
4. *…are motivated to learn as part of the process of developing their identities in their communities of practice. They are not motivated to learn simply to reach some external performance goal or reward*;
5. *frequently display tacit knowledge in the form of*:
    - *spontaneous action and judgments*;
    - *being unaware of having learned to do these things*;
    - *being unable or having difficulty in describing the knowing which their actions reveal.*

Cognitive Apprenticeship

An *intellectual or cognitive* apprenticeship model is somewhat different because this form of learning is less easily observable than learning motor or manual skills. Pratt and Johnson argue that in this context, master and learner must say what they are thinking during applications of knowledge and skills, and must make explicit the context in which the knowledge is being developed because context is so critical to the way knowledge is developed and applied.

Pratt and Johnson suggest five stages for cognitive and intellectual modeling (p. 99):

1. modeling by the master and development of a mental model/ schema by the learner;
2. learner approximates replication of the model with master providing support and feedback (scaffolding/ coaching);
3. learner widens the range of application of the model, with less support from master;
4. self-directed learning within the specified limits acceptable to the profession;
5. generalizing: learner and master discuss how well the model might work or would have to be adapted in a range of other possible contexts.

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Blended and Online Learning

Whether instructional goals originate from curriculum documents, students' expressed interests, or a mixture of both, students are more likely to achieve the goals if teachers draw on a wide variety of resources. As a practical matter, this means looking for materials and experiences that supplement—or occasionally even replace—the most traditional forms of information, such as textbooks. Precisely what resources to use depend on factors unique to each class, school, or community, but they might include one or more of the following.

The Internet as a Learning Tool

The Internet has become a fixture of modern society, and it offers a huge variety of information on virtually any topic, including any school subject and any possible grade level from kindergarten through university. However, the vastness of the Internet is not entirely a blessing. A major problem is the sheer volume of information available, which can sometimes make searching for a specific topic, article, or document overwhelming and inefficient. The newer search engines (such as Google) can help with this problem, though they do not solve it completely. When searching the term *photosynthesis*, for example, Google and other similar search engines return over fourteen *million* web pages that discuss or refer to this topic in some way! If a teacher is planning a unit about photosynthesis, or if a student is writing an essay about it, which of these web pages will prove most helpful? Choosing among web pages is a new, somewhat specialized form of *computer literacy*, one that can be learned partially by trial-and-error online, but that also benefits from assistance from a teacher or by more experienced peers (Ragains, 2006).

Another problem with the Internet is the inequity of access. Even though virtually all schools now have access of some sort, the access is distributed quite unevenly across communities and income groups (Skinner, Biscope, & Poland, 2003; Parsad & Jones, 2005). Schools vary widely in how much Internet service they can provide. In general, well-to-do schools and those in cities provide more access than those located in less well-off areas or in rural areas—though there are many exceptions. A richly endowed school might have an Internet connection in every classroom as well as multiple connections in a school library or in specialized computer rooms. Students, as well as faculty, would be able to use these facilities, and one or more teachers might have special training in Internet research to help when problems arise. On the other extreme, a school might have only a few Internet connections for the entire school, or even just one, located in a central place like the library or the school office. Usage by students would consequently be limited, and teachers would essentially teach themselves how to search the Internet and how to troubleshoot technical problems when they occur.

In spite of these problems, the Internet has considerable potential for enhancing students' learning, precisely *because* of its flexibility and near universality. Some of the best recent successes involve the creation of a **learning commons** (sometimes also called an *information commons* or *teaching commons*), a combination of a website and an actual, physical place in a school or library that brings together information, students, and teachers so that both (though perhaps especially students) can learn (Haas & Robertson, 2004; Beagle, 2006). A learning commons includes an online library catalog and online Internet service, but it also offers other services: online information and advice about study skills, for example, as well as access to peer tutors and support groups, either online or in-person, that can help with difficulties about writing or doing assignments. As you might suspect, using a learning commons effectively sometimes requires reorganizing certain features of

teaching and learning, chiefly toward greater explicit collaboration among students and teachers.

Blended and Online Learning

Online courses are those in which at least 80 percent of course content is delivered online. Blended (sometimes called hybrid) instruction has between 30 and 80 percent of the course content delivered online with some face-to-face interaction. Blended and online courses not only change how content is delivered, but they also redefine traditional educational roles and provide different opportunities for learning. As described by Palloff and Pratt (2013):

> *The online classroom is a potentially powerful teaching and learning arena in which new practices and new relationships can make significant contributions to learning. In order to harness the power this creates in education, instructors must be trained not only to use technology but also to shift the ways in which they organize and deliver material. Making this shift can increase the potential for learners to take charge of their own learning process and facilitate the development of a sense of community among them* (p.30).

Research on Blended and Online Learning

In 2010, the U.S. Department of Education released a meta-analysis and review of empirical studies focused on online learning in K-12 schools and higher education from 1996 to 2008. Their findings revealed that "students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction" (p. xvi). In addition, they

reported that blended instruction combining online and face-to-face elements had a larger advantage than purely online instruction (Means, Toyama, Murphy, Bakia & Jones, 2010).

Although these results suggest that blended learning environments can provide a learning advantage when compared to purely face-to-face instruction, the researchers emphasized the findings "do not demonstrate that online learning is superior as a *medium*...It was the *combination* of elements in the treatment conditions (which was likely to have included additional learning time and materials as well as additional opportunities for collaboration) that produced the observed learning advantages" (p. xviii, original emphasis). In other words, it's important for the instructor to create an interactive, supportive, and collaborative learning environment for students to reap the potential benefits afforded by online learning.

Elements of Successful Online and Blended Learning

As noted above, the research suggests that when facilitated effectively, online education can not only match but also surpass traditional face-to-face learning (Means et al., 2010). Here are some of the potential benefits of online education:

- **Learner-Centered Education:** Palloff and Pratt (2013) explain that an effective online instructor is someone "who is open to giving up control of the learning process" by making students active participants in their learning process (p. 24). A learner-centered approach acknowledges what students bring to the online classroom—their background, needs, and interests—and what they take away as relevant and meaningful outcomes. With the instructor serving as a facilitator, students are given more control and responsibility around how they learn,

including the opportunity to teach one another through collaboration and personal interactions (Palloff & Pratt, 2013).

- **Collaborative & Interactive Learning:** Research has found that online instruction is more effective when students collaborate rather than work independently (Means et al., 2010; Schutte, 1996). There are a variety of ways for students to collaborate online, including synchronous and asynchronous discussions and small group assignments. In addition, the relative anonymity of online discussions helps to create a "level playing field" for quieter students or those from typically marginalized groups. When posed questions in advance, students have the opportunity to compose thoughtful responses and have their voices heard, as well as respond to one another in a manner not usually afforded by face-to-face instruction (Kassop, 2003).

- **Metacognitive Awareness:** Since online learners have more autonomy and responsibility for carrying out the learning process, it's important that students understand which behaviors help them learn and apply those strategies proactively. This awareness and knowledge of one's personal learning process involve increased metacognition—a key practice for student success (Bransford, Brown & Cocking, 2000).

- **Increased Flexibility:** Online learning offers more flexibility because students can control when and where they learn. By self-monitoring their time and pacing, students are able to spend more time on unfamiliar or difficult content (Aslanian & Clinefelter, 2012).

- **Immediate Feedback:** Online learners generally have greater access to instructors via email and are able to have questions answered by their peers in a timely fashion on discussion boards. In addition, online tests and quizzes can be

constructed with automatic grading capability that provides timely feedback (Kassop, 2003). Immediate and continual feedback throughout the learning process is beneficial for gaining an understanding of difficult concepts, as well as triggering retrieval mechanisms and correcting misconceptions (Thalheimer, 2008).

- **Multimodal Content:** The Internet provides an abundance of interactive and multimodal materials that can be used to increase engagement and appeal to diverse learners.

Good Practices for Blended and Online Learning

Designing Your Online Course

- **Know Your Learner:** A recent survey of 1,500 individuals nationwide, who were recently enrolled, currently enrolled, or planning to enroll in an online course found that a wide variety of students were drawn to online learning (Aslanian & Clinefelter, 2012). However, they also identified the following key themes in online students' responses:
    - Most online students have several responsibilities in life, so they seek convenience and flexibility when furthering their education. Millions of post-secondary students have turned to online education because it enables them to fit education around their work and family responsibilities and to study anytime and anywhere (p. 16).
    - Online students unquestionably value independence, self-direction, and control online education offers them. Among several factors that drive them to online programs, students most often point to "the ability to study when and where I want" and "the ability to study at my own

pace" (p. 17).

As you design your course, it's important to develop as comprehensive a picture as possible of the specific students who will be enrolling in the class (Angelino, Williams & Natvig, 2007). Gaining a sense of their prior knowledge and technology competency will help you to know what support they will need and tailor your instruction accordingly. A few ways to gain these insights include asking students to complete an online survey, concept inventory, or pre-assessment. In addition, students can reflect on their prior knowledge and experiences through an online discussion or blog post.

- **Develop Learning Goals:** As with face-to-face instruction, it's imperative, to begin with the end in mind by developing learning goals first (Froyd, 2008). Ask yourself, what are the key concepts and/or skills students need to master by the end of the course? The answer to this question will help in developing course content, activities, and assessments that align with your learning goals, as well as choosing the appropriate technology (Caulfield, 2011).

- **Have Clear Expectations:** Present clear guidelines for participation in the class, as well as specific information for students about course expectations and procedures. In addition, use rubrics to clearly communicate learning objectives and grading criteria for each learning activity in the course (e.g., quality online discussions) and incorporate them into student assessments (Palloff & Pratt, 2013).

Organizing Course Content

- **Provide an obvious path through the material, and make sure guideposts are clear to the student.** Savery (2005) explains

that organization is essential since online learners need to fit the course into their crowded schedules. He emphasizes the importance of posting course assignments and due dates early and having clear directions. Shea and colleagues (Shea, Fredericksen, Pickett & Pelz, 2003; Shea, Pickett & Pelz, 2003) also explained the importance of clearly labeling and organizing course-level and section-level materials in order to create a path that students can follow.

- **Organize the content in logical units, or modules, in which each module is organized around a major topic and contains relevant objectives, material, and associated activities**. In the introduction to the module, including information about how long the student should expect to spend working on the module. This helps to keep students moving along at a similar pace (Shea, Fredericksen, Pickett & Pelz, 2003; Shea, Pickett & Pelz, 2003). The course demo from Boston University here illustrates this modular organization.

- Within each module, present content in chunks that are easily digestible (Smith, 2008).
    - When presenting text, format the content for the Web by breaking it into short paragraphs and using headings, bullets, graphics, and other formatting devices that make webpages easier to read and comprehend. The "7+/-2" instructional design rule of thumb, based on the work of psychologist George Miller, suggests the inclusion of 5 to 9 pieces of information in a segment. This self-paced asynchronous course from UC-Irvine demonstrates several of these principles.
    - When presenting audio or video, include a brief description and information about the length. Keep the segments short, from 2-15 minutes, to help maximize listeners' retention (Smith, 2008). Strategically chunking content helps students to absorb the information, avoiding

information overload and exhaustion (Garrison, Anderson & Archer, 2001).
    - Help your students digest the chunks of material by providing short recall or application questions after each one. Research has demonstrated the critical role of retrieval practices in conceptual learning (Karpicke & Blunt, 2011; Karpicke & Roediger, 2008).

Facilitating Online Learning

- **Promote metacognitive awareness.** Since online learners have more autonomy and responsibility, it is crucial that are supported in planning, monitoring, and assessing their understanding and performance (Bransford, Brown, & Cocking, 2000). As mentioned earlier, providing clear expectations and a clear path through the material can help students monitor their pace. In *Promoting Student Metacognition*, Tanner (2012) offers a handful of adaptable specific activities for promoting metacognition, including pre and post-assessments, reflective journals, and questions for students to ask themselves as they plan, monitor, and evaluate their thinking.

- **Maintain a Social Presence:** Stay present and be responsive to student needs and concerns (Savery, 2005). The instructor should engage in a balanced level of participation and communication—both publicly and privately—so students know he or she is engaged and available. This includes modeling good participation by frequently contributing to discussions by responding to students' posts and asking further questions. The instructor is instrumental in creating a warm and inviting atmosphere that promotes an online sense of community (Garrison & Vaughan, 2008; Jiang & Ting, 2000).

- **Promote Collaboration:** As described by Palloff and Pratt

(2013), "collaborative learning processes help students achieve deeper levels of knowledge generation through the creation of shared goals, shared exploration, and a shared process of meaning-making. In addition, collaborative activity can help to reduce the feeling s of isolation that can occur when students are working at a distance" (p. 39). Collaborative learning can be promoted through a variety of activities, including small group assignments, case studies, simulations, and group discussions.

- **Promote Active Learning:** Chickering and Ehrmann (1996) explain that "learning is not a spectator sport...[Students] must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves" (p. 5). Keeping in mind the characteristics of online learners, it's also important to make tasks authentic for students. That is, complex tasks related to real-life experiences that can also be applied to future activities (Woo, Herrington, Agostinho & Reeves, 2007).

- **Incorporate Multiple Media:** A key mistake instructors make is simply converting print materials to an online environment. Instead, leverage the possibilities of the Internet by considering various content sources and media formats to motivate learning and appeal to different learning styles (Mayer, 2001). CIRTL suggests that when selecting media for a course, think about how it accomplishes learning goals and how the medium will affect the learner (e.g., technology needs, download time, disabilities). In addition, Kapus (2010) recommends that when incorporating streaming media in a course to also post complete transcripts and encourage students to both watch the content and read the transcript.
- **Provide Adequate Technical Support:** It should not be assumed that all students have experience with online learning or using the necessary technology. Provide ample technical

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Chapter Summary: Instruction

This chapter started with one premise but ended with another. It started with the idea that teachers need to locate curriculum goals, usually from a state department of education or a publisher of a curriculum document. In much of the chapter we described what these authorities provide for individual classroom teachers, and how their documents can be clarified and rendered specific enough for classroom use. In the middle of the chapter, however, the premise shifted. We began noting that instruction cannot be planned simply for students; teachers also need to consider involving students themselves in influencing or even choosing their own goals and ways of reaching the goals. Instructional planning, in other words, should not be just *for* students, but also *by* students, at least to some extent. In the final parts of the chapter, we described a number of ways of achieving a reasonable balance between teachers' and students' influence on their learning. We suggested considering relatively strong measures, such as an emergent or an anti-bias curriculum, but we also considered more moderate ones, like the use of the Internet, local experts and field trips, service-learning, and of guided and independent practice. All things considered, then, teachers' planning is not just about organizing teaching; it is also about facilitating learning. Its dual purpose is evident in many features of public education, including the one we discuss in the next two chapters, the assessment of learning.

In the United States, broad educational goals for most subject areas are published by many national professional associations and by all state departments of education. Usually, the state departments of education also publish curriculum frameworks or curriculum guides that offer somewhat more specific explanations of educational goals, and how they might be taught.

Transforming the goals into specific learning objectives, however, remains a responsibility of the teacher. The formulation can focus on curriculum topics that can be analyzed into specific activities, or it can focus on specific behaviors expected of students and assemble them into general types of outcomes. Taxonomies of educational objectives, such as the ones originated by Benjamin Bloom, are a useful tool with either approach to instructional planning.

Since students normally are diverse, teaching requires differentiated instruction, or adjustments to students' learning needs, backgrounds, and capacities. A widely used framework for doing this is called response to intervention and involves continual short-term assessment of students' response to teaching, coupled with a system of more intense instruction for the relatively small number of students who need it.

In addition to planning instruction on students' behalf, many teachers organize instruction so that students themselves can influence the choice of goals. One way to do so is through emergent curriculum; another way is through multicultural and anti-bias curriculum.

Whatever planning strategies are used, learning is enhanced by using a wide variety of resources, including the Internet, local experts, field trips, and service-learning, among others. It is also enhanced if the teacher can build bridges between curriculum goals and students' experiences through judicious use of modeling, activation of prior knowledge, the anticipation of students' preconceptions, and an appropriate blend of guided and independent practice.

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CLASSROOM MANAGEMENT

Theme: Classroom Management

Overview of Content:

- Student Behavior Management

Learning Objectives:

- Define misbehavior and various causes
- Discuss proactive ways to address behavior management
- Summarize considerations for responding to behavior

Classroom Management and Why It Matters

Managing the learning environment is both a major responsibility and an ongoing concern for all teachers, even those with years of experience (Good & Brophy, 2002). for many educators and educational psychologists, classroom management is synonymous with classroom control (Bowers & Flinders, 1990; Doyle, 1986). However, as we will see in this chapter, management should include warmth and care as well as control. Your decisions about classroom arrangement, rules, and routines should reflect a concern for a secure, safe, orderly environment, but not at the expense of communication and trust among your learners. As a new teacher, you will quickly come to realize that warmth and control are not mutually exclusive concerns. Effective teachers who care about their learners inevitably combine the quality of warmth with their efforts to control.

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Video 9.1.1. *Teaching like a Champion-Control* describes the balance of control that teachers exert in their classroom.

Teaching Styles and Classroom Management

For many years, the concepts of warmth and control were considered to be at opposite ends of the same continuum. If a teacher chose to be warm, he or she could not be in control, and vice versa. However, Soar and Soar (1983) have suggested that different degrees of warmth and control may occur simultaneously, and behavior in one dimension does not necessarily preclude behavior in the other. Although many combinations of warmth and control are possible, four major profiles emerge from this conception of classroom climate, as shown in the figure below.

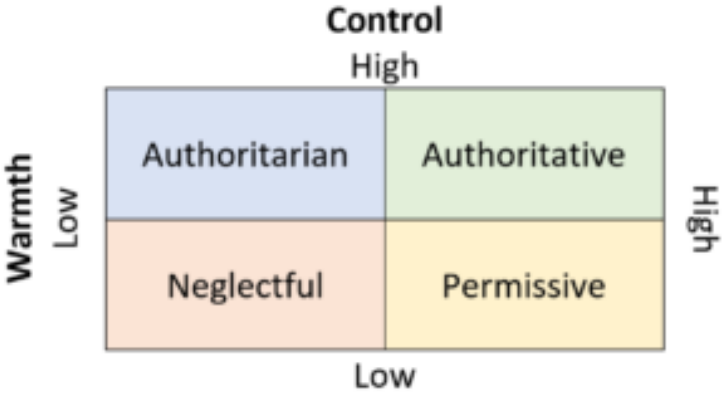

Figure 9.1.1. Teaching styles

For the dimension of control, student spontaneity, risk-taking behavior, and student-initiated responses characterize low-control climates. Teacher
talk, task orientation, and teacher authority characterize high-control climates. For the dimension of warmth, the use of praise and rewards, use of student ideas, and responsiveness to student requests are associated with high warmth. Frequent reference to

formal rules and procedures, use of punishment, criticism, scolding, and reprimanding are associated with low warmth.

Authoritarian

The first is teaching style, **authoritarian**, is characterized as cold and controlling. Such a teacher may humiliate and criticize students in an effort to control all aspects of their behavior. Lesser extremes represent a teacher who provides little praise or reward. This style generally results in a classroom climate that is businesslike and task-oriented, with few interchanges with students that are not initiated by the teacher. It also is a classroom in which motivation to do high-level work may be inspired more by a fear of punishment, embarrassment, or, in extreme cases, humiliation than by the expectation of praise, reward, or reinforcement.

Authoritative

The second type of classroom climate is a result of an **authoritative** teaching style, in which the teacher is warm but in control. Here, classroom rules are mutually determined and a consistently applied system of praise and rewards is used to motivate good behavior, warmth and control may exist simultaneously.

One danger of excessive use of rewards, however, is the creation of an almost suffocating climate in which students have little if any room to pursue a behavior or activity independently. In such a classroom, only those behaviors that the teacher has previously identified are eligible for a reward—all others are deemed less worthy. As Soar and Soar (1983) have noted, this may create a classroom climate in which students have little room to pursue

independent behavior because of the tightly managed praise and reward system established by the teacher.

This style differs primarily from the first in that motivation for good behavior here comes from a well-defined and consistently applied system of praise and rewards. With authoritarian teachers, good behavior results from a well-defined and consistently applied system of rules and/or punishment.

Permissive

A third classroom climate is characterized by a **permissive** teaching style, in which the teacher is warm and permissive. A teacher who falls at the lower right corner of this quadrant is one who praises and rewards students frequently while allowing them almost complete freedom in choosing the limits of their own behavior, sometimes resulting in confusion.

A lesser extreme of this quadrant may represent a classroom in which praise and rewards are used freely but student spontaneity (for example, calling out) and risk-taking behavior are limited to certain times (for example, group discussion, problem-solving activities) or certain types of content (for example, social studies but not math). During these times the teacher acts as a moderator or co-discussant, guiding and directing but not controlling classroom behavior. In such a classroom, students have considerable freedom in how and when to speak, and the teacher's warm and nurturing attitude is conveyed mostly nonverbally, through a set of classroom rules that encourage individual initiative.

Neglectful

The fourth style, **neglectful**, represents a classroom that is cold

yet permissive. A teacher who falls at the lower-left corner of this quadrant is one who spends most of the time scolding and criticizing students but has few classroom rules to control or limit the behavior being criticized. Such an extreme climate sometimes prevails in a classroom where a substitute teacher takes over without warning. In such a classroom, students may use the teacher's unfamiliarity with the rules as an opportunity to act out, thereby initiating scolding or criticizing behavior. Since the substitute teacher is unfamiliar with the classroom rules, he cannot fall back on the established system to prevent misbehavior. And because the substitute's role is to keep order, not to create or discover the rules, much of his behavior is an attempt to "hold the line" by criticizing, reprimanding, and punishing, if need be, in order to keep the class under control.

In a less extreme form, a classroom with lead by this teacher may be characterized by some coverage of content, interspersed with delays for classroom management of misbehavior. In general, this quadrant shows both a lack of task orientation and teacher control over the subject matter
content and a high frequency of scolding, criticizing, and reprimanding.

An effective classroom management plan blends warmth and control in ways that preclude overly rigid, dictatorial, or authoritarian forms of control, using instead a mutually agreed-upon set of rules and a well-defined and consistently applied system of praise and rewards. In other words, an effective plan combines strikes a balance of warmth with control. In this chapter, we will show you how to create this balance to build an effective classroom management plan.

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Video 9.1.2. *Teaching like a Champion-Warm/Strict* describes the balance of warmth and strictness that teachers exert in their classroom.

Why Classroom Management Matters

Managing the learning environment is both a major responsibility and an ongoing concern for all teachers, even those with years of experience (Good & Brophy, 2002). There are several reasons. In the first place, a lot goes on in classrooms simultaneously, even when students seem to be doing only one task in common. Twenty-five students may all seem to be working on a sheet of math problems. But look more closely: several may be stuck on a particular problem, each for different reasons. A few others have worked only the first problem or two and are now chatting quietly with each other instead of continuing. Still, others have finished and are wondering what to do next. At any one moment, each student needs something different—different information, different hints, different kinds of encouragement. Such diversity increases even more if the teacher deliberately assigns multiple activities to different groups or individuals (for example, if some students do a reading assignment while others do the math problems).

A major reason that managing the environment is challenging is because a teacher can not predict everything that will happen in a class. A well-planned lesson may fall flat on its face, or take less time than expected, and you find yourself improvising to fill class

time. On the other hand, an unplanned moment may become a wonderful, sustained exchange among students, and prompt you to drop previous plans and follow the flow of discussion. Interruptions happen continually: a fire drill, a drop-in visit from another teacher or the principal, a call on the intercom from the office. An activity may indeed turn out well, but also rather differently than you intended; you, therefore, have to decide how, if at all, to adjust the next day's lesson to allow for this surprise.

A third reason for the importance of management is that students form opinions and perceptions about your teaching that are inconsistent with your own. What you intend as encouragement for a shy student may seem to the student herself like "forced participation." An eager, outgoing classmate watching your effort to encourage the shy student, moreover, may not see you as *either* encouraging or coercing, but as overlooking or ignoring *other* students who already want to participate. The variety of perceptions can lead to surprises in students' responses—most often small ones, but occasionally major.

At the broadest, society-wide level, classroom management challenges teachers because public schooling is not voluntary, and students' presence in a classroom is therefore not a sign, in and of itself, that they wish to learn. Instead, students' presence is just a sign that an *opportunity* exists for teachers to motivate students to learn. Some students, of course, do enjoy learning and being in school, almost regardless of what teachers do! Others do enjoy school, but only because teachers have worked hard to make classroom life pleasant and interesting. Those students become motivated because you have successfully created a positive learning environment and have sustained it through skillful management.

Fortunately, it is possible to earn this sort of commitment from many students, and this chapter describes ways of doing so. We begin with ways of preventing management problems from happening by increasing students' focus on learning. The methods include ideas about arranging classroom space, establishing procedures, routines, and rules, and communicating the importance

of learning to students and parents. After these prevention-oriented discussions, we look at ways of refocusing students when and if their minds or actions stray from the tasks at hand. As you probably know from being a student, bringing students back on task can happen in many ways, and the ways vary widely in the energy and persistence required of the teacher. We try to indicate some of these variations, but because of space limitations and because of the richness of classroom life, we cannot describe them all.
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Systems of Classroom Management

Anyone who reads the newspaper, listens to candidates running for public office, attends school board meetings, or overhears conversations in the teachers' lounge, quickly realizes that classroom order and discipline are frequently discussed topics. A teacher's inability to control a class is one of the most commonly cited reasons for dismissal, and beginning teachers consistently rate classroom discipline among their most urgent concerns (Rogan, Borich, & Taylor, 1992).

Problems in maintaining classroom order and discipline can be exaggerated, however. Major disciplinary problems (for example, vandalism, violent fighting, and physical abuse toward teachers) are rare in most schools. Unfortunately, these incidents attract attention. Often the media report them to the exclusion of the many positive events that also occur. Below, we will address some major discipline problems, but the primary focus will be on the many less dramatic problems that, without an effective classroom management plan, can divert your attention from the instructional process.

Some teachers spend nearly 50 percent of their class time dealing with misbehavior that might be described as "amiable goofing off" (Jones, 1987), although these problems are minor. Thus, although you may worry about how to handle rare incidents of fighting, open defiance, property destruction, or swearing and cursing, you will actually spend most of your management time coping with students who pass notes, whisper, stare out the window, ignore your simple requests, squirm in their seats, sleep, do work unrelated to your class, or do no work at all.

Let's return for a moment to Mrs. Gates's class, where some of these misbehaviors were occurring. Imagine that on a Wednesday

afternoon you get a call from the principal of Mrs. Gates's school inquiring whether you would accept a teaching job there. It turns out that Mrs. Gates has resigned and they need a replacement for Monday morning. You accept the challenge and have four days to prepare for the class. What will you do?

Approaches to managing classrooms like Mrs. Gates's can be grouped into three traditions. The humanistic tradition emphasizes the critical role of communication and problem solving between teachers and students. This tradition is represented by the writings of Ginott (1972) and Glasser (1986, 1990). The applied behavior analysis tradition is best represented by the writings of O'Leary and O'Leary (1977), Alberto and Troutman (1986), Jones (1987), and Canter (1989), who apply behavioristic principles to the classroom. The third approach, which is the newest, emphasizes the teaching skills involved in organizing and managing instructional activities and in presenting content. The major proponents of this classroom management tradition are Kounin (1970), Brophy and Good (1986), Emmer, Evertson, Clements, and Worsham (1994), and Doyle (1986). This approach, more so than the humanistic and applied behavior analysis traditions, underscores the critical role of prevention in managing classroom behavior.

We will briefly summarize the main features of each of these traditions, point out how they can be used to manage the classroom, and evaluate each approach. First, let's identify six criteria an effective classroom management plan should contain. A comprehensive approach to classroom management should incorporate classroom strategies that accomplish the following:

- Establish positive relationships between all classroom participants. A positive, supportive classroom environment that meets student needs for belonging and acceptance is a necessary foundation for managing an orderly classroom.
- Prevent attention-seeking and work-avoidance behaviors. Time devoted to managing the classroom should be directed to engaging students in the learning process and preventing

behaviors that interfere with it. Engagement and prevention include both arrangements of physical space and teaching rules and routines for working in this space.

- Redirect misbehavior quickly and unobtrusively once it occurs. Most classroom problems take the form of minor off-task and attention-seeking events. Techniques for coping with these events should not cause more disruption than the behavior itself.
- Stop persistent and chronic misbehavior with strategies that are simple enough to be used consistently. Management systems that require responses to every act of positive or negative behavior may not be practical in today's busy classrooms.
- Teach self-control. Students should be allowed the opportunity to exercise internal control before external control is imposed. When external controls are imposed, they should be implemented with plans for fading them out.
- Respect cultural differences. Verbal and nonverbal techniques for redirecting disruptive behavior do not mean the same thing to all cultural groups. Likewise, systematic strategies involving social rewards, tangible rewards, and consequences can violate important cultural norms.

Now let's learn something about each of the three approaches and analyze how well each meets these criteria.

The Humanist Tradition in Classroom Management

The principles underlying the humanist tradition come from the practice of clinical and counseling psychology. It is called humanist because its primary focus is the inner thoughts, feelings,

psychological needs, and emotions of the individual learner. Humanist approaches emphasize allowing the student time to develop control over his or her behavior rather than insisting on immediate behavioral change or compliance. They use interventions that stress the use of communication skills, an understanding of student motives, private conferences, individual and group problem solving, and the exercise of referent and expert power.

Ginott's (1972) cooperation through congruent communication (also called the communication skills approach) and Glasser's (1990) cooperation through individual and group problem solving (also called reality therapy) are examples of the humanistic tradition.

While each emphasizes a different area or set of skills that the effective classroom manager should possess, these approaches essentially represent two sides of the same coin.

Cooperation Through Congruent Communication

The cardinal principle underlying Ginott's communication skills approach is that learners can control their own behavior if teachers allow them to do so. Teachers foster this self-control by allowing learners to choose how they wish to change their own behavior and how the class will be run. In addition, they help their students express their inner thoughts and feelings through the use of effective communication skills.

Communication skills are the primary vehicle for influencing learners' self-esteem, which in turn is the primary force underlying acceptable behavior. Therefore, this tradition tries to influence student behavior above all by enhancing student self-esteem. According to the proponents of this approach, congruent communication is the vehicle for promoting self-esteem. Teachers have many opportunities during the school day to engage their students in congruent communication. Such communication

usually occurs during private conferences with students who misbehave. However, it can also go on during problem-solving with the whole class. At such times, teachers communicate congruently when they do any of the following.

Express "Sane" Messages. Sane messages communicate to students that their behavior is unacceptable but do not blame, scold, preach, accuse, demand, threaten, or humiliate. Sane messages describe what should be done rather than scold what was done. Example: "Rosalyn, we are all supposed to be in our seats before the bell rings," not "Rosalyn, you're always gossiping at the doorway and coming late to class."

Accept Rather than Deny Feelings. Teachers should accept students' feelings about their individual circumstances rather than argue about them. If a student complains, "I have no friends," the teacher should accept the student's feelings of isolation, identify with the student, and say, for example, "So, you're feeling that you don't belong to any group" rather than try to convince the student that he or she has misperceived the social situation.

Avoid Using Labels. When talking to students about what they do well or poorly, teachers should avoid terms such as "lazy," "sloppy," or "bad attitude," as well as "dedicated," "intelligent," or "perfectionist." Instead, teachers should describe what they like or don't like about students in terms of what they do. For example, "You have a lot of erasures and whiteouts on your homework," not "Your homework is sloppy"; "You form your letters correctly," not "You are a good writer."

Use Praise Cautiously. Ginott believes that many teachers use praise excessively and manipulatively to control student behavior rather than to acknowledge exceptional performance. They use praise judgmentally ("Horace, you are a good student"), confuse correctness with goodness (referring to a student who completes work with a minimum of mistakes as a "good child"), and praise students who display minimally acceptable behavior as a way of influencing other students ("I like the way Joan is sitting in her seat"), and praise so often that the statements lose all significance.

Ginott urges teachers to use praise only to acknowledge exceptional performance and in terms that separate the deed from the doer. For example, "That essay showed a great deal of original thought and research."

Elicit Cooperation. Once a teacher and student have identified behavioral concerns, Ginott encourages teachers to offer alternatives to solving the problem rather than tell students what to do. "Cooperate, don't legislate" is a convenient maxim to help teachers remember this point.

Communicate Anger. Teachers are people, too. They get frustrated and angry just like anyone else. Ginott believes that teachers should express their feelings through the use of "I messages" rather than "You messages." The former focus on your feelings about the behavior or situation that angered you ("You talked when the guest speaker was lecturing, and I feel very unhappy and embarrassed by that"). The latter put the focus on the students and typically accuse and blame them ("You were rude to the guest speaker"). "I messages" should be used when you own the problem—that is, when you are the one who is angry or upset.

If you were to consult Ginott about what to do Monday morning in Mrs. Gates's class, he would recommend that you have an open discussion with the students to draw their attention to the problem. Then, you would invite your students' cooperation in developing mutually agreed-upon rules and consequences. Finally, as problems arise you would have individual conferences with your students, during which you would engage them in congruent communication.

Cooperative Learning

Glasser points out that effective classroom managers create a learning environment where students want to be, develop mutually agreed-upon standards of behavior that must be followed if they

want to remain in this environment, and conduct problem-solving conferences with those who violate the standards.

Glasser advocates an instructional approach called cooperative learning as a way to make the classroom a place learners want to be. According to Glasser, classrooms that emphasize cooperative learning motivate all children to engage in learning activities. Whole-group instruction, in which students compete with one another for limited rewards, inevitably causes 50 percent of the students to be bored, frustrated, inattentive, or disruptive.

In the face of such behavior, Glasser asserts, teachers resort to "boss management." That is, they use reward and coercive power to manipulate and control their learners. Boss management (as opposed to lead management) jeopardizes the development of self-control, persuades students to value external rewards over the satisfaction that comes from doing good work, and, when such rewards fail to come, causes students to become disruptive, frustrated, and inattentive. Glasser (1990) summarizes the difference between bosses and leaders in the following way:

- A boss drives. A leader leads.
- A boss relies on authority. A leader relies on cooperation.
- A boss says "I." A leader says "We."
- A boss creates fear. A leader creates confidence.
- A boss knows how. A leader shows how.
- A boss creates resentment. A leader breeds enthusiasm.
- A boss fixes blame. A leader fixes mistakes.
- A boss makes work drudgery. A leader makes work interesting.

For Glasser, dealing with disruptive students is straightforward in a classroom where students experience belonging, power, and freedom—in other words, a classroom the learner would regret leaving. Faced with a student who persists in violating classroom rules the group believes are essential, the teacher should hold a brief private conference with the student during which the teacher reviews the rules, describes the disruptive behavior, asserts the

need for following the rules, and makes clear the consequences for not obeying the rules (for example, removal from the room until the learner chooses to follow the rules). Glasser cautions teachers not to accept excuses from students why they can't control their own behavior. He disagrees with teachers who use socioeconomic or sociocultural conditions as excuses for learners not making the "right" choices. For Glasser, there can be no excuse for disrupting an environment designed to meet learners' needs. Furthermore, when students are faced with removal from such an environment, Glasser believes they will choose, not need to be forced, to behave:

> *...students will soon discover that you have given them every chance. If they want to stay in class, they have no choice but to follow the rules, at least until you talk things over. And if your students are satisfied most of the time, they'll want to stay* (Glasser, 1990, p. 142).

Glasser would have a clear directive for you on Monday morning as you take over Mrs. Gates's class: Begin building a more friendly workplace based on principles of cooperative learning. Some of his more specific recommendations would be the following:

- With your students, develop rules for the workplace.
- Get support from school administrators for setting aside an area to which disruptive students can be removed.
- Hold private conferences with disruptive students; stress the importance of correct choices and accept no excuses for wrong ones.
- Follow through when students must be removed, but always allow them the opportunity to return when they choose to obey class rules.

Applied Behavior Analysis in Classroom Management

Applied behavior analysis is closely linked with B. F. Skinner's (1953) theory of learning, called behaviorism or operant conditioning, which we introduced in the earlier section on Behaviorism. The techniques underlying the practice of behavior modification derive from behaviorism. The use of behavior modification techniques to change the behavior of animals has been called the experimental analysis of behavior. The use of these same techniques to change the socially important behaviors of learners, workers, or the public at large (for example, to encourage conservation and protection of the environment) is called applied behavior analysis (Lovitt, 1994).

So what is applied behavior analysis all about? Simply, we have to first undergo an analysis of the behavior in question to understand a few key pieces of information. We call these the ABCs of behavior and they include:

Antecedents. These are the environmental events or stimuli that trigger a behavior. If your significant other does something nice for you and you say, 'Thank you,' the kind act is the antecedent.

Behaviors. Again, this is what the person does, says, thinks/feels. In the previous example, you say, 'Thank you,' is the behavior or what you said. The behavior may be something we want to increase, and so is classified as a behavioral deficit, or something we need to decrease, and is a behavioral excess. As we will discuss later, we will have desirable and undesirable behaviors we engage in. The undesirable behaviors serve as temptations and distract us from our end goal.

Consequence. You might say a consequence is the outcome of a behavior that either encourages it to be made again in the future or discourages its future occurrence. If we always engage in a particular behavior when a specific stimulus is present, then there must be some favorable outcome that follows the behavior, thereby reinforcing its occurrence and making it highly likely that the

behavior will occur the next time the antecedent is present. Hence why we
say that the antecedent is a trigger for the behavior.

Figure 9.2.1. The ABC model summarizes the most important components of applied behavior analysis.

Let's say that whenever Steve's friend, John, is present he misbehaves in class by talking out of turn, getting out of his seat, and failing to complete his work. John laughs along with him and tells stories about how fun Steve is to the other kids in the 6th grade class. John is the Antecedent for the unruly Behavior, and the approval from Steve's peers is the Consequence. Now consider for a minute that Steve is likely getting in trouble at both school and home, also a consequence, but continues making this behavior. We might say that the positive reinforcers delivered by John and his peers are stronger or more motivational for Steve than the punishment delivered by parents and teachers.

In this case, the school and parents will want to change Steve's behavior in class as it is directly impacting his grades but also the orderliness of the classroom for the teacher. In making this plan, all parties involved will want to keep a few basic principles in mind:

- The behavior will need to be measured both before and after any treatment is implemented.

- Whatever treatment is decided upon by the applied behavior analysist, everyday people in the child's life will have to implement it. Why? The therapist cannot be present 24/7 but parents and other caregivers, teachers, administrators, babysitters, etc. will be. In fact, none of these people are present 24/7 and so it will take a coordinated effort of several stakeholders to bring about behavior change. It really does take a village to raise a child, or in this case to help change/establish a behavior.
- The behavior to be changed must be defined precisely.
- Controlling variables, or the events in Steve's environment that are related to the behavior in a functional way, need to be considered. If these four principles are addressed, then a sound treatment plan can be developed and implemented to bring about positive change in Steve's behavior.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=135#oembed-1

Video 9.2.1. *Antecedent Behavior Consequence: ABC Charts & Model* explains the process used in behavioral analysis.

Changing Behavior

The applied behavior analysis approach, as it is used in schools, focuses on changing behaviors that are important for cognitive and social development. These behaviors are actions that can be seen, heard, or counted. Attitudes, values, beliefs, feelings, emotions, or

self-images, all important aspects of a learner's school life, are not behaviors. Consequently, they are not the focus of applied behavior analysis.

If ever you are unsure whether something is a "behavior," put it to the "Hey, Dad! Watch me…" test. For example, "Hey, Dad! Watch me ride a bike" (or "do a handstand," or "solve this problem") would pass the test, since Dad can see you do it with his own eyes. But, substitute "Hey, Dad! Watch me feel good about myself" (or "have a positive attitude toward
school," or "be motivated," or "have an interest in science"). These expressions fail the test since they do not describe behaviors that Dad can observe directly.

Antecedents

Antecedents are events (or stimuli) that, when present, increase the likelihood that a particular behavior will occur. For example, seeing the teacher seated at her desk talking to a student may be an antecedent for a student in the back of the room to fool around with the person sitting next to her. Similarly, an antecedent to misbehavior in a class might be the teacher turning his back to write on the chalkboard. To give a positive example, turning on the overhead projector may be an antecedent for some students to take out their notebooks and start copying without the teacher needing to ask them. Posting rules for all to see and reminding learners of these rules before a lesson can be an antecedent for some students to engage in learning-related behaviors.

Antecedents are an important aspect of classroom conduct management because their presence or absence often makes the difference in whether students engage in appropriate learning and social behaviors. Antecedents acquire this ability to control behavior by their repeated association with the rewards or consequences that typically follow behavior. For example, seeing the teacher with

her back to the class is an antecedent for certain types of disruptive behavior because, in the past, whenever the teacher turned her back and students misbehaved they were rewarded with attention from peers (positive reinforcement) or by avoiding work (negative reinforcement).

Similarly, teachers often want students to raise their hands and wait to be called on (behavior) following a question (antecedent). To develop this association between question-asking and hand raising, teachers explain and model the behaviors they expect, praise students who respond appropriately, and call on students who raise their hands. They ignore students who call out answers without first raising their hands. If teachers use this important procedure consistently, children learn that following a question, they must raise a hand if they are to get recognized by the teacher.

Here are some antecedents to appropriate and inappropriate behavior often observed in classrooms:

- Seating arrangement. Whenever Mike sits near Jamal he is likely to talk and not complete work; sitting near the window or door is an antecedent to not paying attention, but sitting near the teacher is an antecedent to getting work done.
- Teacher proximity. The farther a teacher is from students, the more likely they are to engage in off-task behaviors; students are more likely to listen and participate in the lesson when the teacher faces them; during independent seatwork activities, students work best when the teacher walks around the room and monitors their work.
- Style of asking questions. Students are more likely to pay attention when the teacher asks a question, pauses, looks at the entire class, and then calls on someone.
- Activity transitions. Students are more likely to engage in disruptive behavior during transitions from one activity to another.
- Nature of the activity. Students pay attention during whole group activities and discussions but disrupt during individual

seatwork (or vice versa).
- Person leading the lesson. Students pay attention when the teacher leads the lesson but misbehave for substitute teachers and student teachers.
- Teacher's manner to students. Students typically talk back to the teacher after she has harshly criticized a response, made fun of a student, or unjustly accused a student of misbehavior.

These and other antecedents to good and bad behavior are important to you as a teacher because they suggest low-profile, non-intrusive ways of preventing the behavior. For example, rather than interrupt your lesson to stop the misbehavior of two students who are sitting near each other, you can change their seats beforehand. Similarly, walking around the room to prevent misbehavior is preferable to constantly calling out the names of students who misbehave while you are seated at your desk doing paperwork.

Consequences

When your goal is to teach a new behavior, or make an existing behavior occur more frequently (for example, spell more words correctly, come to class on time more often), the behavior must be followed by some type of reinforcement during the initial stages of learning.

Recall that reinforcement can be either positive or negative. Positive reinforcement occurs when a teacher provides pleasant or satisfying consequences after the desired behavior and these consequences increase the likelihood that this behavior will occur again. Negative reinforcement occurs when a teacher ends or terminates some condition that a child perceives as threatening, fearful, or uncomfortable, after the child has engaged in some

positive behavior. This increases the likelihood that the positive behavior will occur again.

Negative Reinforcement. Thorndike gave us one of the earliest demonstrations of the power of negative reinforcement when he used it to teach a cat how to escape a puzzle box. He placed the cat in an enclosed box, a situation that most cats find uncomfortable. To get out of the box, the cat had to pull a cord hanging from the top of the box. As soon as the cat pulled the cord, a door opened and the cat escaped. The next time Thorndike placed the cat in the same box, the animal pulled the cord more quickly. It had learned a useful behavior that helped it escape an unpleasant situation—an example of negative reinforcement.

While teachers plan ways to use positive reinforcement to teach children useful behaviors, they rarely arrange situations to use negative reinforcement for this purpose. This is because the use of negative reinforcement first requires that the child be put in an unpleasant situation and then taught how to get out of it. Such an approach is contrary to recommendations made by both applied behavior analysts and school personnel that teachers give preference to positive (nonaversive) techniques for improving the conduct of their learners (Donnellan & LaVigna, 1990).

However, teachers must be aware of the principle of negative reinforcement in their classrooms because many of them are inadvertently using it to reinforce inappropriate behaviors. For example, consider the common situation in which a learner experiences something in the classroom that he wants to escape or avoid: difficult work, dull workbook exercises, or a teacher he perceives as punitive and unfair. Such a learner may complain, refuse to do work, change his seat without permission, fall asleep, or disrupt the class to delay or escape the unpleasant event. If the teacher changes the learner's assignment when he complains, or puts him in the hallway when he is disruptive, that is negatively reinforcing the learner's behavior and thus increasing the likelihood that it will recur.

As this example illustrates, teachers can easily fall into the

"negative reinforcement trap" that some learners unconsciously set. In fact, applied behavior analysts like Brian Iwata (1987) speculate that more inappropriate behavior is learned through negative than through positive reinforcement. In other words, students are more likely to avoid or escape something undesirable than to be rewarded with attention for doing something appropriate.

Intermittent Reinforcement. When you are satisfied with a particular behavior and its frequency, intermittent reinforcement can be applied to maintain the behavior at its present level. For example, suppose that at the start of the school year, a student consistently came late and unprepared. You started a program to reinforce this student for coming to class prepared and on time. The student now has met the goal. You can maintain this behavior by reinforcing the student's behavior on an intermittent schedule (for example, every fourth day), as we discussed in the earlier section on Behaviorism.

Using Applied Behavior Analysis to Improve Classroom Behavior

Applied behavior analysts recommend the following strategies for improving the classroom behavior of your learners:

1. Identify precisely both the inappropriate behavior you wish to change and the appropriate behavior you want to take its place. As we emphasized above, applied behavior analysis requires observable definitions of classroom problems and goals. Be sure to state positively the alternative behavior in which you want the student or students to engage. For example, if students are looking out the window or talking with one another during seatwork, the appropriate statement would be "Complete your assignments," not "No talking or whispering or staring out the window." This last statement violates the so-called Dead Person's Rule: If the behavior can be performed better by a dead person, it is not an appropriately

stated goal. Negatively stated goals ("No talking," "No getting out of your seat," "No calling out") should be restated positively: "Take notes while the teacher is speaking," "Complete seatwork," "Raise your hand and wait to be called on," and "Look at me when I am talking to you."

2. Identify the antecedents to both inappropriate and appropriate behavior and make the necessary changes. The following are examples of changes in classroom antecedents that can accomplish the goals above: changing seating arrangements to bring you closer to the students, eliminating certain distractions (what's going on outside the classroom), or to separate students who misbehave; using an overhead projector so that your back is never turned to the class; walking around the room and monitoring students whenever you assign seatwork; reviewing rules at the start of class to remind students of expected behavior; preparing students for activity transitions so that they go smoothly; giving students warm-up activities to eliminate dead time at the start of a class; commenting on student responses in an encouraging manner.

3. Identify the goal of the inappropriate behavior and discontinue actions on your part (or those of peers) that reinforce it. Students typically misbehave with two goals in mind: (1) to gain positive reinforcement from you or their peers or (2) to escape or delay classroom situations that they find unpleasant, undesirable, or boring. One strategy for dealing with misbehavior is to ensure that the student is not positively reinforced for misbehavior. This typically involves such teacher actions as ignoring misbehavior whose purpose is to gain attention (a response sometimes called extinction), seeing to it that peers don't attend to misbehavior, and not giving students preferred activities when they misbehave to get them. When the goal of misbehavior is to escape or avoid classroom activities and responsibilities, the general strategy is for you to be careful not to let this happen. Be sure students are held accountable for work they don't complete; follow through on assignments rather than forgetting about them in the face of noncompliance; do not shorten assignments in response to student complaints.

4. Set up procedures to reinforce the behavior you want to replace the inappropriate behavior. In addition to changing antecedents and avoiding reinforcing inappropriate behavior, applied behavior analysts recommend that you set up procedures to systematically reinforce the appropriate behavior you want students to demonstrate. When choosing reinforcement procedures to teach appropriate classroom behavior, use reinforcers that are natural to the school setting, such as extra time to do homework, lunch with the principal or favorite teacher, extra recess, playing an educational game, time to use the library for pleasure reading, or access to computers. Such reinforcers, called natural reinforcers, are readily available in schools at almost no cost. Consequently, you will use them more consistently than reinforcers that must be purchased and brought into the school setting. The accompanying box, Using Natural Reinforcers, provides additional suggestions.

5. Use punishment as a last resort. Most behavior problems can be dealt with without punishment (Donnellan & LaVigna, 1990). For some learners, however, more restrictive strategies may be required. Thus, if you have tried the strategies above and still not been able to change learner behavior for the better, you might, under appropriate guidance and supervision from a school psychologist or counselor, consider the following strategies for reducing inappropriate behavior, together with the positive strategies described above:

- Removal from the classroom setting: Remove the student to a setting where he or she cannot gain access to positive reinforcement (a "time out"). Time-outs should be used only when the goal of the misbehavior is positive reinforcement (e.g., attention), not when the goal of the behavior is to escape the lesson or class. It should be used for a brief period of time (10 to 30 minutes). Following the end of the time-out period, the student should be returned to the classroom and expected to engage in the classroom activities that are going on at that time. If a particular student's misbehavior is motivated to

escape the classroom and becomes so disruptive that he must be removed, make sure he completes work missed during the time-out period.

- Loss of privileges: Denying a student a desired activity because he has misbehaved can be effective in reducing misbehavior; for example, missing part of recess, coming in early from lunch, staying a few extra minutes after school, and so forth.
- Restitution: This strategy involves the student performing such activities as repairing things that were broken, cleaning objects that were soiled or disfigured, paying for things that were stolen, or apologizing to others for behaving inappropriately toward them.
- Positive practice: Have students write essays in which they explain their misbehavior, why it was not a good choice of actions, what they should do instead, and why this would be useful to them; or have students practice the appropriate behavior they should have performed.

If you were to invite an applied behavior analyst to help you with Mrs. Gates's classroom, she would first take a "wait-and-see approach," assuming that much of the misbehavior was elicited by actions on Mrs. Gates's part that serve as antecedents. Since the students will meet a new teacher on Monday, some of their behavior may change. The behavior analyst would wait to see which disruptive behaviors emerge, analyze the antecedents for these behaviors, decide what is reinforcing them, and then develop an intervention that uses punishment only as a last resort.

PRINCIPLES OF BEHAVIOR ANALYSIS AND MODIFICATION

For a more detailed review of behavior analysis and modification, the OER book

Principles of Behavior Analysis and Modification provides more information.

The Classroom Management Tradition

Throughout much of the latter half of this century, classroom discipline was focused on the question of how best to respond to student misbehavior. The humanistic and applied behavior analysis approaches to classroom management shared the spotlight during this period.

As we have seen from the previous sections, both of these traditions are primarily reactive rather than preventative systems of classroom management. That is, they tend to emphasize solutions to misbehavior after it occurs, rather than before. The 1970s and 1980s, however, provided another approach to classroom management that framed the question of classroom control and warmth not in terms of reaction but in terms of prevention. This approach was based on classroom research that examined what effective teachers do to prevent misconduct and what less effective teachers do to create it.

The research basis for this tradition began with projects carried out by Kounin (1970), by the Research and Development Center for Teacher Education at the University of Texas at Austin (Emmer et al., 1994), and by the Institute for Research on Teaching at Michigan

State University (Brophy, 1986, 1988). Some of this research involved the observation and analysis of both experienced and inexperienced teachers while they taught. The major conclusion was that the distinction between more and less effective classroom managers can be made more by what they do to prevent misbehavior than by how they respond to it. In this section, we will explain how the researchers came to this conclusion and the characteristics of effective classroom managers they found. First, let's look at one study of classroom management and how it was conducted.

In a study by Emmer, Evertson, and Anderson (1980), 27 third-grade teachers in eight elementary schools were recruited for a year-long observation. Based on their average rates of student engagement and student off-task behavior (measured after the first three weeks of school), the teachers were classified into two groups: more effective managers and less effective managers. The teachers who were categorized as effective classroom managers had significantly higher student engagement rates (more students actively engaged in the goals of the lesson) and significantly lower student off-task behaviors (fewer reprimands and warnings) throughout the school year. Finally, observation data pertaining to the classroom management procedures of these teachers during the first three weeks of school were used to compare the two groups. These included data on room arrangement, classroom rules, consequences of misbehavior, responses to inappropriate behavior, consistency of teacher responses, monitoring, and reward systems. In addition, observers counted the number of students who were on-task or off-task at 15-minute intervals to determine the extent to which students were attending to the teacher.

The more effective managers established themselves as instructional leaders early in the school year. They worked on rules and procedures until students had fully learned them. Instructional content was important for these teachers, but they also emphasized group cohesiveness and socialization into a common set of classroom norms. By the end of the first three weeks, their classes were ready for the rest of the year.

In contrast to the more effective managers, the less effective managers did not have well-worked-out procedures in advance. This was most evident among the first-year teachers who were being observed. For example, the researchers described one new teacher who had no procedures for using the bathroom, pencil sharpener, or water fountain. As a result, the children came and went at will, complicating the teacher's instructional tasks.

Like the better managers, most of the poorer managers had rules, but they presented the rules and followed up on them differently. In some cases, the rules were vague: "Be in the right place at the right time." In other cases, they were introduced casually and without discussion, leaving it unclear to most children when and where a rule applied.

The less effective managers were also ineffective monitors of their classes. This was caused in part by the lack of efficient routines for activities. In other cases, this was the result of teachers removing themselves from the active surveillance of the whole class to work at length with a single child. A major result of the combination of vague and untaught rules and poor procedures for monitoring and establishing routines was that students were frequently left without sufficient guidance to direct their own activities.

One further characteristic of the less effective managers was that the consequences of good behavior and inappropriate behavior were either not in evidence in those classrooms or not delivered in a timely manner. For example, teachers sometimes issued general criticisms that failed to identify a specific offender or a particular event. Some of these teachers frequently threatened or warned children but did not follow through, even after several warnings. This allowed children to push the teacher to the limits, causing more problems. Other teachers issued vague disciplinary messages ("You're being too noisy") that were not sufficiently focused to capture the attention of the children for whom they were intended.

It was easy to see how deficiencies in the areas of rules, the establishment of routines, monitoring, and a praise-and-reward

structure negatively affected the overall management and organization of the classroom. Most of the time these deficiencies became "windows of opportunity" that prompted a wider range of pupil misconduct, off-task behavior, and disengagement from the goals of the classroom. After only a few weeks had elapsed, undesirable patterns of behavior and low teacher credibility had become established in the less effective managers' classrooms.

From this and related studies of classroom management (Evertson, Emmer, Clements, & Worsham, 1994; Evertson & Emmer, 1982), we learn that effective classroom managers possess three broad classes of effective teaching behaviors:

- • They devote extensive time before and during the first few weeks of school to planning and organizing their classrooms to minimize disruption and enhance work engagement.
- • They approach the teaching of rules and routines as methodically as they approach teaching their subject areas. They provide students with clear instructions about acceptable behavior, and they monitor student compliance with these instructions carefully during the first few weeks of school.
- • They inform students about the consequences of breaking rules and enforce these consequences consistently.

How would this tradition analyze Mrs. Gates's class? Recall that this tradition has a lot to say about ways to prevent behavior problems but offers few immediate, short-term solutions after a problem has occurred. In other words, it offers no quick fixes, since it emphasizes planning in anticipation of such problems, not their resolution afterward. A comprehensive plan incorporating elements of all three traditions is needed to make Mrs. Gates's classroom a positive environment for learning. We will present such a perspective in the next section.

An Integrated Approach to Classroom

Management

As we have seen, all three approaches have both advantages and limitations. Each approach has made significant contributions, effective classroom managers blend together the best parts of different approaches (Doyle, 1986; Emmer et al., 1980; Evertson & Emmer, 1982). We now turn to an integration of all three traditions of classroom management.

Setting Up the Classroom Workplace

During the first week of school, do you want your students to do more listening or more talking? Do you want them to be calm and quiet or excited and talkative? Do you want them to focus on your questions or listen to your answers? Do you want to promote talking or listening, independent or cooperative work, self-study or group problem solving? The way you arrange your classroom—align furniture, place partitions, decorate walls and bulletin boards, and "soften" the environment—will have as much to do with achieving these goals as the rules and routines you create to establish a classroom management plan.

Psychologists use the term behavioral setting to refer to the way in which particular environments elicit specific behaviors. You will have numerous choices to make about how to arrange your classroom—your behavioral setting. Each choice will encourage certain student behaviors and discourage others. The first step in designing your behavioral setting is to identify what you want your students to do when they are in it. Your behavioral and instructional goals for students will vary from day to day and from month to month as you identify learner needs and provide the necessary learning experiences to meet them. As your goals vary, so must the behavioral setting you arrange to bring about these goals.

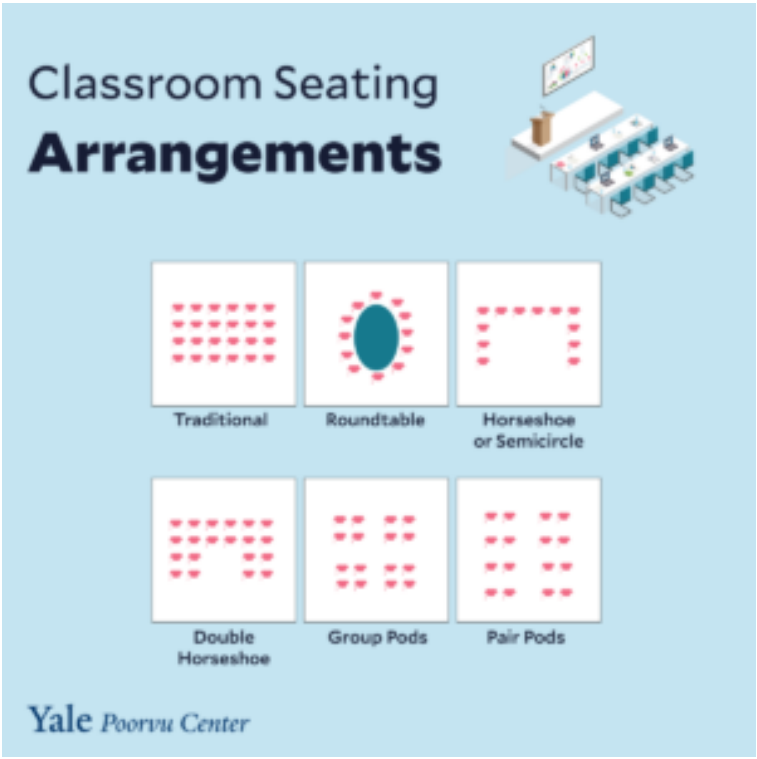

Figure 9.2.2. Classroom seating arrangements.

As a rule, you will want to match your behavioral goals with your behavioral setting. Thus, the room arrangement you choose is important in communicating to your students the kind of behaviors you are trying to elicit. We will discuss this more in Preventing Management Problems.

The arrangement of space also tends to dictate patterns of student involvement. For example, a more traditional arrangement encourages speaking in sequential order, one-on-one involvement with the teacher, and individual seatwork (Phillips, 1983). Some arrangements may also limit the teacher's interaction with

individual students, who then must respond in front of the entire group (Erickson & Mohatt, 1982).

If the internal features of your classroom turn from a traditionally formal arrangement to this less formal one, so too will the social climate of the classroom. Grouping arrangements suggest that interpersonal communication and sharing are permitted, then they undoubtedly will occur. And, sometimes more than one classroom arrangement can exist simultaneously, as when both the acquisition of knowledge and cooperation and sharing may be your goals.

Classroom arrangements should be responsive to both instructional goals and classroom culture expectations. However, keep in mind that whichever arrangement that you select, differences in ability, personality, or culture, some students may be less responsive to some classroom arrangements than to others.

Rules for Running the Workplace

Just as no one behavioral setting is best for all students and every teacher, there is no one best set of rules to direct your students' behavior. When you develop rules you are making a personal statement about the type of atmosphere you want to promote in your behavioral setting.

If you want to establish an orderly, businesslike, task-oriented climate, rules such as "Speak and leave your seat only when recognized" are appropriate. But such rules are inappropriate if you want a classroom where students are expected to discuss, obtain resources in different parts of the room, problem solve, and cooperate with one another.

Here are several general suggestions for developing classroom rules:

- Make your rules consistent with the classroom climate you

seek to promote. The beginning of your teaching career is the time to recognize your own values and preferences for managing your classroom. Articulate your personal philosophy of classroom management and have your classroom rules reflect it.

- Don't establish rules that can't be enforced. A rule that says "No talking or getting out of your seat" may be difficult to enforce when your personal philosophy encourages independent thinking, problem-solving, and group work. Unfairness and inconsistency may result in your applying rules you do not fully believe in.
- Set only necessary rules. There are four reasons to have rules, and each should reflect at least one of these purposes: Enhance work engagement and minimize disruption Promote safety and security Prevent disturbance to other students or other classroom activities Promote acceptable standards of courtesy and interpersonal relations.
- Make your rules general enough to include a range of specific behaviors. The rule "Respect other people's property and person" covers a variety of problems, such as stealing, borrowing without permission, and throwing things. Similarly, the rule "Follow the teacher's requests immediately" allows you to put an end to a variety of off-task, disruptive behaviors that no list of rules could anticipate or cover. Similarly, be careful not to state a rule so generally that the specific problems to which it pertains remain unclear to your learners. For example, a rule that states simply "Show respect" or "Obey the teacher" may be sufficiently vague as to be ignored by most of your learners and to thus be unenforceable by you.

Engaging Students in the Learning Process

Classrooms are busy places. Materials have to be checked in and

out, activities begun and ended, learners moved through their lessons, and assignments given, completed, and evaluated. Groups are formed, arranged, and rearranged. In the midst of these activities, students need things, forget things, borrow things. They get thirsty, hungry, tired, and sick. They have to use the bathroom.

This complexity requires systematic routines. A routine is a set of rules organized around a particular time (for example, beginning of the day), context (for example, group work), or place (for example, library, learning center, or playground) that helps guide your learners through the day. The key to keeping your learners engaged and you in control of this complexity is effective teaching of the routines that keep your classroom productive and efficient.

The amount of time learners spend thinking about, acting on, or working on a learning task is referred to as engaged learning time (Savage, 1991). Engaged learning time is different from the amount of time you may have planned for teaching a particular lesson or activity. For example, you may have allocated 35 minutes for a particular activity, but your students may spend only 15 minutes of that time actively engaged in the learning task. What happened to the other 20 minutes? Most likely they were used up passing out materials, making announcements, giving directions, dealing with student requests to leave the room or to borrow materials, cleaning up, and handling discipline problems. In the studies of effective classroom managers we cited earlier, the teachers who were most successful at maximizing engaged learning time were those who taught routines to their students during the first few weeks of school (Emmer et al., 1994). There is also a significant relationship between engaged learning time and achievement, providing perhaps the most persuasive argument for using well-established routines.

With each routine comes a set of procedures or informal rules pertaining to specific areas of concern. For example, your "beginning class routine" may include what your students should be doing while you are taking attendance (sit still without talking, check over homework or last assignment, read silently from text, for

instance). It can also include how a student should enter the room after the bell has rung (for example, come to you, go directly to his or her seat, or go see the counselor) and how handouts, tests, and assignments are to be dispensed (for example, first in each row passes them to those behind, student helpers come to your desk, each helps himself or herself from stacks conveniently placed in the front and back of the room). The procedures you establish under each routine will depend on your own circumstances and instructional style.

There are five elements to effectively teaching classroom routines (EIS, 2022):

1. Define the behavioral expectations for each routine. The expectations should be developmentally appropriate, culturally responsive, positively stated, specific, and observable.
2. Explicitly teach the routine to students and review it often.
3. Practice the routines.
4. Provide positive reinforcement to students when they effectively demonstrate the routines using praise or rewards.
5. Provide visual prompts of the classroom routines, keeping each routine to the fewest steps possible.

Teaching a routine takes time and energy, but routines established in advance of your first day of teaching will also save you time later and give your students a sense of organization and order. Routines allow you more time to teach and more time for your learners to become engaged in the learning process, since the routines will enhance the speed and efficiency with which things get done. Routines are especially effective with time-consuming noninstructional activities, which can sometimes take up to 50 percent of the time you initially allocate to a particular topic or lesson (Jones & Jones, 1990). Think for a moment about the time that might have been saved in Mrs. Gates's class, had she had a routine for the beginning of class. Routines should be taught with as much planning and thoroughness as your learning objectives, and then

followed up by monitoring their effectiveness (Jones & Jones, 1990; Pasch, SparksLanger, Gardner, Starko, & Moody, 1991).

Maintaining Work Engagement

A concern for trusting relationships and a behavioral setting suited to the goals of your instruction, together with a carefully crafted set of rules and routines, will get you off on the right foot during the first weeks of school. Some students, however, may choose not to follow your rules and routines. They may be disinterested in school, lack the skills to profit from the lesson, or simply want to escape from the classroom. Some of these disruptions will be minor, last for only a short time, and resolve themselves. But others will persist. If they do, it is important that you respond in ways that promote a positive learning climate.

Low-Profile Classroom Management

Rinne (1984) has used the expression low-profile classroom control to refer to coping strategies used by effective teachers to stop misbehavior without disrupting the flow of a lesson. These techniques are effective for surface behaviors (Levin & Nolan, 1991), minor disruptions that represent the majority of disruptive classroom actions. Examples of surface behaviors are laughing, talking out of turn, passing notes, daydreaming, not following directions, combing hair, doodling, humming, and tapping. These are the normal developmental behaviors that children do when confined to a small space with large numbers of other children. They are not indicative of underlying emotional disorders or personality problems. However, they can disrupt the flow of a lesson and the work engagement of others if left unchecked.

Low-profile classroom control consists of a set of techniques that requires *anticipation* by the teacher to prevent problems before they occur; *deflection* to redirect disruptive behavior that is about to occur; and *reaction* to stop disruptions immediately after they occur. Let's look at each. We also list some of the most time-honored of these techniques in the accompanying box, Employing Low-Profile Classroom Control.

Anticipation. Alert teachers have their antennae up to sense changes in student motivation, attentiveness, arousal levels, or excitability as these changes happen or even as they are about to happen. They are aware that at certain times of the year (before and after holidays), week (just before a major social event), or day (right after an assembly or physical education class), the class will be less ready for work than usual. Skilled classroom managers are alert not only to changes in the group's motivational or attention level but also to changes in specific individuals that may be noticed as soon as they enter class.

At these times anticipation involves visually scanning back and forth to quickly size up the seriousness of a potential problem and head it off before it emerges or becomes a bigger problem. For example, you may decide to pick up the pace of the class to counter a perceived lethargy after a three-day weekend, or remove magazines or other objects that may distract attention before a long holiday. Anticipation involves not only knowing what to look for but where and when to look for it. It also involves having a technique ready, no matter how small, for changing the environment quickly and without notice to your students to prevent the problem from occurring or escalating.

Deflection. As noted, good classroom managers sense when disruption is about to occur. They are attuned to verbal and nonverbal cues that in the past have preceded disruptive behavior. For instance, a student may glance at a friend, close his textbook abruptly, sit idly, squirm, ask to be excused, sigh with frustration, or grimace. Although not disruptive by themselves, these behaviors may signal that other, more disruptive behavior is about to follow.

Some teachers can deflect these behaviors by simply moving nearer to the student who may be about to misbehave, thus preventing a more disruptive episode from occurring. Other teachers make eye contact with the learner and use certain facial expressions such as raised eyebrows or a slight tilt of the head to communicate a warning. Both these techniques effectively use nonverbal signals to deflect a potential problem. Verbal signals, such as prompting or name dropping, can also be effective (see the box). As the potential for the problem to escalate increases, the effective manager shifts from nonverbal to verbal techniques to keep pace with the seriousness of the misbehavior about to occur.

Table 9.2.1. *Types of Control: Eyes*

Table 1. Type of Control: Eyes

Low Profile:	Level 1 — Look at *all* students during the lesson.
	Level 2 — Look at one student *occasionally* during the lesson.
	Level 3 — Look at one student *often* during the lesson.
	Level 4 — Look at one student *constantly* during the lesson.
	Level 5 — Look *constantly* at one student, with a *wink* or *blink* or *slight frown*, during the lesson.
	Level 6 — Look at one student, with a *glare* or *frown*.
High Profile:	Level 7 — Look at one student, with a *prolonged glare* or *frown*.

Note: adopted from Rinne, C. H. (1982). *Low-profile classroom controls.* The Phi Delta Kappan, 64(1), 53. Retrieved from https://www.jstor.org/stable/20386554.

Reaction. Anticipation and deflection can efficiently and unobtrusively prevent actions that disrupt the flow of a lesson. They allow students the opportunity to correct themselves, thus fostering the development of self-control. However, the classroom is a busy place, and the many demands on your attention may make a behavior difficult to anticipate or deflect.

When disruptive behavior that cannot be anticipated or unobtrusively redirected occurs, your primary goal is to end the disruptive episode as quickly as possible. Effective classroom managers, therefore, must at times react to a behavior by providing

a warning and a consequence. Glasser (1990) points out that an effective consequence for breaking a rule is temporary removal from the classroom—provided that your classroom is a place where that student wants to be. Other possible consequences are loss of privileges, school detention, loss of recess, or loss of another activity that the learner would miss. When disruptive behavior occurs, your reaction sequence might proceed as follows:

1. As soon as a student is disruptive, acknowledge a nearby classmate who is performing the expected behavior: "Carlos, I appreciate how hard you are working on the spelling words." Then wait 15 seconds for the disruptive student to change his or her behavior.

2. If the disruption continues, say, "Michael, this is a warning. Complete the spelling assignment and leave Carrie alone." Wait 15 seconds.

3. If the student doesn't follow the request after this warning, say, "Michael, you were given a warning. You must now leave the room [or you must stay inside during lunch or cannot go to the resource center today]. I'll talk to you about this during my free period."

Dealing with Chronic Disruptive Behavior

The low-profile techniques of anticipation, deflection, and reaction should promote lesson flow when used skillfully. When these techniques do not work for a particular student or group of students, it may be a signal that the needs of the student (for example, for belonging, as discussed in the chapter on Motivation) are not being met. When disruptive behavior persists and you are sure you have taken all reasonable steps to deal with it (for example, following the anticipation deflection-reaction approach), you should consult a school counselor or school psychologist. Many school districts have professionals either on staff or under consultant contracts who can handle such matters.

Culturally Responsive Classroom Management

One of the most interesting and encouraging advances in the understanding of classroom management is the emerging field of cultural compatibility and behavior management. The writings and research of Tharp (1989), Dillon (1989), and Bowers and Flinders (1990) present convincing arguments that members of different cultures react differently to the nonverbal and verbal behavior management techniques discussed in this chapter, including proximity control, eye contact, warnings, and classroom arrangement. Furthermore, they cite numerous examples of varying ways in which teachers from one culture interpret disruptive behaviors of children from another culture.

In the section on Cultural Differences in the Classroom, we deal with the issues of culturally responsive teaching in more detail. For now, it is important for you to know simply that many behavioral management techniques are culturally sensitive and that the effective classroom manager matches the technique not only with the situation but also with the cultural history of the learner.

ClassroomSeatingArrangements. **License**: CC BY-NC-ND: Attribution-NonCommercial-NoDerivatives

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- Antecedent Behavior Consequence: ABC Charts & Model. **Authored by**: Teachings in Education. **Retrieved from**: https://youtu.be/UVKb_BXEp5U. **License**: *All Rights Reserved*

Preventing Management Problems

The easiest management problems to solve are ones that do not happen in the first place! Even before the school year begins, you can minimize behavior problems by arranging classroom furniture and materials in ways that encourage a focus on learning as much as possible. Later, once school begins, you can establish procedures and rules that support a focus on learning even more.

Arranging Classroom Space

Viewed broadly, classrooms may seem to be arranged in similar ways, but there are actually important alternative arrangements to consider. Variations exist because of grade level, the subjects taught, the teacher's philosophy of education, and of course the size of the room and the furniture available. Whatever the arrangement that you choose, it should help students to focus on learning tasks as much as possible and minimize the chances of distractions. Beyond these basic principles, however, the "best" arrangement depends on what your students need and on the kind of teaching that you prefer and feel able to provide (Boyner, 2003; Nations & Boyett, 2002). The next sections describe some of the options.

Displays and Wall space

All classrooms have walls, of course, and how you fill them can affect the mood or feeling of a classroom. Ample displays make a room interesting and can be used to reinforce curriculum goals

and display (and hence publicly recognize) students' work. But too many displays can also make a room seem "busy" or distracting as well as physically smaller. They can also be more work to maintain. If you are starting a new school year, then, a good strategy is to decorate some of the walls or bulletin board space, but not to fill it all immediately. Leaving some space open leaves flexibility to respond to ideas and curriculum needs that emerge after the year is underway. The same advice applies especially for displays that are high maintenance, such as aquariums, pets, and plants. These can serve wonderfully as learning aids, but do not have to be in place on the first day of school. Not only the students but also you may already have enough to cope with at that time.

Computers in the Classroom

If you are like the majority of teachers, you will have only one computer in your room, or at most, just a few, and their placement may be pre-determined by the location of power and cable outlets. If so, you need to think about computer placement early in the process of setting up a room. Once the location of computers is set, locations for desks, high-usage shelves, and other moveable items can be chosen more sensibly—in general, as already mentioned, so as to minimize distractions to students and to avoid unnecessary traffic congestion.

Visibility of and Interactions with Students

Learning is facilitated if the furniture and space allow you to see all students and interact with them from a comfortable distance. Usually, this means that the main, central part of the room—where desks and tables are usually located—needs to be as open and as

spacious as possible. While this idea may seem obvious, enacting it can be challenging in practice if the room itself is small or shaped unusually. In classrooms with young students (kindergarten), furthermore, open spaces tend to allow, if not invite, physical movement of children—a feature that you may consider either constructive or annoying, depending on your educational goals and the actual level of activity that occurs.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=136#oembed-1

Video 9.3.1. *Teach Like a Champion Technique–Circulate* explains the benefits of the teacher circulating the classroom for classroom management.

Spatial Arrangements

The physical setup of chairs, tables, and presentations in a classroom can significantly influence learning. Instructional communication theory suggests that seating arrangements can impact how the instructor communicates with students and how the students interact with one another, impacting engagement, motivation, and focus (McCorskey and McVetta, 1978). More recent research also suggests that students tend to prefer more flexible seating arrangements (Harvey and Kenyon, 2013). In particular, students have been shown to be more partial towards classrooms with mobile vs. fixed chairs, and trapezoidal tables with chairs on casters as opposed to rectangular tables with immobile chairs.

The best room arrangement sometimes depends on the grade level or subject area of the class. If you teach in elementary school, for example, you may need to think especially about where students can keep their daily belongings, such as coats and lunches. In some schools, these can be kept outside the classroom—but not necessarily. Some subjects and grade levels, furthermore, lend themselves especially well to small group interaction, in which case you might prefer not to seat students in rows, but instead around small-group tables or work areas. The latter arrangement is sometimes preferred by elementary teachers, but is also useful in high schools wherever students need lots of counter space, as in some shops or art courses, or where they need to interact, as in English as Second Language courses (McCafferty, Jacobs, & Iddings, 2006). The key issue in deciding between tables and rows, however, is not grade level or subject as such, but the amount of small group interaction you want to encourage, compared to the amount of whole-group instruction. As a rule, tables make working with peers easier, rows make listening to the teacher more likely, and group-work slightly more awkward physically.

In general, spaces designed in a student-centered manner, focusing on learner construction of knowledge, can support student learning (Rands and Gansemer-Topf, 2017). In reality, however, many classrooms are built using more conventional models for traditional seating arrangements. Teachers can consider ways to modify seating arrangements and match arrangements with the demands of classroom activities in order to help maximize student learning.

Seating Arrangement Options

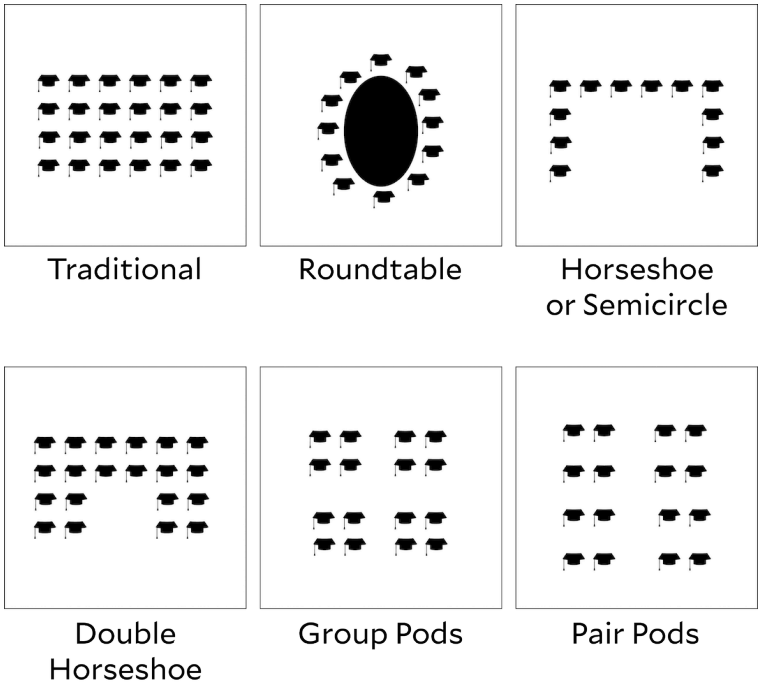

Figure 9.3.1. Varieties of classroom seating arrangements.

- **Traditional.** The traditional classroom setup typically consists of rows of fixed seating. Students face the teacher with their backs to one another. This seating arrangement is historically common in classrooms, minimizing student-student communication and largely supporting a "sage on the stage" learning environment. The highest communication interactions between teacher and students typically occur with students in the first row or along the middle of the classroom. Students in back rows are more likely to be less engaged.
- **Roundtable.** Many seminar-course room arrangements may consist of teachers and students sitting around a single large

table. This seating arrangement can also be formed using individual desks. Students and teachers all face one another in this setup, which can support whole-class as well as pair-wise dialogue.

- **Horseshoe or Semicircle.** The horseshoe or semi-circle offers a modified roundtable setup, where all participants face each other while the teacher can move about the room. The horseshoe encourages discussion between students and with the teacher, although this setup tends to encourage more engagement between the teacher and students directly opposite, with slightly lesser amounts for students immediately adjacent to the instructor. A horseshoe setup can be particularly effective when the instructor wishes to project and discuss course-related material in the front of the class.
- **Double Horseshoe.** This seating arrangement involves an inner and outer horseshoe, and similar to the conventional horseshoe, invites greater discussion than the traditional format. It is more limited by the backs of students within the inner circle facing students in the outer circle. However, students may also more easily interact with those nearest to them or turn around and face students behind them for group work.
- **Pods (Groups, Pairs).** The pod or pair arrangement can be designed with rectangular, circular or trapezoidal tables, or individual desks. With regards to stations, teachers can place several tables together to form student groups (e.g. 3 – 4 students), or pairs. This arrangement can be especially advantageous when students will work in groups or pairs with their classmates for a large portion of class time. More generally, this arrangement communicates a learning community where students are expected to work with one another.

Recommendations

- **Align Arrangement with Activity.** Teachers can consider matching the classroom seating arrangement to the goals of instruction. For instance, classes involving group work might utilize group pods, while whole-class discussion might benefit from a horseshoe. Teachers can also strategically change arrangements during class to suit shifting learning goals.
- **Bolster Arrangement With Engagement.** When dynamic change to seating arrangements proves difficult, teachers can bolster the physical space through intentional engagement. For example, in a typical horseshoe arrangement where students along the sides may experience less attention, a teacher may be more deliberate in their interactions with those particular learners. In a traditional classroom setup where the teacher cannot change the seating arrangements, they can maximize student engagement by implementing Think-Pair-Share or other active learning activities conducive to students working with a neighbor. They can also encourage student groups to work in other spaces of the classroom as needed (e.g. on the floor, front of the room, etc.).
- **Set Up Early.** To the extent possible, a teacher can designate time for setting up the classroom and/or can ask students to help. If there is no class immediately before, this can be done prior to class, or alternatively during the first few minutes. Similar consideration should be given to resetting the room after the session ends.

Ironically, some teachers also experience challenges with room arrangement because they do not actually have a classroom of their own, because they must move each day among other teachers' rooms. "Floating" is especially likely for specialized teachers (e.g. music teachers in

elementary schools, who move from class to class) and in schools have an overall shortage of classrooms. Floating can sometimes be annoying to the teacher, though it actually also has advantages, such as not having to take responsibility for how other teachers' rooms are arranged. If you find yourself floating, it helps to consider a few key strategies, such as:

- consider using a permanent cart to move crucial supplies from room to room
- make sure that every one of your rooms has an overhead projector (do not count on using chalkboards or computers in other teachers' rooms)
- talk to the other teachers about having at least one shelf or corner in each room designated for your exclusive use

Class Set-up Tool

When considering classroom arrangement options (and before moving too much furniture around your room!), you might want to try experimenting with spatial arrangements "virtually" by using one of the computer programs available on the Internet, like the Scholastic Class Set-Up Tool.

Establishing Daily Procedures and Routines

Procedures or **routines** are specific ways of doing common, repeated classroom tasks or activities. Examples include checking

daily attendance, dealing with students who arrive late, or granting permission to leave the classroom for an errand. Academically related procedures include ways of turning in daily homework (e.g. putting it on a designated shelf at a particular time), of gaining the teacher's attention during quiet seat work (e.g. raising your hand and waiting), and of starting a "free choice" activity after completing a classroom assignment.

Procedures serve the largely practical purpose of making activities and tasks flow smoothly—a valuable and necessary purpose in classrooms, where the actions of many people have to be coordinated within limited time and space. As such, procedures are more like social conventions than moral expectations. They are only indirectly about what is ethically *right* or ethically *desirable* to do (Turiel, 2006). Most procedures or routines can be accomplished in more than one way, with only minor differences in outcomes. There is more than one way, for example, for the procedure of taking attendance: the teacher could call the role, delegate a student to call the role or note students' presence on a seating chart. Each variation accomplishes essentially the same task, and the choice may be less important than the fact that the class coordinates its actions *somehow*, by committing to *some* sort of choice.

For teachers, of course, an initial management task is to establish procedures and routines as promptly as possible. Because of the conventional quality of procedures, some teachers find that it works well simply to announce and explain key procedures without inviting much discussion from students ("Here is how we will choose partners for the group work"). Other teachers prefer to invite input from students when creating procedures (asking the class, "What do *you* feel is the best way for students to get my attention during quiet reading time?"). Both approaches have advantages as well as disadvantages. Simply announcing key procedures saves time and ensures consistency in case you teach more than one class (as you would in high school). But it puts more responsibility on the teacher to choose procedures that are truly reasonable and practical. Inviting students' input, on the other

hand, can help students to become aware of and committed to procedures, but at the cost of requiring more time to settle on them. It also risks creating confusion if you teach multiple classes, each of which adopts different procedures. Whatever approach you choose, of course, they have to take into account any procedures or rules imposed by the school or school district as a whole. A school may have a uniform policy about how to record daily attendance, for example, and that policy may determine, either partly or completely, how you take attendance with your particular students.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=136#oembed-2

Video 9.3.2. *Seat Signals* provides examples of procedures that teachers can implement that will allow students to make requests, like using the restroom, without interrupting instruction or disturbing others.

Establishing Classroom Rules

Unlike procedures or routines, rules express standards of behavior for which individual students need to take responsibility. Although they are like procedures in that they sometimes help in ensuring the efficiency of classroom tasks, they are really about encouraging students to be responsible for learning and showing respect for each other. Example 1 lists a typical set of classroom rules.

SAMPLE SET OF CLASSROOM RULES

- Treat others with courtesy and politeness.
- Make sure to bring required materials to class and to activities.
- Be on time for class and other activities.
- Listen to the teacher and to others when they are speaking.
- Follow all school rules.

Note three things about the examples in Example 1. One is that the rules are not numerous; the table lists only five. Most educational experts recommend keeping the number of rules to a minimum in order to make them easier to remember (Thorson, 2003; Brophy, 2004). A second feature is that they are stated in positive terms ("Do X…") rather than negative terms ("Do not do Y…"), a strategy that emphasizes and clarifies what students should do rather than what they should avoid. A third feature is that each rule actually covers a collection of more specific behaviors. The rule "Bring all materials to class," for example, covers bringing pencils, paper, textbooks, homework papers, and permission slips—depending on the situation. As a result of their generality, rules often have a degree of ambiguity that sometimes requires interpretation. Infractions may occur that are marginal or "in a grey area," rather than clear cut. A student may bring a pen, for example, but the pen may not work properly. You may therefore wonder whether this incident is really a failure to follow the rule or just an unfortunate (and in this case minor) fault of the pen manufacturer.

As with classroom procedures, rules can be planned either by the teacher alone or by the teacher with advice from students. The arguments for each approach are similar to the arguments for

procedures: rules "laid on" by the teacher may be more efficient and consistent, and in this sense fairer, but rules influenced by the students may be supported more fully by the students. Because rules focus strongly on personal responsibility, however, there is a stronger case for involving students in making them than in making classroom procedures (Brookfield, 2006; Kohn, 2006). In any case, the question of who plans classroom rules is not necessarily an either/or choice. It is possible in principle to impose certain rules on students (for example, "Always be polite to each other") but let the students determine the consequences for violations of certain rules (for example, "If a student is discourteous to a classmate, he/she must apologize to the student in writing"). Some mixture of influences is probably inevitable, in fact, if only because the class needs to take into account your own moral commitments as the teacher as well as any imposed by the school (like "No smoking in the school" or "Always walk in the hallways").

Pacing and Structuring Lessons and Activities

One of the best ways to prevent management problems is by pacing and structuring lessons or activities as smoothly and continuously as possible. This goal depends on three major strategies:

- selecting tasks or activities at an appropriate level of difficulty for your students
- providing a moderate level of structure or clarity to students about what they are supposed to do, especially during transitions between activities
- keeping alert to the flow and interplay of behaviors for the class as a whole and for individuals within it.

Each strategy presents special challenges to teachers, but also opportunities for helping students to learn.

Choosing Tasks at an Appropriate Level of Difficulty

As experienced teachers know and as research has confirmed, students are most likely to engage with learning when tasks are of moderate difficulty, neither too easy nor too hard and therefore neither boring nor frustrating (Britt, 2005). Finding the right level of difficulty, however, can be a challenge if you have little experience teaching a particular grade level or curriculum, or even if students are simply new to you and their abilities unknown. Whether familiar or not, members of any class are likely to have diverse skills and readiness–a fact that makes it challenging to determine what level of difficulty is appropriate. A common strategy for dealing with these challenges is to begin units, lessons, or projects with tasks that are relatively easy and familiar. Then, introduce more difficult material or tasks gradually until students seem challenged, but not overwhelmed. Following this strategy gives the teacher a chance to observe and diagnose students' learning needs before adjusting content, and it gives students a chance to orient themselves to the teacher's expectations, teaching style, and the topic of study without becoming frustrated prematurely. Later in a unit, lesson, or project, students seem better able to deal with more difficult tasks or content (Van Merrionboer, 2003). The principle seems to help as well with "authentic" learning tasks—ones that resemble real-world activities, such as learning to drive an automobile or to cook a meal, and that present a variety of complex tasks simultaneously. Even in those cases, it helps to isolate and focus on the simplest subtasks first (such as "put the key in the ignition") and move to harder tasks only later (such as parallel parking).

Sequencing instruction is only a partial solution to finding the best "level" of difficulty, however, because it does not deal with enduring individual differences among students. The fundamental challenge to teachers is to individualize or differentiate instruction fully: to tailor it not only to the class as a group but to the lasting

differences among members of the class. One way to approach this sort of diversity, obviously, is to plan different content or activities for different students or groups of students. While one group works on Task A, another group works on Task B; one group works on relatively easy math problems, for example, while another works on harder ones. Differentiating instruction in this way complicates a teacher's job, but it can be done and has in fact been done by many teachers (it also makes teaching more interesting!). In the next chapter, we describe some classroom management strategies that help with such multitasking.

Providing Moderate Amounts of Structure and Detail

Chances are that at some point in your educational career you have wished that a teacher would clarify or explain an assignment more fully, and perhaps give it a clearer structure or organization. Students' desire for clarity is especially common with assignments that are by nature open-ended, such as long essays, large projects, or creative works. Simply being told to "write an essay critiquing the novel," for example, leaves more room for uncertainty (and worry) than being given guidelines about what questions the essay should address, what topics or parts it should have, and what its length or style should be (Chesebro, 2003). As you might suspect, some students desire clarity more than others, and improve their performance, especially when provided with plenty of structure and clarity. Students with certain kinds of learning difficulties, in particular, often learn effectively and stay on task only if provided with somewhat explicit, detailed instructions about the tasks expected of them (Marks, et al., 2003).

As a teacher, the challenge is to accommodate students' need for clarity without making guidance so specific or detailed that students do little thinking for themselves. As a (ridiculously

extreme) example, consider a teacher giving "clear" instructions for an essay by announcing not only exactly which articles to read and cite in the essay and which topics or issues to cover, but even requires specific wording of sentences in their essays. This much specificity may reduce students' uncertainties and make the teacher's task of evaluating the essays relatively straightforward and easy. But it also reduces or even eliminates the educational value of the assignment—assuming, of course, that its purpose is to get students to think for themselves.

Ideally, then, structure should be moderate rather than extreme. There should be just enough to give students some sense of direction and to stimulate more accomplishment than if they worked with less structure or guidance. This ideal is an application of Vygotsky's idea of the zone of proximal development that we discussed in the chapter, "The learning process": a place (figuratively speaking) where students get more done with help than without it. The ideal amount of guidance—the "location" of the zone of proximal development—varies with the assignment and the student, and it (hopefully) decreases over time for all students. One student may need more guidance to do his or her best in math, but less guidance in order to write her or his best essay. Another student may need the reverse. But if all goes well, both students may need less at the end of the year than at the beginning.

Managing Transitions

Transitions between activities are often full of distractions and "lost" time, and is a time when inappropriate behaviors are especially likely to occur. Part of the problem is intrinsic to transitions: students may have to wait before a new activity actually begins, and therefore get bored at the very moment when the teacher is preoccupied with arranging materials for the new activity. From the point of view of the students, transitions may

seem essentially like unsupervised group time, when seemingly any behavior is tolerated.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=136#oembed-3

Video 9.2.3. *Tight Transitions* offers advice for easy and fast transitions.

Minimizing such problems requires two strategies, one of which is easier to implement than the other. The easier strategy is for you, as a teacher, to organize materials as well as possible ahead of time so that you minimize the time needed to begin a new activity. The advice sounds simple, and mostly is, but it sometimes takes a bit of practice to implement smoothly. When Kelvin (remember from the beginning of this chapter?) first began teaching university, for example, particular papers or overhead transparencies sometimes got lost in the wrong folder in spite of Kelvin's efforts to keep them where they were easy to find. The resulting delays in finding them slowed the pace of the class and caused frustrations.

A second, more complex strategy is to teach students ways to manage their own behavior during transitions (Marzano & Marzano, 2004). If students talk too loudly at these times, for example, then discuss with them what constitutes appropriate levels or amounts of talk, and discuss the need for them to monitor their own sound level. Or if students stop work early in anticipation of ending an activity, then talk about—or even practice—waiting for a signal from yourself to indicate the true ending point for an activity. If certain students continue working beyond the end of an activity. On the other hand, try giving them warning of the impending end in advance, and remind them about to take responsibility for actually

finishing work once they hear the advance warning, and so on. The point of these tactics is to encourage responsibility for behavior during transitions, and thereby reduce your own need to monitor students at that crucial time.

None of these ideas, of course, mean that you, as a teacher, should give up monitoring students' behavior entirely. Chances are that you still will need to notice if and when someone talks too loudly, finishes too early, or continues too long, and you will still need to give some students appropriate reminders. But the amount of reminding will be less to the extent that students can remind and monitor themselves—a welcome trend at any time, but especially during transitions

Maintaining the Flow of Activities

A lot of classroom management is really about keeping activities flowing smoothly, both during individual lessons and across the school day. The trouble is that there is never just "one" event happening at a time, even if only one activity has been formally planned and is supposed to be occurring. Imagine, for example, that everyone is supposed to be attending a single whole-class discussion on a topic; yet individual students will be having different experiences at any one moment. Several students may be listening and contributing comments, for example, but a few others may be planning what they want to say *next* and ignoring the current speakers, still, others may be ruminating about what a previous speaker said, and still others may be thinking about unrelated matters—the restroom, food, or sex. Things get even more complicated if the teacher deliberately plans multiple activities: in that case, some students may interact with the teacher, for example, while others do work in an unsupervised group or work independently in a different part of the room. How is a teacher to keep activities flowing smoothly in the face of such variety?

A common mistake of beginning teachers in multi-faceted settings like these is to pay too much attention to any one activity, student, or small group, at the expense of noticing and responding to all the others. If you are helping a student on one side of the room when someone on the other side disturbs classmates with off-task conversation, it can be less effective *either* to finish with the student you are helping before attending to the disruption, *or* to interrupt yourself to solve the disruption on the other side of the room. Although one of these responses may be necessary, either one involves disruption *somewhere*. There is a risk that either the student's chatting may spread to others, or the interrupted student may become bored with waiting for the teacher's attention and wander off-task herself.

A better solution, though one that at first may seem challenging, is to attend to *both* events at once—a strategy that was named **withitness** in a series of now-classic research studies several decades ago (Kounin, 1970). Withitness does not mean that you focus on all simultaneous activities with equal care, but only that you remain aware of multiple activities, behaviors, and events to some degree. At a particular moment, for example, you may be focusing on helping a student, but in some corner of your mind, you also notice when chatting begins on the other side of the room. You have, as the saying goes, "eyes in the back of your head." Research has found that experienced teachers are much more likely to show withitness than inexperienced teachers, and that these qualities are associated with managing classrooms successfully (Emmer & Stough, 2001).

Simultaneous awareness—withitness—makes possible responses to the multiple events that are immediate and nearly simultaneous—what educators sometimes called overlapping. The teacher's responses to each event or behavior need not take equal time, nor even be equally noticeable to all students. If you are helping one student with seat work at the precise moment when another student begins chatting off-task, for example, a quick glance to the second student may be enough to bring the second

one back to the work at hand, and may scarcely interrupt your conversation with the first student, or be noticed by others who are not even involved. The result is a smoother flow to activities overall.

As a new teacher, you may find that withitness and overlapping develop more easily in some situations than in others. It may be easier to keep an eye (or ear) on multiple activities during familiar routines, such as taking attendance, but harder to do the same during activities that are unfamiliar or complex, such as introducing a new topic or unit that you have never taught before. But skill at broadening your attention does increase with time and practice. It helps to keep trying. Merely demonstrating to students that you are "withit," in fact, even without making deliberate overlapping responses, can sometimes deter students from off-task behavior. Someone who is tempted to pass notes in class, for example, might not do so because she believes that you will probably notice her doing it anyway, whether or not you are able to notice in fact.

Communicating the Importance of Learning and Positive Behavior

Altogether, the factors we have discussed—arranging space, procedures, and rules, and developing *withitness*— help communicate an important message: that in the classroom learning and positive social behavior are priorities. In addition, teachers can convey this message by offering timely feedback to students about performance, by keeping accurate records of the performance, and by deliberately communicating with parents or caregivers about their children and about class activities.

Communicating effectively is so important for all aspects of teaching. However, here we will focus on only one of its important aspects: how communication contributes to a smoothly functioning classroom and in this way helps prevent behavior problems.

Giving Timely Feedback

The term *feedback*, when used by educators, refers to responses to students about their behavior or performance. Feedback is essential if students are to learn and if they are to develop classroom behavior that is socially skilled and "mature." But feedback can only be fully effective if offered as soon as possible when it is still relevant to the task or activity at hand (Reynolds, 1992). A score on a test is more informative immediately after a test than after a six-month delay, when students may have forgotten much of the content of the test. A teacher's comment to a student about an inappropriate, off-task behavior may not be especially welcome at the moment the behavior occurs, but it can be more influential and informative then; later, both teacher and student will have trouble remembering the details of the off-task behavior, and in this sense may literally "not know what they are talking about." The same is true for comments about a *positive* behavior by a student: hearing a compliment right away makes it easier to the comment with the behavior, and allows the compliment to influence the student more strongly. There are of course practical limits to how fast feedback can be given, but the general principle is clear: feedback tends to work better when it is timely.

The principle of timely feedback is consistent, incidentally, with a central principle of operant conditioning: reinforcement works best when it follows a to-be-learned operant behavior closely (Skinner, 1957). In this case, a teacher's feedback serves as a form of reinforcement. The analogy is easiest to understand when the feedback takes the form of praise; in operant conditioning terms, the reinforcing praise then functions like a "reward." When feedback is negative, it functions as an "aversive stimulus" (in operant terms), shutting down the behavior criticized. At other times, though, criticism can also function as an unintended reinforcement. This happens, for example, if a student experiences criticism as a reduction in isolation and therefore as an increase in his importance

in the class—a relatively desirable change. So the inappropriate behavior continues, or even increases, contrary to the teacher's intentions. Example 2 diagrams this sequence of events.

ATTRACTING ATTENTION AS NEGATIVE REINFORCEMENT

Example of unintended negative reinforcement in the classroom:

Student is isolated socially → Student publicly misbehaves → Student gains others' attention

Reinforcement can happen in class if an undesirable behavior, leads to a less aversive state for a student. Social isolation can be reduced by public misbehavior, which stimulates attention that is reinforcing. Ironically, the effort to end misbehavior ends up stimulating the misbehavior.

Maintaining Accurate Records

Although timeliness in responding to students can sometimes happen naturally during class, there are also situations where promptness depends on having organized key information ahead of time. Obvious examples are the scores, marks, and grades returned to students for their work. A short quiz (such as a weekly spelling test) may be possible to return quite soon after the quiz—sometimes you or even the students themselves can mark it during class. More often, though, assignments and tests require longer processing times: you have to read, score, or add comments to each paper individually. Excessive time to evaluate students' work can reduce

the usefulness of a teacher's evaluations to students when she finally does return the work (Black, et al., 2004). During the days or weeks waiting for a test or assignment to be returned, students are left without information about the quality or nature of their performance; at the extreme, they may even have to complete another test or do another assignment before getting information about an earlier one. (Perhaps you yourself have experienced this particular problem!)

Delays in providing feedback about academic performance can never be eliminated entirely, but they can be reduced by keeping accurate, well-organized records of students' work. A number of computer programs are available to help with this challenge; if your school does not already have one in use, then there are several downloadable either free or at low cost from the Internet (e.g. dmoz.org). Describing these is beyond the scope of this book. For now, we simply emphasize that grading systems benefit students' learning the most when they provide feedback as quickly and frequently as possible (McMillan, 2001), precisely the reason why accurate, well-organized record-keeping is important to keep.

Accurate records are helpful not only for scores on tests, quizzes, or assignments but also for developing descriptive summaries of the nature of students' academic skills or progress. A common way to develop a description is the student portfolio, which is a compilation of the student's work and on-going assessments of it created by the teacher or in some cases by the student (Moritz & Christie, 2005; White, 2005). To know how a student's science project evolved from its beginning, for example, a teacher and student can keep a portfolio of lab notes, logs, preliminary data, and the like. To know how a student's writing skills developed, they could keep a portfolio of early drafts on various writing assignments. As the work accumulates, the student can discuss it with the teacher, and write brief reflections on its strengths thus far or on the steps needed to improve the work further. By providing a way to respond to work as it evolves, and by including students in making the assessments, portfolios provide relatively

prompt feedback, and in any case provide it sooner than by waiting for the teacher to review work that is complete or final.

Communicating with Parents and Caregivers

Since parents and caregivers in a sense "donate" their children to schools (at least figuratively speaking), teachers are responsible for keeping them informed and involved to whatever extent is practical. Virtually all parents understand and assume that schools are generally intended for learning. Detailed communication can enrich parents' understanding, of how learning is addressed with their particular child's classroom, and show them more precisely what their particular child is doing. The better such understanding in turn encourages parents and caregivers to support their child's learning more confidently and "intelligently." In this sense, it contributes indirectly to a positive learning environment in their child's class.

There are various ways to communicate with parents, each with advantages and limitations. Here are three common examples:

- A *regular classroom newsletter*: A newsletter establishes a link with parents or caregivers with comparatively little effort on the part of the teacher. At the beginning of the year, for example, a newsletter can tell about special materials that students will need, important dates to remember (like professional development days when there is no school), or about curriculum plans for the next few weeks. But newsletters also have limitations. They can seem impersonal, and they may get lost on the way home and never reach parents or caregivers. They can also be impractical for teachers with multiple classes, as in high school or in specialist subjects (like music or physical education), where each class follows a different program or curriculum.

- *Telephone calls*: The main advantage of phoning is its immediacy and individuality. Teacher and parent or caregiver can talk about a particular student, behavior, or concern, and do it *now*. By the same token, however, phone calls are not an efficient way of informing parents about events or activities that affect everyone in common. The individuality of phoning may explain why teachers often use this method when a student has a problem that is urgent or unusual—as when he has failed a test, missed classes or misbehaved seriously. Rightly or wrongly, a student's successes tend not to prompt phone calls to the student's home (though in fairness students may be more likely to tell parents about their successes themselves, making it less essential for the teacher to do so).
- *Parent-teacher conferences*: Most schools schedule periodic times—often a day or evening per term—when teachers meet briefly with parents or caregivers who wish to meet. Under good conditions, the conferences have the individuality of phone calls, but also the richness of communication possible only in face-to-face meetings. Since conferences are available to all parents, they need not focus on behavior or academic problems, but often simply help to build rapport and understanding between parents or caregivers and the teacher. Sometimes too, particularly at younger grade levels, teachers involve students in leading their own conferences; the students display and explain their own work using a portfolio or other archive of accumulated materials (Benson & Barnett, 2005; Stiggins & Chappuis, 2005). In spite of all of these advantages, though, parent-teacher conferences have limitations. Some parents cannot get to conferences because of work schedules, child care, or transportation problems. Others may feel intimated by any school-sponsored event because they speak limited English or because they remember painful experiences from their own school days.

Even if you make several efforts to communicate, some parents may

remain out of contact. In these cases, it is important to remember that the parents may *not* be indifferent to their child or to the value of education. Other possibilities exist, as some of our comments above imply: parents may have difficulties with child care, for example, have inconvenient work schedules, or feel self-conscious about their own communication skills (Stevens & Tollafield, 2003). Even so, there are ways to encourage parents who may be shy, hesitant, or busy. One is to think about how they can assist the school even from home—for example, by making materials to be used in class or (if they are comfortable using English) phoning other parents about class events. A second way is to have a specific task for the parents in mind—one with a clear structure, such as photocopying materials to be used by students later. A third is to remember to encourage, support, and respect the parents' presence and contributions when they *do* show up at school functions. Keep in mind that parents are experts about their own particular children, and without them, you would have no students to teach!
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Responding to Student Misbehavior

So far we have focused on preventing behaviors that are inappropriate or annoying. The advice has all been proactive or forward-looking: plan classroom space thoughtfully, create reasonable procedures and rules, pace lessons and activities appropriately, and communicate the importance of learning clearly. Although we consider these ideas important, it would be naïve to imply they are enough to prevent all behavior problems. For various reasons, students sometimes still do things that disrupt other students or interrupt the flow of activities. At such moments the challenge is not about long-term planning but about making appropriate, but prompt responses. Misbehaviors left alone can be contagious, a process educators sometimes call the **ripple effect** (Kounin, 1970). Chatting between two students, for example, can gradually spread to six students; rudeness by one can eventually become rudeness by several; and so on. Because of this tendency, delaying a response to inappropriate behavior can make the job of getting students back on track harder than responding to it as immediately as possible.

There are many ways to respond to inappropriate behaviors, of course, and they vary in how much they focus on the immediate behavior compared to longer-term features or patterns of a student's behavior. There are so many ways to respond, in fact, that we can describe only a sample of the possibilities here. None are effective all of the time, though all do work at least some of the time. We start with a response that may not seem on the surface like a remedy at all—simply ignoring misbehaviors.

Ignoring Misbehaviors

A lot of misbehaviors are not important or frequent enough to deserve any response at all. They are likely to disappear (or *extinguish*, in behaviorist terms) simply if left alone. If a student who is usually quiet during class happens to whisper to a neighbor once in a while, it is probably less disruptive and just as effective to ignore the infraction than to respond to it. Some misbehaviors may not be worth a response even if they are frequent, as long as they do not seem to bother others. Suppose, for example, that a certain student has a habit of choosing quiet seat-work times to sharpen her pencil. She is continually out of her seat to go to the sharpener. Yet this behavior is not really noticed by others. Is it then really a problem, however unnecessary or ill-timed it may be? In both examples ignoring the behavior may be wise because there is little danger of the behavior disrupting other students or of becoming more frequent. Interrupting your activities—or the students'—might cause more disruption than simply ignoring the problem.

That said, there can still be problems in deciding whether particular misbehavior is truly minor, infrequent, or unnoticed by others. Unlike in our example above, students may whisper to each other more than "rarely" but less than "often": in that case, when do you decide that the whispering is in fact *too* frequent and needs a more active response from you? Or the student who sharpens her pencil, mentioned above, may not bother most others, but she may nonetheless bother a few. In that case how many bothered classmates are "too many"? Five, three, just one, or...? In these ambiguous cases, you may need more active ways of dealing with inappropriate behavior, like the ones described in the next sections.

Gesturing Nonverbally

Sometimes it works to communicate using gestures, eye contact, or "body language" that involves little or no speaking. Nonverbal cues are often appropriate if misbehavior is just a bit too serious or frequent to ignore, but not serious or frequent enough to merit taking the time deliberately to speak to or talk with the student. If two students are chatting off-task for a relatively extended time, for example, sometimes a glance in their direction, a frown, or even just moving closer to the students is enough of a reminder to get them back on task. Even if these responses prove *not* to be enough, they may help to keep the off-task behavior from spreading to other students.

A risk of relying on nonverbal cues, however, is that some students may not understand their meaning, or may even fail to notice them. If the two chatting students mentioned above are engrossed in their talking, for example, they may not see you glance or frown at them. Or they might notice but not interpret your cue as a reminder to get back on task. Misinterpretation of nonverbal gestures and cues is more likely with young children, who are still learning the subtleties of adults' nonverbal "language" (Guerrero & Floyd, 2005; Heimann, et al., 2006). It is also more likely with students who speak limited English or whose cultural background differs significantly from your own. These students may have learned different nonverbal gestures from your own as part of their participation in their original culture (Marsh, Elfenbein, & Ambady, 2003).

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=137#oembed-1

Video 9.4.1. Teach *Like a Champion: Getting Everyone's Attention in Class*

Natural and Logical Consequences

Consequences are the outcomes or results of an action. When managing a classroom, two kinds of consequences are especially effective for influencing students' behavior: natural consequences and logical consequences. As the term implies, **natural consequences** happen "naturally," without deliberate intention by anyone. If a student is late for class, for example, a natural consequence is that he misses information or material that is needed to do an assignment. **Logical consequences** are ones that happen because of the responses of or decisions by others, but that also have an obvious or "logical" relationship to the original action. If one student steals another's lunch, for example, a logical consequence might be for the thief to reimburse the victim for the cost of the lunch. Natural and logical consequences are often woven together and thus hard to distinguish: if one student picks a fight with another student, a natural consequence might be injury not only to the victim, but also to the aggressor (an inherent byproduct of fighting), but a logical consequence might be to lose friends (the response of others to fighting). In practice, both may occur.

In general, research has found that both natural and logical consequences can be effective for minimizing undesirable behaviors, provided they are applied in appropriate situations (Weinstein, Tomlinson-Clarke, & Curran, 2004). Consider a student who runs impulsively down school hallways. The student is likely to have "traffic accidents," and thus (hopefully) see that running is not safe and reduce the frequency of running. Or consider a student who chronically talks during class instead of working on an assigned task. The student may have to make up the assignment later, possibly as homework. Because the behavior and the

consequence are connected logically, the student is relatively likely to see the drawback of choosing to talk and to reduce how much he or she talks on subsequent occasions. In either case, whether natural or logical, the key features that make consequences work are (a) that they are appropriate to the misbehavior and (b) that the student understands the connection between the consequences and the original behavior.

Notice, though, that natural and logical consequences do not always work; if they did, there would be no further need for management strategies! One limitation is that misbehaviors can sometimes be so serious that no natural or logical consequence seems sufficient or appropriate. Suppose, for example, that one student deliberately breaks another student's eyeglasses. There may be a natural consequence for the *victim* (he or she will not be able to see easily), but not for the student who broke the glasses. There may also be no consequences for the aggressor that are both logical and fully satisfactory: the aggressor student will not be able to repair the broken glasses himself, and may not be able to pay for new glasses either.

Another limitation of natural and logical consequences is that their success depends on the motives of the misbehaving student. If the student is seeking attention or acceptance by others, then consequences often work well. Bullying in order to impress others, for example, is more likely to *lose* friends than to win them—so bullying motivated in this way is self-limiting. If a student is seeking power over others, on the other hand, then the consequences of bullying may not reduce the behavior. Bullying in order to control others' actions by definition actually achieves its own goal, and its "natural" result (losing friends) would be irrelevant. Of course, a bully might also act from a combination of motives, so that natural and logical consequences limit bullying behavior, but only partially.

A third problem with natural and logical consequences is that they can easily be confused with deliberate punishment (Kohn, 2006). The difference is important. Consequences are focused on repairing damage and restoring relationships, and in this sense, they

focus on the future. Punishments highlight a mistake or wrongdoing and in this sense focus on the past. Consequences tend to be more solution-focused. Punishments tend to highlight the person who committed the action, and they often shame or humiliate the wrongdoer. (Table below summarizes these and other differences.)

Table 9.4.1: Differences between consequences and punishments

Focused on future solutions	**Focused on past mistakes**
Focused on individual's actions	Focused on character of student or child
Focused on repairing mistakes	Focused on establishing blame
Focused on restoring positive relationships	Focused on isolating wrong-doer
Tend to reduce emotional pain and conflict	Tend to impose emotional pain or conflict

Classroom examples of the differences between consequences and punishment are plentiful. If a student fails to listen to the teacher's instructions, then a consequence is that he or she misses important information, but punishment may be that the teacher criticizes or reprimands the student. If a student speaks rudely to the teacher, a consequence may be that the teacher does not respond to the comment, or simply reminds the student to speak courteously. A punishment may be that the teacher scolds the student in the presence of others, or even imposes detention ("Stay after school for 15 minutes").

One or more interactive elements has been excluded from this version of the text. You can view them online here:
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Video 9.4.2. *Teach Like a Champion–Discipline* describes discipline

as a noun that refers to the process of teaching someone the right way to do something or to the state of being able to do something the right way: "I have discipline" or "I teach discipline." This sense of the word is also captured in the meaning of self-discipline: the ability to make oneself do things all the way through.

Conflict Resolution and Problem-Solving

When a student misbehaves persistently and disruptively, you will need strategies that are more active and assertive than the ones discussed so far, and that focus on **conflict resolution**—the reduction of disagreements that persist over time. Conflict resolution strategies that educators and teachers tend to use usually have two parts (Jones, 2004). First, they involve ways of identifying precisely what is "the" problem. Second, they remind the student of classroom expectations and rules with simple clarity and assertiveness, but *without* apology or harshness. When used together, the two strategies not only reduce conflicts between a teacher and an individual student but also provide a model for other students to follow when they have disagreements of their own. The next sections discuss the nature of assertion and clarification for conflict resolution in more detail.

Step 1: Clarifying and Focusing: Problem Ownership

Classrooms can be emotional places even though their primary purpose is to promote thinking rather than an expression of feelings. The emotions can be quite desirable: they can give teachers and students "passion" for learning and a sense of care among members of the class. But feelings can also cause trouble

if students misbehave: at those moments negative feelings—annoyance, anger, discomfort—can interfere with understanding exactly what is wrong and how to set things right again. Gaining a bit of distance from the negative feelings is exactly what those moments need, especially on the part of the teacher, the person with (presumably) the greatest maturity.

In a widely cited approach to conflict resolution called *Teacher Effectiveness Training*, the educator Thomas Gordon describes this challenge as an issue of **problem ownership**, or deciding whose problem behavior or conflict it really is (Gordon, 2003). The "owner" of the problem is the primary person who is troubled or bothered by it. The owner can be the student committing the behavior, the teacher, or another student who merely happens to see the behavior. Since the owner of a problem needs to take primary responsibility for solving it, identifying ownership makes a difference in how to deal with the behavior or problem effectively.

Suppose, for example, that a student named David makes a remark that the teacher finds offensive (like "Sean is fat"). Is this remark the student's problem or the teacher's? If David made the comment privately to the teacher and is unlikely to repeat it, then maybe it is only the teacher's problem. If he is likely to repeat it to other students or to Sean himself, however, then maybe the problem is really David's. On the other hand, suppose that a different student, Sarah, complains repeatedly that classmates refuse to let her into group projects. This is less likely to be the teacher's problem rather than Sarah's: her difficulty may affect her ability to do her own work, but not really affect the teacher or classmates directly. As you might suspect, too, a problem may sometimes affect several people at once. David, who criticized Sean, may discover that he offended not only the teacher but also classmates, who therefore avoid working with him. At that point, the whole class begins to share in some aspect of "the" problem: not only is David prevented from working with others comfortably but also classmates *and* the teacher begin dealing with bad feelings about David.

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Video 9.4.3. *Teach Like a Champion–What to Do* discusses ownership of a problem. We often see behavior issues as defiance of the student, but there are other sources to these misbehaviors, including teacher behaviors.

Step 2: Active, Empathetic Listening

Diagnosing accurately who really has a problem with a behavior—who "owns" it—is helped by a number of strategies. One is **active listening**—attending carefully to all aspects of what a student says and attempting to understand or empathize as fully as possible, even if you do not agree with what is being said (Cooper & Simonds, 2003). Active listening involves asking questions in order continually to check your understanding. It also involves encouraging the student to elaborate on his or her remarks, and paraphrasing and summarizing what the student says in order to check your perceptions of what is said. It is important *not* to move too fast toward solving the problem with advice, instructions, or scolding, even if these are responses that you might, as a teacher, feel responsible for making. Responding too soon with solutions can shut down communication prematurely, and leave you with inaccurate impressions of the source or nature of the problem.

Step 3: Assertive Discipline and "I"-Messages

Once you have listened well to the student's point of view, it helps to frame your responses and comments in terms of how the student's behavior affects you in particular, especially in your role as the teacher. The comments should have several features:

- They should be *assertive*—neither passive and apologetic, nor unnecessarily hostile and aggressive (Cantor, 1996). State the problem as matter-of-factly as possible: "Joe, you are talking while I'm explaining something," instead of either "Joe, do you think you could be quiet now?" or "Joe, be quiet!"
- The comments should emphasize **I-messages** (Gordon, 1981), which are comments that focus on how the problem behavior is affecting the teacher's ability to teach, as well as how the behavior makes the teacher feel. They are distinct from *you-messages*, which focus on evaluating the mistake or problem which the student has created. An I-message might be, "Your talking is making it hard for me to remember what I'm trying to say." A you-message might be, "Your talking is rude."
- The comments should encourage the student to think about the effects of his or her actions on others—a strategy that in effect encourages the student to consider the ethical implications of the actions (Gibbs, 2003). Instead of simply saying: "When you cut in line ahead of the other kids, that was not fair to them," you can try saying, "How do you think the other kids feel when you cut in line ahead of them?"

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here:
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Video 9.4.4. *Teach Like a Champion–What to Do (part 2)* provides suggestions for providing assertive redirection and correction of misbehavior without being harsh.

Step 4: Negotiation

The first three steps describe ways of interacting that are desirable, but also fairly specific in scope and limited in duration. But in themselves, they may not be enough when conflict persists over time and develops a number of complications or confusing features. A student may persist in being late for class, for example, in spite of efforts by the teacher to modify this behavior. Or two students may repeatedly speak rudely to each other, even though the teacher has mediated this conflict in the past. Or a student may fail to complete homework, time after time. Because these problems develop over time, and because they may involve repeated disagreements, they can eventually become stressful for the teacher, the student, and any classmates who may be affected. Their persistence can tempt a teacher simply to dictate a resolution—a decision that can leave everyone feeling defeated, including the teacher.

Often in these situations, it is better to **negotiate** a solution, which means systematically discussing options and compromising one if possible. Although negotiation always requires time and effort, it is often less time or effort than continuing to cope with the original problem, and the results can be beneficial to everyone. A number of experts on conflict resolution have suggested strategies for negotiating with students about persistent problems (Davidson

& Wood, 2004). The suggestions vary in detail, but usually include some combination of the steps we have already discussed above, along with a few others:

- *Decide as accurately as possible what the problem is.* Usually, this step involves a lot of the active listening described above.
- *Brainstorm possible solutions, and **then** consider their effectiveness.* Remember to include students in this step; otherwise, you end up simply imposing a solution on others, which is *not* what negotiation is supposed to achieve.
- *If possible, choose a solution by consensus.* Complete agreement on the choice may not be possible, but strive for it as best you can. Remember that taking a vote may be a democratic, acceptable way to settle differences in some situations, but if feelings are running high, voting does not work as well. In that case, voting may simply allow the majority to impose its will on the minority, leaving the underlying conflict unresolved.
- *Pay attention to how well the solution works after it is underway.* For many reasons, things may not work out the way you or students hope or expect. You may need to renegotiate the solution at a later time.

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Chapter Summary: Classroom Management

There are two primary messages from this chapter. One is that management issues are important, complex, and deserving of serious attention. The other is that strategies exist that can reduce, if not eliminate, management problems when and if they occur. We have explained some of those strategies—including some intended to prevent problems and others intended to remedy problems.

But there is an underlying assumption about management that this chapter emphasized fully: that good classroom management is not an end in itself, but a means for creating a classroom where learning happens and students are motivated. Amidst the stresses of handling a problem behavior, there is a risk of losing sight of this idea. Telling a student to be quiet is never a goal in itself, for example; it is desirable only because (or when) it allows all students to hear the teacher's instructions or classmates' spoken comments, or because it allows students to concentrate on their work. There may actually be moments when students' keeping quiet is *not* appropriate, such as during a "free choice" time in an elementary classroom or during a group work task in a middle school classroom. As teachers, we need to keep this perspective firmly in mind. Classroom management should serve students' learning, and not the other way around. The next chapter is based on this idea, because it discusses ways not just to set the stage for learning, as this chapter has done, but ways to plan directly for students' learning.

Classroom management is the coordination of lessons and activities to make learning as productive as possible. It is important because classrooms are complex and somewhat unpredictable, because students respond to teachers' actions in diverse ways, and because society requires that students attend school. There are two

major features of management: preventing problems before they occur and responding to them after they occur. Many management problems can be prevented by attending to how classroom space is used, by establishing daily procedures, routines, and rules, by pacing and structuring activities appropriately, and by communicating the importance of learning and of positive behavior to students and parents. There are several ways of dealing with a management problem after it occurs, and the choice depends on the nature of the problem. A teacher can simply ignore a misbehavior, gesture or cue students nonverbally, rely on natural and logical consequences, or engage conflict resolution strategies. Whatever tactics the teacher uses, it is important to keep in mind their ultimate purpose: to make learning possible and effective.

Glossary

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ASSESSMENT AND EVALUATION

Theme: Options in Assessment and Standardized Testing

Overview of Concepts:

- Assessment Planning
- Developing Classroom Tests
- Performance Assessment
- Standardized Tests and Scores
- Testing and Accountability

Learning Objectives:

- Describe how assessment is used in educational decision making
- Explain why developing an assessment plan is important
- Discuss the importance of grading procedures
- Discuss the importance of validity, reliability, fairness/equivalence, and practicality in test construction
- Explain how test blueprint is used to develop a good test
- Discuss the usefulness of various test item formats and scoring considerations
- Describe the benefits of item analysis

- Define performance assessment and examples of formative and summative assessment
- Define authentic assessment and the characteristics
- Describe the purpose of standardized tests
- Explain the difference between criterion-referenced and norm-referenced
- Explain normal distribution
- Explain validity and reliability of standardized tests
- Explain how NCLB is considered high-stakes, and 3 problems with the law
- Explain how teachers can avoid the 6 negative outcomes of high-stakes testing
- Explain how accommodations improve validity of test scores
- Explain the difference between test fairness and test bias

Assessment

Assessment is an integrated process of gaining information about students' learning and *making value judgments* about their progress (Linn & Miller, 2005). Information about students' progress can be obtained from a variety of sources including projects, portfolios, performances, observations, and tests. The information about students' learning is often assigned specific numbers or grades and this involves **measurement**. Measurement answers the question, "How much?" and is used most commonly when the teacher scores a test or product and assigns numbers (e.g. 28 /30 on the biology test; 90/100 on the science project). **Evaluation** is the process of making judgments about the assessment information (Airasian, 2005). These judgments may be about individual students (e.g. should Jacob's course grade take into account his significant improvement over the grading period?), the assessment method used (e.g. is the multiple-choice test a useful way to obtain information about problem-solving), or one's own teaching (e.g. most of the students this year did much better on the essay assignment than last year so my new teaching methods seem effective).

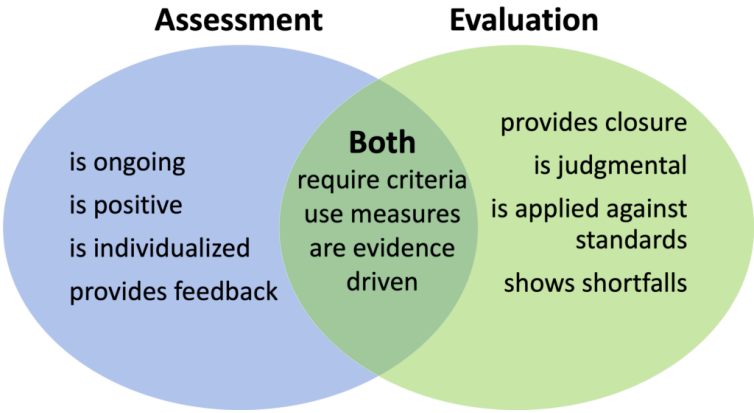

Figure 10.1.1. Purposes of assessment and evaluation.

We will first explore **assessment *for* learning**, where the priority is designing and using assessment strategies to enhance student learning and development. Sometimes a teacher might begin the lesson, unit, or academic term with a **diagnostic assessment**. These assessments are used to determine students' previous knowledge, skills, and understandings prior to teaching. This 'pre-test' helps the teacher determine what students already know, what they need to know, and how to adjust the curriculum to meet the needs of the students.

Assessment for learning is most often **formative assessment**, i.e. it takes place during the course of instruction by providing information that teachers can use to revise their teaching and students can use to improve their learning (Black, Harrison, Lee, Marshall & Wiliam, 2004). Formative assessment includes both **informal assessment** involving spontaneous unsystematic observations of students' behaviors (e.g. during a question and answer session or while the students are working on an assignment) and **formal assessment** involving the pre-planned, systematic gathering of data.

Assessment *of* learning is a **formal assessment** that involves assessing students in order to certify their competence and fulfill accountability mandates. Assessment of learning is typically **summative**, that is, administered after the instruction is completed (e.g. a final examination in an educational psychology course). Summative assessments provide information about how well students mastered the material, whether students are ready for the next unit, and what grades should be given (Airasian, 2005).

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Video 10.1.1. *Formative vs. Summative vs. Diagnostic Assessments* explains the different uses and implementations for different types of assessments.

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Video 10.1.2. *Formal vs. Informal Assessments and Examples* provides explanation of the differences between these types of assessments.

Assessment for Learning: An Overview of the Process

Using assessment to advance students' learning not just check on learning requires viewing assessment as a process that is integral to all phases of teaching including planning, classroom interactions and instruction, communication with parents, and self-reflection (Stiggins, 2002). Essential steps in assessment for learning are laid out below.

Step 1: Having Clear Instructional Goals and Communicating Them to Students

Teachers must think carefully about the purposes of each lesson and unit. This may be hard for beginning teachers. For example, Vanessa, a middle school social studies teacher, might say that the goal of her next unit is: "Students will learn about the Civil War." Clearer goals require that Vanessa decides what it is about the US Civil War she wants her students to learn, e.g. the dates and names of battles, the causes of the US Civil War, the differing perspectives of those living in the North and the South, or the day-to-day experiences of soldiers fighting in the war. Vanessa cannot devise appropriate assessments of her students' learning about the US Civil War until she is clear about her own purposes.

For effective teaching, Vanessa also needs to communicate clearly the goals and objectives to her students so they know what is important for them to learn. No matter how thorough a teacher's planning has been, if students do not know what they are supposed to learn they will not learn as much.

Step 2: Selecting Appropriate Assessment Techniques

Selecting and administrating assessment techniques that are appropriate for the goals of instruction as well as the developmental level of the students are crucial components of effective assessment for learning. Teachers need to know the characteristics of a wide variety of classroom assessment techniques and how these techniques can be adapted for various content, skills, and student characteristics. They also should understand the role reliability, validity, and the absence of bias should play is choosing and using assessment techniques. Finally, teachers must consider the practicality of an assessment. Is there adequate time and resources for successfully employing a particular assessment? Much of this chapter focuses on this information.

Step 3: Using Assessment to Enhance Motivation and Confidence

Students' motivation and confidence are influenced by the type of assessment used as well as the feedback given about the assessment results. Consider, Samantha a college student who takes a history class in which the professor's lectures and textbook focus on really interesting major themes. However, the assessments are all multiple-choice tests that ask about facts, and Samantha, who initially enjoys the classes and readings, becomes angry, loses confidence she can do well, and begins to spend less time on the class material. In contrast, some instructors have observed that many students in educational psychology classes like the one you are now taking will work harder on assessments that are case studies rather than more traditional exams or essays. The type of

feedback provided to students is also important and we elaborate on these ideas later in this chapter.

Step 4: Adjusting Instruction Based on Information

An essential component of assessment for learning is that the teacher uses the information gained from assessment to adjust instruction. These adjustments occur in the middle of a lesson when a teacher may decide that students' responses to questions indicate sufficient understanding to introduce a new topic, or that her observations of students' behavior indicate that they do not understand the assignment and so need further explanation. Adjustments also occur when the teacher reflects on the instruction after the lesson is over and is planning for the next day. We provide examples of adjusting instruction in this chapter and consider teacher reflection in more detail in Appendix C.

Step 5: Communicating with Parents and Guardians

Students' learning and development are enhanced when teachers communicate with parents regularly about their children's performance. Teachers communicate with parents in a variety of ways including newsletters, telephone conversations, email, school district websites, and parent-teacher conferences. Effective communication requires that teachers can clearly explain the purpose and characteristics of the assessment as well as the meaning of students' performance. This requires a thorough knowledge of the types and purposes of teacher-made and standardized assessments and well as clear communication skills.

We now consider each step in the process of assessment for learning in more detail. In order to be able to select and administer appropriate assessment techniques, teachers need to know about the variety of techniques that can be used as well as what factors ensure that the assessment techniques are high quality. We begin by considering high-quality assessments.

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Selecting High-Quality Assessments

For an assessment to be high quality it needs to have good validity and reliability as well as absence from bias.

Validity

Validity is the evaluation of the "adequacy and appropriateness of the interpretations and uses of assessment results" for a given group of individuals (Linn & Miller, 2005, p. 68). For example, is it appropriate to conclude that the results of a mathematics test on fractions given to recent immigrants accurately represent their understanding of fractions? Is it appropriate for the teacher to conclude, based on her observations, that a kindergarten student, Jasmine, has Attention Deficit Disorder because she does not follow the teacher's oral instructions? Obviously, in each situation, other interpretations are possible that the immigrant students have poor English skills rather than mathematics skills, or that Jasmine may be hearing impaired.

It is important to understand that validity refers to the *interpretation and uses made of the results* of an assessment procedure, not of the assessment procedure itself. For example, making judgments about the results of the same test on fractions may be valid if the students all understand English well. A teacher concluding from her observations that the kindergarten student has Attention Deficit Disorder (ADD) may be appropriate if the student has been screened for hearing and other disorders (although the classification of a disorder like ADD cannot be made by one teacher). Validity involves making an overall judgment of the degree to which

the interpretations and uses of the assessment results are justified. Validity is a matter of degree (e.g. high, moderate, or low validity) rather than all-or-none (e.g. totally valid vs invalid) (Linn & Miller, 2005).

Three sources of evidence are considered when assessing validity—content, construct, and predictive. **Content validity** evidence is associated with the question: How well does the assessment include the content or tasks it is supposed to? For example, suppose your educational psychology instructor devises a mid-term test and tells you this includes chapters one to seven in the textbook. Obviously, all the items in the test should be based on the content from educational psychology, not your methods or cultural foundations classes. Also, the items in the test should cover content from all seven chapters and not just chapters three to seven—unless the instructor tells you that these chapters have priority.

Teachers' have to be clear about their purposes and priorities for instruction *before* they can begin to gather evidence related to content validity. Content validation determines the degree that which assessment tasks are relevant and representative of the tasks judged by the teacher (or test developer) to represent their goals and objectives (Linn & Miller, 2005). It is important for teachers to think about content validation when devising assessment tasks and one way to help do this is to devise a Table of Specifications. An example, based on Pennsylvania's State standards for grade 3 geography, is in the table below. In the left-hand column is the instructional content for a 20-item test the teacher has decided to construct with two kinds of instructional objectives: identification and uses or locates. The second and third columns identify the number of items for each content area and each instructional objective. Notice that the teacher has decided that six items should be devoted to the sub-area of geographic representations- more than any other sub-area. Devising a table of specifications helps teachers determine if some content areas or concepts are over-

sampled (i.e. there are too many items) and some concepts are under-sampled (i.e. there are too few items).

Table 10.2.1. Example of Table of Specifications: grade 3 basic geography literacy

Content	Instructional objective		Total number of items	Percent of items
	Identifies	Uses or locates		
Identify geography tools and their uses				
Geographic representations: e.g., maps, globe, diagrams, and photographs	3	3	6	30%
Spatial information: sketch & thematic maps	1	1	2	10%
Mental maps	1	1	2	10%
Identify and locate places and regions				
Physical features (e.g. lakes, continents)	1	2	3	15%
Human features (countries, states, cities)	3	2	5	25%
Regions with unifying geographic characteristics e.g. river basins	1	1	3	10%
Total number of items	10	10	20	
Total percentage of items	50%	50%		100%

Construct validity evidence is more complex than content validity evidence. Often we are interested in making broader judgments about students' performances than specific skills such as doing fractions. The focus may be on constructs such as mathematical reasoning or reading comprehension. A construct is a characteristic of a person we assume exists to help explain behavior. For example, we use the concept of test anxiety to explain why some individuals when taking a test have difficulty concentrating, have physiological reactions such as sweating, and perform poorly on tests but not

in-class assignments. Similarly, mathematics reasoning and reading comprehension are constructs as we use them to help explain performance on an assessment. Construct validation is the process of determining the extent to which performance on an assessment can be interpreted in terms of the intended constructs and is not influenced by factors irrelevant to the construct. For example, judgments about recent immigrants' performance on a mathematical reasoning test administered in English will have low construct validity if the results are influenced by English language skills that are irrelevant to mathematical problem-solving. Similarly, construct validity of end-of-semester examinations is likely to be poor for those students who are highly anxious when taking major tests but not during regular class periods or when doing assignments. Teachers can help increase construct validity by trying to reduce factors that influence performance but are irrelevant to the construct being assessed. These factors include anxiety, English language skills, and reading speed (Linn & Miller 2005).

The third form of validity evidence is called **criterion-related validity**. Selective colleges in the USA use the ACT or SAT among other criteria to choose who will be admitted because these standardized tests help predict freshman grades, i.e. have high criterion-related validity. Some K-12 schools give students math or reading tests in the fall semester in order to predict which are likely to do well on the annual state tests administered in the spring semester and which students are unlikely to pass the tests and will need additional assistance. If the tests administered in the fall do not predict students' performances accurately then the additional assistance may be given to the wrong students illustrating the importance of criterion-related validity.

Reliability

Reliability refers to the consistency of the measurement (Linn &

Miller 2005). Suppose Mr. Garcia is teaching a unit on food chemistry in his tenth-grade class and gives an assessment at the end of the unit using test items from the teachers' guide. Reliability is related to questions such as: How similar would the scores of the students be if they had taken the assessment on a Friday or Monday? Would the scores have varied if Mr. Garcia had selected different test items, or if a different teacher had graded the test? An assessment provides information about students by using a specific measure of performance at one particular time. Unless the results from the assessment are reasonably consistent over different occasions, different raters, or different tasks (in the same content domain) confidence in the results will be low and so cannot be useful in improving student learning.

Obviously, we cannot expect perfect consistency. Students' memory, attention, fatigue, effort, and anxiety fluctuate and so influence performance. Even trained raters vary somewhat when grading assessments such as essays, science projects, or oral presentations. Also, the wording and design of specific items influence students' performances. However, some assessments are more reliable than others and there are several strategies teachers can use to increase reliability.

First, assessments with more tasks or items typically have higher reliability. To understand this, consider two tests one with five items and one with 50 items. Chance factors influence the shorter test more than the longer test. If a student does not understand one of the items in the first test the total score is very highly influenced (it would be reduced by 20 percent). In contrast, if there was one item in the test with 50 items that were confusing, the total score would be influenced much less (by only 2 percent). Obviously, this does not mean that assessments should be inordinately long, but, on average, enough tasks should be included to reduce the influence of chance variations. Second, clear directions and tasks help increase reliability. If the directions or wording of specific tasks or items are unclear, then students have to guess what they mean undermining the accuracy of their results. Third, clear scoring

criteria are crucial in ensuring high reliability (Linn & Miller, 2005). Later in this chapter, we describe strategies for developing scoring criteria for a variety of types of assessment.

Absence of Bias

Bias occurs in assessment when there are components in the assessment method or administration of the assessment that distort the performance of the student because of their personal characteristics such as gender, ethnicity, or social class (Popham, 2005). Two types of assessment bias are important: *offensiveness* and *unfair penalization.* An assessment is most likely to be offensive to a subgroup of students when negative stereotypes are included in the test. For example, the assessment in a health class could include items in which all the doctors were men and all the nurses were women. Or, a series of questions in a social studies class could portray Latinos and Asians as immigrants rather than native-born Americans. In these examples, some female, Latino or Asian students are likely to be offended by the stereotypes and this can distract them from performing well on the assessment.

Unfair penalization occurs when items disadvantage one group not because they may be offensive but because of differential background experiences. For example, an item for math assessment that assumes knowledge of a particular sport may disadvantage groups not as familiar with that sport (e.g. American football for recent immigrants). Or an assessment on teamwork that asks students to model their concept of a team on a symphony orchestra is likely to be easier for those students who have attended orchestra performances—probable students from affluent families. Unfair penalization does not occur just because some students do poorly in class. For example, asking questions about a specific sport in a physical education class when information on that sport had been discussed in class is not unfair penalization as long as the questions

do not require knowledge beyond that taught in class that some groups are less likely to have.

It can be difficult for new teachers to teach in multi-ethnic classrooms to devise interesting assessments that do not penalize any groups of students. Teachers need to think seriously about the impact of students' differing backgrounds on the assessment they use in class. Listening carefully to what students say is important as is learning about the backgrounds of the students.

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Teacher-Made Assessments

One of the challenges for beginning teachers is to select and use appropriate assessment techniques. In this section, we summarize the wide variety of types of assessments that classroom teachers use. First, we discuss the informal techniques teachers use during instruction that typically require instantaneous decisions. Then we consider formal assessment techniques that teachers plan before instruction and allow for reflective decisions.

Teachers' Observation, Questioning, and Record-Keeping

During teaching, teachers not only have to communicate the information they planned but also continuously monitor students' learning and motivation in order to determine whether modifications have to be made (Airasian, 2005). Beginning teachers find this more difficult than experienced teachers because of the complex cognitive skills required to improvise and be responsive to students' needs while simultaneously keeping in mind the goals and plans of the lesson (Borko & Livingston, 1989). The informal assessment strategies teachers most often use during instruction are *observation* and *questioning*.

Observation

Effective teachers observe their students from the time they enter the classroom. Some teachers greet their students at the door not only to welcome them but also to observe their mood and

motivation. Are Hannah and Naomi still not talking to each other? Does Ethan have his materials with him? Gaining information on such questions can help the teacher foster student learning more effectively (e.g. suggesting Ethan goes back to his locker to get his materials before the bell rings or avoiding assigning Hannah and Naomi to the same group).

During instruction, teachers observe students' behavior to gain information about students' level of interest and understanding of the material or activity. Observation includes looking at non-verbal behaviors as well as listening to what the students are saying. For example, a teacher may observe that a number of students are looking out of the window rather than watching the science demonstration, or a teacher may hear students making comments in their group indicating they do not understand what they are supposed to be doing. Observations also help teachers decide which student to call on next, whether to speed up or slow down the pace of the lesson, when more examples are needed, whether to begin or end an activity, how well students are performing a physical activity, and if there are potential behavior problems (Airasian, 2005). Many teachers find that moving around the classroom helps them observe more effectively because they can see more students from a variety of perspectives. However, the fast pace and complexity of most classrooms make it difficult for teachers to gain as much information as they want.

Questioning

Teachers ask questions for many instructional reasons including keeping students' attention on the lesson, highlighting important points and ideas, promoting critical thinking, allowing students to learn from each other's answers, and providing information about students' learning. Devising good appropriate questions and using students' responses to make effective instantaneous instructional

decisions is very difficult. Some strategies to improve questioning include planning and writing down the instructional questions that will be asked, allowing sufficient wait time for students to respond, listening carefully to what students say rather than listening for what is expected, varying the types of questions asked, making sure some of the questions are higher level, and asking follow-up questions.

While the informal assessment based on spontaneous observation and questioning is essential for teaching there are inherent problems with the validity, reliability, and bias of this information (Airasian, 2005; Stiggins 2005). We summarize these issues and some ways to reduce the problems in the table below.

Table 10.3.1. Validity and reliability of observation and questioning

Problem	Strategies to alleviate the problem
Teachers lack objectivity about overall class involvement and understanding	Try to make sure you are not only seeing what you want to see. Teachers typically want to feel good about their instruction so it is easy to look for positive student interactions. Occasionally, teachers want to see negative student reactions to confirm their beliefs about an individual student or class.
Tendency to focus on process rather than learning	Remember to concentrate on student learning, not just involvement. Most of the teachers' observations focus on process—student attention, facial expressions posture—rather than pupil learning. Students can be active and engaged but not develop new skills.
Limited information and selective sampling	Make sure you observe a variety of students—not just those who are typically very good or very bad. Walk around the room to observe more students "up close" and view the room from multiple perspectives. Call on a wide variety of students—not just those with their hands up, or those who are skilled as the subject, or those who sit in a particular place in the room. Keep records.
Fast pace of classrooms inhibits corroborative evidence	If you want to know if you are missing important information ask a peer to visit your classroom and observe the students' behaviors. Classrooms are complex and fast-paced and one teacher cannot see much of what is going on while trying to also teach.
Cultural and individual differences in the meaning of verbal and nonverbal behaviors	Be cautious in the conclusions that you draw from your observations and questions. Remember that the meaning and expectations of certain types of questions, wait time, social distance, and the role of "small talk" varies across cultures. Some students are quiet because of their personalities not because they are uninvolved, keeping up with the lesson, nor depressed or tired.

Record Keeping

Keeping records of observations improves reliability and can be

used to enhance the understanding of one student, a group, or the whole class' interactions. Sometimes this requires help from other teachers. For example, Alexis, a beginning science teacher is aware of the research documenting that longer wait time enhances students' learning (e.g. Rowe, 2003) but is unsure of her behaviors so she asks a colleague to observe and record her wait times during one class period. Alexis learns her wait times are very short for all students so she starts practicing silently counting to five whenever she asks students a question.

Teachers can keep *anecdotal records* about students without help from peers. These records contain descriptions of incidents of a student's behavior, the time and place the incident takes place, and a tentative interpretation of the incident. For example, the description of the incident might involve Joseph, a second-grade student, who fell asleep during the mathematics class on a Monday morning. A tentative interpretation could be the student did not get enough sleep over the weekend, but alternative explanations could be the student is sick or is on medications that make him drowsy. Obviously, additional information is needed and the teacher could ask Joseph why he is so sleepy and also observe him to see if he looks tired and sleepy over the next couple of weeks.

Anecdotal records often provide important information and are better than relying on one's memory but they take time to maintain and it is difficult for teachers to be objective. For example, after seeing Joseph fall asleep the teacher may now look for any signs of Joseph's sleepiness—ignoring the days he is not sleepy. Also, it is hard for teachers to sample a wide enough range of data for their observations to be highly reliable.

Teachers also conduct more formal observations, especially for students with special needs who have IEPs. An example of the importance of informal and formal observations in a preschool follows:

The class of preschoolers in a suburban neighborhood of a large city has eight special needs students and four students—the peer models—who have been selected because of their well-developed language and social skills. Some of the special needs students have been diagnosed with delayed language, some with behavior disorders, and several with autism.

The students are sitting on the mat with the teacher who has a box with sets of three "cool" things of varying sizes (e.g. toy pandas) and the students are asked to put the things in order by size, big, medium, and small. Students who are able to are also requested to point to each item in turn and say "This is the big one," "This is the medium one," and "This is the little one." For some students, only two choices (big and little) are offered because that is appropriate for their developmental level.

The teacher informally observes that one of the boys is having trouble keeping his legs still so she quietly asks the aid for a weighted pad that she places on the boy's legs to help him keep them still. The activity continues and the aide carefully observes students' behaviors and records on IEP progress cards whether a child meets specific objectives such as: "When given two picture or object choices, Mark will point to the appropriate object in 80 percent of the opportunities." The teacher and aides keep records of the relevant behavior of the special needs students during the half-day they are in preschool. The daily records are summarized weekly. If there are not enough observations that have been

recorded for a specific objective, the teacher and aide focus their observations more on that child, and if necessary, try to create specific situations that relate to that objective. At the end of each month, the teacher calculates whether the special needs children are meeting their IEP objectives.

Selected Response Items

Common formal assessment formats used by teachers are *multiple-choice*, *matching*, and *true/false items*. In selected-response items, students have to select a response provided by the teacher or test developer rather than constructing a response in their own words or actions. Selected response items do not require that students *recall* the information but rather *recognize* the correct answer. Tests with these items are called *objective* because the results are not influenced by scorers' judgments or interpretations and so are often machine scored. Eliminating potential errors in scoring increases the reliability of tests but teachers who only use objective tests are liable to reduce the validity of their assessment because objective tests are not appropriate for all learning goals (Linn & Miller, 2005). Effective assessment *for* learning as well as the assessment of learning must be based on aligning the assessment technique to the learning goals and outcomes.

For example, if the goal is for students to conduct an experiment then they should be asked to do that rather than being asked *about* conducting an experiment.

Common problems

Selected response items are easy to score but are hard to devise. Teachers often do not spend enough time constructing items and common problems include:

- Unclear wording in the items
    - *True or False*: Although George Washington was born into a wealthy family, his father died when he was only 11, he worked as a youth as a surveyor of rural lands, and later stood on the balcony of Federal Hall in New York when he took his oath of office in 1789.
- Cues that are not related to the content being examined.
    - A common clue is that all the true statements on a true/false test or the corrective alternatives on a multiple-choice test are longer than the untrue statements or the incorrect alternatives.
- Using negatives (or double negatives) for the items.
    - A *poor item*: "True or False: None of the steps made by the student was unnecessary."
    - A *better item*: True or False: "All of the steps were necessary."
    - Students often do not notice the negative terms or find them confusing so avoiding them is generally recommended (Linn & Miller 2005). However, since standardized tests often use negative items, teachers sometimes deliberately include some negative items to give students practice in responding to that format.
- Taking sentences directly from the textbook or lecture notes. Removing the words from their context often makes them ambiguous or can change the meaning. For example, a statement from Chapter 3 taken out of context suggests all children are clumsy. "Similarly with jumping, throwing, and

catching: the large majority of children can do these things, though often a bit clumsily." A fuller quotation makes it clearer that this sentence refers to 5-year-olds: "For some fives, running still looks a bit like a hurried walk, but usually it becomes more coordinated within a year or two. Similarly with jumping, throwing, and catching: the large majority of children can do these things, though often a bit clumsily, by the time they start school, and most improve their skills noticeably during the early elementary years." If the abbreviated form was used as the stem in a true/false item it would obviously be misleading.

- Avoid trivial questions e.g. Jean Piaget was born in what year?
    - While it is important to know approximately when Piaget made his seminal contributions to the understanding of child development, the exact year of his birth (1880) is not important.

Strengths and weaknesses

All types of selected-response items have a number of strengths and weaknesses. *True/False* items are appropriate for measuring factual knowledge such as vocabulary, formulae, dates, proper names, and technical terms. They are very efficient as they use a simple structure that students can easily understand and take little time to complete. They are also easier to construct than multiple-choice and matching items. However, students have a 50 percent probability of getting the answer correct through guessing so it can be difficult to interpret how much students know from their test scores. Examples of common problems that arise when devising true/false items are in the table below.

Table 10.3.2. Common errors in selected-response items

Type of item	Common errors	Example
True/ False	The statement is not absolutely true—typically because it contains a broad generalization.	T/F: The President of the United States is elected to that office. This is usually true but the US Vice President can succeed the President.
True/ False	The item is opinion not fact	T/F: Education for K-12 students is improved through policies that support charter schools. Some people believe this, some do not.
True/ False	Two ideas are included in item	T/F: George H Bush the 40th president of the US was defeated by William Jefferson Clinton in 1992. The 1st idea is false; the 2nd is true making it difficult for students to decide whether to circle T or F.
True/ False	Irrelevant cues	T/F: The President of the United States is usually elected to that office. True items contain words such as usually generally; whereas false items contain terms such as always, all, never.
Matching	Columns do not contain homogeneous information	Directions: On the line to the US Civil War Battle write the year or confederate general in Column B Column A • Ft Sumter • 2nd Battle of Bull Run • Ft Henry Column B • General Stonewall Jackson • General Johnson • 1861 • 1862 Column B is a mixture of generals and dates.
Matching	Too many items in each list	Lists should be relatively short (4–7) in each column. More than 10 are too confusing.

Table 10.3.2. Common errors in selected-response items		
Matching	**Responses are not in logical order**	**In the example with Spanish and English words (Exhibit 1) should be in a logical order (they are alphabetical). If the order is not logical, students spend too much time searching for the correct answer.**
Multiple Choice	**Problem (i.e. the stem) is not clearly stated problem**	**New Zealand** • **Is the worlds' smallest continent** • **Is home to the kangaroo** • **Was settled mainly by colonists from Great Britain** • **Is a dictatorship** This is really a series of true-false items. Because the correct answer is 3, a better version with the problem in the stem is Much of New Zealand was settled by colonists from 1. **Great Britain** 2. **Spain** 3. **France** 4. **Holland**

Table 10.3.2. Common errors in selected-response items

Multiple Choice	**Some of the alternatives are not plausible**	**Who is best known for their work on the development of the morality of justice?** **1. Gerald Ford** **2. Vygotsky** **3. Maslow** **4. Kohlberg** Obviously Gerald Ford is not a plausible alternative.
Multiple Choice	**Irrelevant cues**	**• Correct alternative is longer** **• Incorrect alternatives are not grammatically correct with the stem** **• Too many correct alternatives are in position "b" or "c" making it easier for students to guess. All the options (e.g. a, b, c, d) should be used in approximately equal frequently (not exact as that also provides clues).**
Multiple Choice	**Use of "All of above"**	**If all of the "above is used" then the other items must be correct. This means that a student may read the 1st response, mark it correct, and move on. Alternatively, a student may read the 1st two items, and seeing they are true does not need to read the other alternatives to know to circle "all of the above." The teacher probably does not want either of these options.**

In *matching items*, two parallel columns containing terms, phrases, symbols, or numbers are presented and the student is asked to match the items in the first column with those in the second column. Typically there are more items in the second column to make the task more difficult and to ensure that if a student makes one error they do not have to make another. Matching items most

often are used to measure lower-level knowledge such as persons and their achievements, dates and historical events, terms and definitions, symbols and concepts, plants or animals, and classifications (Linn & Miller, 2005). An example of Spanish language words and their English equivalents is in Example 1.

EXample 1: SPANISH AND ENGLISH TRANSLATION

Directions: On the line to the right of the Spanish word in Column A, write the letter of the English word in Column B that has the same meaning.

Column A		*Column B*	
		1.	Aunt
1.	Casa ___	2.	Baby
2.	Bebé ___	3.	Brother
3.	Gata ___	4.	Cat
4.	Perro ___	5.	Dog
5.	Hermano___	6.	Father
		7.	House

While matching items may seem easy to devise it is hard to create homogenous lists. Other problems with matching items and suggested remedies are in Table 10.3.2.

Multiple Choice items are the most commonly used type of objective test items because they have a number of advantages over other objective test items. Most importantly they can be adapted to assess higher levels of thinking such as application as well as lower-level factual knowledge. The first example in Example 2 assesses knowledge of a specific fact whereas the second example assesses the application of knowledge.

Example 2: MULTIPLE-CHOICE EXAMPLES

Who is best known for their work on the development of the morality of justice?

1. Erikson
2. Vygotsky
3. Maslow
4. Kohlberg

Which one of the following best illustrates the law of diminishing returns?

1. A factory doubled its labor force and increased production by 50 percent
2. The demand for an electronic product increased faster than the supply of the product
3. The population of a country increased faster than agricultural self-sufficiency
4. A machine decreased in efficacy as its parts became worn out

(Adapted from Linn and Miller 2005, p, 193).

There are several other advantages of multiple-choice items. Students have to recognize the correct answer not just know the incorrect answer as they do in true/false items. Also, the opportunity for guessing is reduced because four or five alternatives are usually provided whereas in true/false items students only have to choose between two choices. Also, multiple-choice items do not need homogeneous material as matching items do. However, creating good multiple-choice test items is difficult and students (maybe including you) often become frustrated when taking a test

with poor multiple-choice items. Three steps have to be considered when constructing a multiple-choice item: formulating a clearly stated problem, identifying plausible alternatives, and removing irrelevant clues to the answer. Common problems in each of these steps are summarized in Table 10.3.3 (below).

Constructed Response Items

Formal assessment also includes constructed-response items in which students are asked to recall information and create an answer—not just recognize if the answer is correct—so guessing is reduced. Constructed response items can be used to assess a wide variety of kinds of knowledge and two major kinds are discussed: completion or short answer (also called short response) and extended response.

Completion and Short Answer

Completion and short-answer items can be answered in a word, phrase, number, or symbol. These types of items are essentially the same only varying in whether the problem is presented as a statement or a question (Linn & Miller 2005). Look at Example 3 for a sample:

Example 3: COMPLETION AND SHORT ANSWER QUESTIONS

Completion: The first traffic light in the US was invented by _____.

Short Answer: Who invented the first traffic light in the US?

These items are often used in mathematics tests, for example:

3 + 10 = ____?

If $x = 6$, what does $x(x - 1)$ = _____

Draw the line of symmetry on the following shape:

A major advantage of these items is that they are easy to construct. However, apart from their use in mathematics they are unsuitable for measuring complex learning outcomes and are often difficult to score. Completion and short-answer tests are sometimes called objective tests as the intent is that there is only one correct answer and so there is no variability in scoring but unless the question is phrased very carefully, there are frequently a variety of correct answers. For example, consider the short answer question "Where was President Lincoln born?"

The teacher may expect the answer "in a log cabin" but other correct answers are also "on Sinking Spring Farm," "in Hardin County," or "in Kentucky." Common errors in these items are summarized in the table below.

Table 10.3.3. Common errors in constructed response items

Type of item	Common errors	Examples
Completion and short answer	There is more than one possible answer.	Where was US President Lincoln born? *The answer could be in a log cabin, in Kentucky, etc.*
Completion and short answer	Too many blanks are in the completion item so it is too difficult or doesn't make sense.	In _____ theory, the first stage, _____ is when infants process through their _____ and_____ _____.
Completion and short answer	Clues are given by length of blanks in completion items.	Three states are contiguous to New Hampshire: _____ is to the West, _____ is to the East, and _____ is to the South.
Extended response	Ambiguous questions	Was the US Civil War avoidable? *Students could interpret this question in a wide variety of ways, perhaps even stating "yes" or "no." One student may discuss only political causes, another moral, political and economic causes. There is no guidance in the question for students.*
Extended response	Poor reliability in grading	The teacher does not use a scoring rubric and so is inconsistent in how he scores answers especially unexpected responses, irrelevant information, and grammatical errors.
Extended response	Perception of student influences grading	By spring semester the teacher has developed expectations of each student's performance and this influences the grading (numbers can be used instead of names). The test consists of three constructed responses and the teacher grades the three answers on each students' paper before moving to the next paper. This means that the grading of questions 2 and 3 are influenced by the answers to question 1 (teachers should grade all the 1st question then the 2nd etc).

Table 10.3.3. Common errors in constructed response items		
Extended response	Choices are given on the test and some answers are easier than others	Testing experts recommend not giving choices in tests because then students are not really taking the same test creating equity problems.

Extended Response

Extended response items are used in many content areas and answers may vary in length from a paragraph to several pages. Questions that require longer responses are often called essay questions. Extended response items have several advantages and the most important is their adaptability for measuring complex learning outcomes— particularly integration and application. These items also require that students write and therefore provide teachers a way to assess writing skills. A commonly cited advantage to these items is their ease in construction; however, carefully worded items that are related to learning outcomes and assess complex learning are hard to devise (Linn & Miller, 2005). Well-constructed items phrase the question so the task of the student is clear. Often this involves providing hints or planning notes. In the first example below the actual question is clear not only because of the wording but because of the format (i.e. it is placed in a box). In the second and third examples planning notes are provided:

EXAMPLE 4: THIRD GRADE MATHEMATICS

The owner of a bookstore gave 14 books to the school. The principal will give an equal number of books to each of three classrooms and the remaining books to the school library. How many books could the principal give to each student and the school?

Show all your work on the space below and on the next page. Explain in words how you found the answer. Tell why you took the steps you did to solve the problem.

(From Illinois Standards Achievement Test, 2006; (http://www.isbe.state.il.us/assessment/isat.htm))

Example 5: FIFTH GRADE SCIENCE: THE GRASS IS ALWAYS GREENER

Jose and Maria noticed three different types of soil, black soil, sand, and clay, were found in their neighborhood. They decided to investigate the question, "How does the type of soil (black soil, sand, and clay) under grass sod affect the height of grass?"

Plan an investigation that could answer their new question. In your plan, be sure to include:

- Prediction of the outcome of the investigation

- Materials needed to do the investigation
- Procedure that includes:
    - logical steps to do the investigation
    - one variable kept the same (controlled)
    - one variable changed (manipulated)
    - any variables being measure and recorded
    - how often measurements are taken and recorded

(From Washington State 2004 assessment of student learning (http://www.k12.wa.us/assessment/WASL/default.aspx))

Example 6: GRADES 9–11 ENGLISH

Writing prompt

Some people think that schools should teach students how to cook. Other people think that cooking is something that ought to be taught in the home. What do you think? Explain why you think as you do.

Planning notes

Choose One:

- I think schools should teach students how to cook
- I think cooking should l be taught in the home

I think cooking should be taught in _____ because _____.

(From Illinois Measure of Annual Growth in English (http://www.isbe.state.il.us/assessment/image.htm))

A major disadvantage of extended-response items is the difficulty in reliable scoring. Not only do various teachers score the same response differently but also the same teacher may score an identical response differently on various occasions (Linn & Miller 2005). A variety of steps can be taken to improve the reliability and validity of scoring. First, teachers should begin by writing an outline of a model answer. This helps make it clear what students are expected to include. Second, a sample of the answers should be read. This assists in determining what the students can do and if there are any common misconceptions arising from the question. Third, teachers have to decide what to do about irrelevant information that is included (e.g. is it ignored or are students penalized) and how to evaluate mechanical errors such as grammar and spelling. Then, a *point scoring* or a *scoring rubric* should be used.

In point-scoring components of the answer are assigned points. This provides some guidance for evaluation and helps consistency but point-scoring systems often lead the teacher to focus on facts (e.g. naming risk factors) rather than higher-level thinking which may undermine the validity of the assessment if the teachers' purposes include higher-level thinking. A better approach is to use a scoring rubric that *describes* the quality of the answer or performance at each level.

Example 7: Point Scoring for Written Response

For example, if students were asked: What are the nature, symptoms, and risk factors of hyperthermia?

Point Scoring Guide:

- Definition (natures) 2 pts
- Symptoms (1 pt for each) 5 pts
- Risk Factors (1 point for each) 5 pts
- Writing 3 pts

Scoring Rubrics

A rubric is a scoring guide used to assess performance given a set of criteria.

A basic scoring rubric could be a list of the required components for evaluating the assignment. More advanced rubrics divide an assignment into all component parts and provide explicit expectations of acceptable and unacceptable levels of performance for each component. More complex scoring rubrics can be *holistic* or *analytical*. In holistic scoring rubrics, general descriptions of performance are made and a single overall score is obtained.

Rubrics help teachers carefully plan assignments and expectations of the students before giving the assignment. The guidance provided by the rubric may reduce the time clarifying assignment requirements for students and helps students know precisely what is expected from them when completing the work. When students have clear expectations, the quality of student work

increases. Rubrics usually reduce time spent grading, but still be able to give constructive feedback to students. Finally, student complaints and questions about grades will decrease when it is clear why they received a particular score. It takes time to create a rubric, but you only have to create it once for each assignment. However, in the long run, a rubric is a time-saver, because you'll spend less time clarifying and grading.

Checklists

The least complex type of scoring rubric is the **checklist**. A checklist allows the rater to simply indicate the presence of the expected component, but it does not indicate the quality of the element, a pass/fail of sorts. These rubrics do tend to be quick and easy to administer, they do not provide much feedback to the student. Checklists may be most useful for providing feedback on minor assignments or drafts of assignments. If the teacher wants to provide feedback about the quality of work, a rating scale would be more appropriate.

Example 8: Checklist: Question Response Checklist

Assignment: read the chapter and write a reply to the assigned question. Define relevant terms and apply concepts in a real-world setting.

Category	Y/N
You wrote at least 10 complete "non-fluff" sentences	
You addressed most or all aspects of the question	
You thoroughly addressed all aspects of the question	
You cited appropriate material for the question (including page numbers and time stamps)	
You correctly interpreted most or all of the material that you cited	
You correctly interpreted all of the material that you cited	
You put ideas into your own words	
Your answer was easy to read and understand	
You left blank lines between paragraphs for readability	
Your spelling and grammar was correct	
Total	

Basic Rating Scales

Rating scales are like checklists with the addition of evaluating the quality of criteria using a scoring system. While rating scales may be more informative than checklists, the meaning of the numeric ratings is vague. Without a narrative for the ratings, the raters must make a judgment based on their perception of the meanings of the rating scale. For example, for an assignment, one rater might score it a "3," presuming that it means "good" and another rater might also choose "3" but believe the work was "marginal." Similarly, the rating may not mean the same thing to the student as it does to the teacher. The vagueness of the basic rating scale can be corrected by adding descriptors for the ratings, making it a holistic rubric.

Example 9: Basic Rating scale: Wiki Group

Project

Assignment: students work with a group to create a wiki page on a given topic.

Criteria	Your Score	Excellent	Marginal	Unprofessional
Your content is technically accurate		15	8	0
You addressed relevant concepts		15	8	0
You gave appropriate sample calculations		5	3	0
You added appropriate pictures		5	3	0
You cited your sources		5	3	0
You wrote in your own words		20	10	0
You used appropriate headings		5	3	0
You contributed every week		20	10	0
You used correct grammar and spelling		10	5	0
Total (out of 100 points)				

Holistic Scoring Rubrics

Holistic scoring rubrics use a short narrative of characteristics associated with each numeric score based on an overall impression of a student's performance on a task. The descriptions tend to be

rather vague because the same score descriptions are applied to multiple components of the assignment. This type of rubric does not provide specific areas of strengths and weaknesses for each element and therefore the feedback is less directive for teachers and students to focus improvement efforts.

A holistic rubric may be more appropriate when the assignments to be assessed will vary significantly (e.g., independent study projects submitted in a capstone course) or when practicality dictates a speedier assessment due to the number of assignments or time limitations (e.g., reviewing all the essays from applicants to determine who will need developmental courses).

An example from grade 2 language arts in Los Angeles Unified School District classifies responses into four levels: not proficient, partially proficient, proficient, and advanced is on Example 4.

Example 10: HOLISTIC SCORING RUBRIC: ENGLISH LANGUAGE ARTS GRADE 2

Assignment: write about an interesting, fun, or exciting story you have read in class this year. Some of the things you could write about are:

- What happened in the story (the plot or events)
- Where the events took place (the setting)
- People, animals, or things in the story (the characters)

In your writing make sure you use facts and details from the story to describe everything clearly. After you write about the story, explain what makes the story interesting, fun or exciting.

Scoring Rubric

Level	Points	Criteria
Advanced	Score 4	• The response demonstrates well-developed reading comprehension skills. • Major story elements (plot, setting, or characters) are clearly and accurately described. • Statements about the plot, setting, or characters are arranged in a manner that makes sense. • Ideas or judgments (why the story is interesting, fun, or exciting) are clearly supported or explained with facts and details from the story.
Proficient	Score 3	• The response demonstrates solid reading comprehension skills. • Most statements about the plot, setting, or characters are clearly described. • Most statements about the plot, setting, or characters are arranged in a manner that makes sense. • Ideas or judgments are supported with facts and details from the story.
Partially Proficient	Score 1	• The response demonstrates some reading comprehension skills • There is an attempt to describe the plot, setting, or characters • Some statements about the plot, setting, or characters are arranged in a manner that makes sense. • Ideas or judgments may be supported with some facts and details from the story.

Scoring Rubric

Not Proficient Score 1	• The response demonstrates little or no skill in reading comprehension. • The plot, setting, or characters are not described, or the description is unclear. • Statements about the plot, setting, or characters are not arranged in a manner that makes sense. • Ideas or judgments are not stated, and facts and details from the text are not used.

Source: Adapted from English Language Arts Grade 2 Los Angeles Unified School District, 2001 (http://www.cse.ucla.edu/resources/justforteachers_set.htm)

Analytical rubrics provide descriptions of levels of student performance on a variety of characteristics. For example, six characteristics used for assessing writing developed by the Northwest Regional Education Laboratory (NWREL) are:

- ideas and content
- organization
- voice
- word-choice
- sentence fluency
- conventions

Descriptions of the high, medium, and low responses for each characteristic are available from Education Northwest.

Holistic rubrics have the advantages that they can be developed more quickly than analytical rubrics. They are also faster to use as there is only one dimension to examine. However, they do not provide students with feedback about which aspects of the

response are strong and which aspects need improvement (Linn & Miller, 2005). This means they are less useful for assessment *for* learning. An important use of rubrics is to use them as teaching tools and provide them to students *before* the assessment so they know what knowledge and skills are expected.

Analytic Scoring Rubrics

A scoring rubric that includes specific performance expectations for each rating for each criterion is an **analytic scoring rubric.** Analytic rating scales are especially appropriate for complex assignments with multiple criteria. These rubrics help raters with consistency and provide the most detailed feedback for teacher and student improvement. The disadvantage of using this type of rubric is that it can be time-consuming to construct and score.

Teachers can use scoring rubrics as part of instruction by giving students the rubric during instruction, providing several responses, and analyzing these responses in terms of the rubric. For example, the use of accurate terminology is one dimension of the science rubric in Example 11. An elementary science teacher could discuss why it is important for scientists to use accurate terminology, give examples of inaccurate and accurate terminology, provide that component of the scoring rubric to students, distribute some examples of student responses (maybe from former students), and then discuss how these responses would be classified according to the rubric. This strategy of assessment for learning should be more effective if the teacher (a) emphasizes to students why using accurate terminology is important when learning science rather than how to get a good grade on the test (we provide more details about this in the section on motivation later in this chapter); (b) provides an exemplary response so students can see a model; (c) emphasizes that the goal is student improvement on this skill not ranking students.

Example 11: Analytic Scoring Rubric:

Assignment: write a response to questions using the correct terminology, supporting details. Synthesize and apply relevant information to demonstrate understanding of the topic.

Level of understanding	Use of accurate scientific terminology	Use of supporting details	Synthesis of information	Application of information
4	There is evidence in the response that the student has a full and complete understanding.	The use of accurate scientific terminology enhances the response.	Pertinent and complete supporting details demonstrate integration of ideas.	The response reflects a complete synthesis of information.	An effective application of the concept to a practical problem or real-world situation reveals an insight into scientific principles.
3	There is evidence in the response that the student has a good understanding.	The use of accurate scientific terminology strengthens the response.	The supporting details are generally complete.	The response reflects some synthesis of information.	The concept has been applied to a practical problem or real-world situation.
2	There is evidence in the response that the student has a basic understanding.	The use of accurate scientific terminology may be present in the response.	The supporting details are adequate.	The response provides little or no synthesis of information.	The application of the concept to a practical problem or real-world situation is inadequate.
1	There is evidence in the response that the student has some understanding.	The use of accurate scientific terminology is not present in the response.	The supporting details are only minimally effective.	The response addresses the question.	The application, if attempted, is irrelevant.
0	The student has **no understanding** of the question or problem. The response is completely incorrect or irrelevant.				

Rubric Maker

There are several online tools available to help teachers create rubrics. Rubric Maker is a website that offers sample rubrics for different subjects and activities, as well as allows you to create custom rubrics.

Performance Assessments

Typically in performance assessments, students complete a specific task while teachers observe the process or procedure (e.g. data collection in an experiment) as well as the product (e.g. completed report) (Popham, 2005; Stiggens, 2005). The tasks that students complete in performance assessments are not simple—in contrast to selected-response items—and include the following:

- playing a musical instrument
- athletic skills
- artistic creation
- conversing in a foreign language
- engaging in a debate about political issues
- conducting an experiment in science
- repairing a machine
- writing a term paper
- using interaction skills to play together

These examples all involve complex skills but illustrate that the term performance assessment is used in a variety of ways. For example, the teacher may not observe all of the processes (e.g. she sees a

draft paper but the final product is written during out-of-school hours) and essay tests are typically classified as performance assessments (Airasian, 2000). In addition, in some performance assessments there may be no clear product (e.g. the performance may be group interaction skills).

Two related terms, *alternative assessment*, and *authentic assessment* are sometimes used instead of performance assessment but they have different meanings (Linn & Miller, 2005). Alternative assessment refers to tasks that are not pencil-and-paper and while many performance assessments are not pencil-and-paper tasks some are (e.g. writing a term paper, essay tests). Authentic assessment is used to describe tasks that students do that are similar to those in the "real world." Classroom tasks vary in the level of authenticity (Popham, 2005). For example, in a Japanese language class taught in a high school in Chicago conversing in Japanese in Tokyo is highly authentic— but only possible in a study abroad program or a trip to Japan. Conversing in Japanese with native Japanese speakers in Chicago is also highly authentic, and conversing with the teacher in Japanese during class is moderately authentic. Much less authentic is a matching test on English and Japanese words. In a language arts class, writing a letter (to an editor) or a memo to the principal is highly authentic as letters and memos are common work products. However, writing a five-paragraph paper is not as authentic as such papers are not used in the world of work. However, a five-paragraph paper is a complex task and would typically be classified as a performance assessment.

Advantages and Disadvantages of Performance Assessments

There are several advantages of performance assessments (Linn & Miller 2005). First, the focus is on complex learning outcomes that often cannot be measured by other methods. Second, performance

assessments typically assess the process or procedure as well as the product. For example, the teacher can observe if the students are repairing the machine using the appropriate tools and procedures as well as whether the machine functions properly after the repairs. Third, well-designed performance assessments communicate the instructional goals and meaningful learning clearly to students. For example, if the topic in a fifth-grade art class is a one-point perspective the performance assessment could be drawing a city scene that illustrates a one-point perspective. This assessment is meaningful and clearly communicates the learning goal. This performance assessment is a good instructional activity and has good content validity—common with well-designed performance assessments (Linn & Miller 2005).

One major disadvantage of performance assessments is that they are typically very time-consuming for students and teachers. This means that fewer assessments can be gathered so if they are not carefully devised fewer learning goals will be assessed—which can reduce content validity. State curriculum guidelines can be helpful in determining what should be included in a performance assessment. For example, Eric, a dance teacher in a high school in Tennessee learns that the state standards indicate that dance students at the highest level should be able to do demonstrate consistency and clarity in performing technical skills by:

- performing complex movement combinations to music in a variety of meters and styles
- performing combinations and variations in a broad dynamic range
- demonstrating improvement in performing movement combinations through self-evaluation
- critiquing a live or taped dance production based on given criteria

Eric devises the following performance task for his eleventh-grade modern dance class:

In groups of 4–6, students will perform a dance at least 5 minutes in length. The dance selected should be multifaceted so that all the dancers can demonstrate technical skills, complex movements, and a dynamic range (Items 1–2). Students will videotape their rehearsals and document how they improved through self-evaluation (Item 3). Each group will view and critique the final performance of one other group in class (Item 4). Eric would need to scaffold most steps in this performance assessment. The groups probably would need guidance in selecting a dance that allowed all the dancers to demonstrate the appropriate skills; critiquing their own performances constructively; working effectively as a team, and applying criteria to evaluate a dance.

Another disadvantage of performance assessments is they are hard to assess reliably which can lead to inaccuracy and unfair evaluation. As with any constructed response assessment, scoring rubrics is very important. A rubric designed to assess the *process* of group interactions is in the table below.

Table 10.3.4: Example of group interaction rubric

Score	Time management	Participation and performance in roles	Shared involvement
0	Group did not stay on task and so task was not completed.	Group did not assign or share roles.	Single individual did the task.
1	Group was off-task the majority of the time but task was completed.	Groups assigned roles but members did not use these roles.	Group totally disregarded comments and ideas from some members.
2	Group stayed on task most of the time.	Groups accepted and used some but not all roles.	Group accepted some ideas but did not give others adequate consideration
3	Group stayed on task throughout the activity and managed time well.	Group accepted and used roles and actively participated.	Groups gave equal consideration to all ideas
4	Group defined their own approach in a way that more effectively managed the activity.	Group defined and used roles not mentioned to them. Role changes took place that maximized individuals' expertise.	Groups made specific efforts to involve all group members including the reticent members.

Source: Adapted from Group Interaction (GI) SETUP (2003). Issues, Evidence and You. Ronkonkomo, NY Lab-Aids, (http://cse.edc.org/products/assessment/middleschool/scorerub.asp).

This rubric was devised for middle-grade science but could be used in other subject areas when assessing the group process. In some performance assessments, several scoring rubrics should be used. In the dance performance example above, Eric should have scoring rubrics for the performance skills, the improvement based on self-evaluation, teamwork, and the critique of the other group. Obviously, devising a good performance assessment is complex and Linn and Miller (2005) recommend that teachers should:

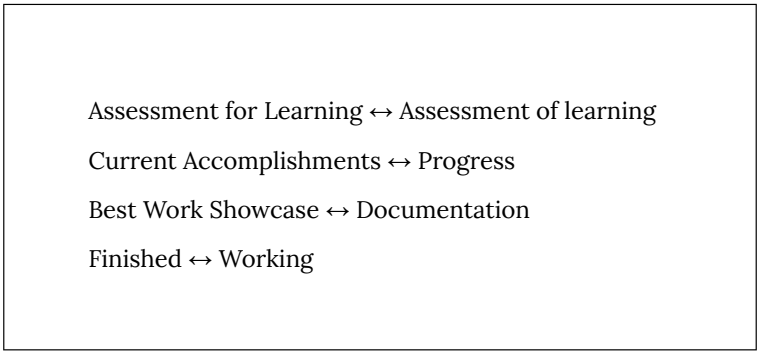
- Create performance assessments that require students to use

complex cognitive skills. Sometimes teachers devise assessments that are interesting and that the students enjoy but do not require students to use higher-level cognitive skills that lead to significant learning. Focusing on high-level skills and learning outcomes is particularly important because performance assessments are typically so time-consuming.

- Ensure that the task is clear to the students. Performance assessments typically require multiple steps so students need to have the necessary prerequisite skills and knowledge as well as clear directions. Careful scaffolding is important for successful performance assessments.
- Specify expectations of the performance clearly by providing students with scoring rubrics during the instruction. This not only helps students understand what it expected but it also guarantees that teachers are clear about what they expect. Thinking this through while planning the performance assessment can be difficult for teachers but is crucial as it typically leads to revisions of the actual assessment and directions provided to students.
- Reduce the importance of unessential skills in completing the task. What skills are essential depends on the purpose of the task? For example, for a science report, is the use of publishing software essential? If the purpose of the assessment is for students to demonstrate the process of the scientific method including writing a report, then the format of the report may not be significant. However, if the purpose includes integrating two subject areas, science, and technology, then the use of publishing software is important. Because performance assessments take time, it is tempting to include multiple skills without carefully considering if all the skills are essential to the learning goals.

Portfolios

"A portfolio is a meaningful collection of student work that tells the story of student achievement or growth" (Arter, Spandel, & Culham, 1995, p. 2). Portfolios are a *purposeful* collection of student work not just folders of all the work a student does. Portfolios are used for a variety of purposes and developing a portfolio system can be confusing and stressful unless the teachers are clear on their purpose. The varied purposes can be illustrated in four dimensions (Linn & Miller 2005):



When the primary purpose is assessment *for* learning, the emphasis is on student self-reflection and responsibility for learning. Students not only select samples of their work they wish to include, but also reflect and interpret their own work. Portfolios containing this information can be used to aid communication as students can present and explain their work to their teachers and parents (Stiggins, 2005). Portfolios focusing on the assessment *of* learning contain students' work samples that certify accomplishments for a classroom grade, graduation, state requirements, etc. Typically, students have less choice in the work contained in such portfolios as some consistency is needed for this type of assessment. For example, the writing portfolios that fourth and seventh graders are required to submit in Kentucky must contain a self-reflective statement and an example of three pieces of writing (reflective,

personal experience or literary, and transactive). Students do choose which of their pieces of writing in each type to include in the portfolio (Kentucky Student Performance Standards).

Portfolios can be designed to focus on student progress or current accomplishments. For example, audio recordings of English language learners speaking could be collected over one year to demonstrate growth in learning. Student progress portfolios may also contain multiple versions of a single piece of work. For example, a writing project may contain notes on the original idea, outline, first draft, comments on the first draft by peers or teacher, second draft, and the final finished product (Linn & Miller 2005). If the focus is on current accomplishments, only recently completed work samples are included.

Portfolios can focus on documenting student activities or highlighting important accomplishments. Documentation portfolios are inclusive containing all the work samples rather than focusing on one special strength, best work, or progress. In contrast, showcase portfolios focus on the best work. The best work is typically identified by students. One aim of such portfolios is that students learn how to identify products that demonstrate what they know and can do. Students are not expected to identify their best work in isolation but also use feedback from their teachers and peers.

A final distinction can be made between a finished portfolio—which may be used for a job application—versus a working portfolio that typically includes day-to-day work samples. Working portfolios evolve over time and are not intended to be used for the assessment *of* learning. The focus of a working portfolio is on developing ideas and skills so students should be allowed to make mistakes, freely comment on their own work, and respond to teacher feedback (Linn & Miller, 2005). Finished portfolios are designed for use with a particular audience and the products selected may be drawn from a working portfolio. For example, in a teacher education program, the working portfolio may contain work samples from all the courses taken. A student may develop one

finished portfolio to demonstrate she has mastered the required competencies in the teacher education program and a second finished portfolio for her job application.

Advantages and Disadvantages of Portfolios

Portfolios used well in classrooms have several advantages. They provide a way of documenting and evaluating growth in a much more nuanced way than selected-response tests can. Also, portfolios can be integrated easily into instruction, i.e. used for assessment for learning. Portfolios also encourage student self-evaluation and reflection, as well as ownership for learning (Popham, 2005). Using classroom assessment to promote student motivation is an important component of assessment *for* learning which is considered in the next section.

However, there are some major disadvantages of portfolio use. First, a good portfolio assessment takes an enormous amount of teacher time and organization. The time is needed to help students understand the purpose and structure of the portfolio, decide which work samples to collect, and self-reflect. Some of this time needs to be conducted in one-to-one conferences. Reviewing and evaluating the portfolios out of class time is also enormously time-consuming. Teachers have to weigh if the time spent is worth the benefits of portfolio use.

Second, evaluating portfolio reliability and eliminating bias can be even more difficult than in a constructed response assessment because the products are more varied. The experience of the state-wide use of portfolios for assessment in writing and mathematics for fourth and eighth graders in Vermont is sobering. Teachers used the same analytic scoring rubric when evaluating the portfolio. In the first two years of implementation samples from schools were collected and scored by an external panel of teachers. In the first year, the agreement among raters (i.e. inter-rater reliability) was

poor for mathematics and reading; in the second year, the agreement among raters improved for mathematics but not for reading. However, even with the improvement in mathematics, the reliability was too low to use the portfolios for individual student accountability (Koretz, Stecher, Klein & McCaffrey, 1994). When reliability is low, validity is also compromised because unstable results cannot be interpreted meaningfully.

If teachers do use portfolios in their classroom, the series of steps needed for implementation are outlined in the table below. If the school or district has an existing portfolio system these steps may have to be modified.

Table 10.3.4 Steps in implementing a classroom portfolio program	
1. Make sure students own their portfolios.	Talk to your students about your ideas of the portfolio, the different purposes, and the variety of work samples. If possible, have them help make decisions about the kind of portfolio you implement.
2. Decide on the purpose.	Will the focus be on growth or current accomplishments? Best work showcase or documentation? Good portfolios can have multiple purposes but the teacher and students need to be clear about the purpose.
3. Decide what work samples to collect.	For example, in writing, is every writing assignment included? Are early drafts as well as final products included?
4. Collect and store work samples.	Decide where the work sample will be stored. For example, will each student have a file folder in a file cabinet or a small plastic tub on a shelf in the classroom?
5. Select criteria to evaluate samples.	If possible, work with students to develop scoring rubrics. This may take considerable time as different rubrics may be needed for a variety of work samples. If you are using existing scoring rubrics, discuss with students possible modifications after the rubrics have been used at least once.
6. Teach and require students conduct self-evaluations of their own work.	Help students learn to evaluate their own work using agreed-upon criteria. For younger students, the self-evaluations may be simple (strengths, weaknesses, and ways to improve); for older students, a more analytic approach is desirable including using the same scoring rubrics that the teachers will use.
7. Schedule and conduct portfolio conferences.	Teacher-student conferences are time-consuming but conferences are essential for the portfolio process to significantly enhance learning. These conferences should aid students' self-evaluation and should take place frequently.
8. Involve parents.	Parents need to understand the portfolio process. Encourage parents to review the work samples. You may wish to schedule parent, teacher-students conferences in which students talk about their work samples.
Source: Adapted from Popham (2005)	

Assessment that Enhances Motivation and

Student Confidence

Studies on *testing* and learning conducted more than 20 years ago demonstrated that tests promote learning and that more frequent tests are more effective than less frequent tests (Dempster & Perkins, 1993). Frequent smaller tests encourage continuous effort rather than last-minute cramming and may also reduce test anxiety because the consequences of errors are reduced. College students report preferring more frequent testing over infrequent testing (Bangert-Downs, Kulik, Kulik, 1991). More recent research indicates that teachers' assessment *purposes and beliefs*, the *type* of assessment selected, and the *feedback* given contribute to the assessment climate in the classroom which influences students' confidence and motivation. The use of self-assessment is also important in establishing a positive assessment climate.
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Teacher's Purpose and Belief

Student motivation can be enhanced when the purpose of assessment is promoting student learning and this is clearly communicated to students by what teachers say and do (Harlen, 2006). This approach to assessment is associated with what the psychologist, Carol Dweck, (2000) calls an incremental view of ability or intelligence. An incremental view assumes that ability increases whenever an individual learns more. This means that effort is valued because effort leads to knowing more and therefore having more ability. Individuals with an incremental view also ask for help when needed and respond well to constructive feedback as the primary goal is increased learning and mastery. In contrast, a fixed view of ability assumes that some people have more ability than others and nothing much can be done to change that. Individuals with a fixed view of ability often view effort in opposition to ability ("Smart people don't have to study") and so do not try as hard, and are less likely to ask for help as that indicates that they are not smart. While there are individual differences in students' beliefs about their views of intelligence, teachers' beliefs and classroom practices influence students' perceptions and behaviors.

Teachers with an incremental view of intelligence communicate to students that the goal of learning is mastering the material and figuring things out. Assessment is used by these teachers to understand what students know so they can decide whether to move to the next topic, re-teach the entire class, or provide remediation for a few students. Assessment also helps students understand their own learning and demonstrate their competence. Teachers with these views say things like, "We are going to practice over and over again. That's how you get good. And you're going to make mistakes. That's how you learn." (Patrick, Anderman, Ryan, Edelin, Midgley, 2001, p. 45).

In contrast, teachers with a fixed view of ability are more likely

to believe that the goal of learning is doing well on tests especially outperforming others. These teachers are more likely to say things that imply fixed abilities e.g. "This test will determine what your math abilities are," or stress the importance of interpersonal competition, "We will have speech competition and the top person will compete against all the other district schools and last year the winner got a big award and their photo in the paper." When teachers stress interpersonal competition some students may be motivated but there can only be a few winners so there are many more students who know they have no chance of winning. Another problem with interpersonal competition in assessment is that the focus can become winning rather than understanding the material.

Teachers who communicate to their students that ability is incremental and that the goal of assessment is promoting learning rather than ranking students, awarding prizes to those who did very well, or catching those who did not pay attention, are likely to enhance students' motivation.

Choosing Assessments

The choice of assessment task also influences students' motivation and confidence. First, assessments that have clear criteria that students understand and can meet rather than assessments that pit students against each other in interpersonal competition enhance motivation (Black, Harrison, Lee, Marshall, Wiliam, 2004). This is consistent with the point we made in the previous section about the importance of focusing on enhancing learning for all students rather than ranking students. Second, meaningful assessment tasks enhance student motivation. Students often want to know why they have to do something and teachers need to provide meaningful answers. For example, a teacher might say, "You need to be able to calculate the area of a rectangle because if you want new carpet you need to know how much carpet is needed and how much it would

cost." Well-designed performance tasks are often more meaningful to students than selected-response tests so students will work harder to prepare for them.

Third, providing choices of assessment tasks can enhance students' sense of autonomy and motivation according to self-determination theory. Kym, the sixth-grade teacher whose story began this chapter, reports that giving students choices was very helpful. Another middle school social studies teacher, Aaron, gives his students a choice of performance tasks at the end of the unit on the US Bill of Rights. Students have to demonstrate specified key ideas but can do that by making up a board game, presenting a brief play, composing a rap song, etc. Aaron reports that students work much harder on this performance assessment which allows them to use their strengths than previously when he did not provide any choices and gave a more traditional assignment. Measurement experts caution that the danger of giving choices is that the assessment tasks are no longer equivalent and so the reliability of scoring is reduced so it is particularly important to use well-designed scoring rubrics. Fourth, assessment tasks should be challenging but achievable with reasonable effort (Elliott, McGregor & Thrash, 2004). This is often hard for beginning teachers to do, who may give assessment tasks that are too easy or too hard because they have to learn to match their assessment to the skills of their students.

Providing Feedback

When the goal is assessment *for* learning, providing constructive feedback that helps students know what they do and do not understand as well as encouraging them to learn from their errors is fundamental. Effective feedback should be given as soon as possible as the longer the delay between students' work and feedback the longer students will continue to have some misconceptions. Also, delays reduce the relationship between students' performance and the feedback as students can forget what they were thinking during the assessment. Effective feedback should also inform students clearly what they did well and what needs modification. General comments just as "good work, A," or "needs improvement" do not help students understand how to improve their learning. Giving feedback to students using well-designed scoring rubrics helps clearly communicate strengths and weaknesses. Obviously, grades are often needed but teachers can minimize the focus by placing the grade after the comments or on the last page of a paper. It can also be helpful to allow students to keep their grades private making sure when returning assignments that the grade is not prominent (e.g. not using red ink on the top page) and never asking students to read their scores aloud in class. Some students choose to share their grades—but that should be their decision, not their teachers.

When grading, teachers often become angry at the mistakes that students make. It is easy for teachers to think something like: "With all the effort I put into teaching, this student could not even be bothered to follow the directions or spell check!" Many experienced teachers believe that communicating their *anger* is not helpful, so rather than saying: "How dare you turn in such shoddy work," they rephrase it as, "I am disappointed that your work on this assignment does not meet the standards set" (Sutton, 2004). Research evidence also suggests that comments such as "You are so smart" for a high-quality performance can be counterproductive. This is surprising

to many teachers but if students are told they are smart when they produce a good product, then if they do poorly on the next assignment the conclusion must be they are "not smart" (Dweck, 2000). More effective feedback focuses on positive aspects of the task (not the person), as well as strategies, and effort. The focus of the feedback should relate to the criteria set by the teacher and how improvements can be made.

When the teacher and student are from different racial/ethnic backgrounds providing feedback that enhances motivation and confidence but also includes criticism can be particularly challenging because the students of color have historical reasons to distrust negative comments from a white teacher. Research by Cohen Steele, and Ross (1999) indicates that "wise" feedback from teachers needs three components: positive comments, criticisms, and an assurance that the teacher believes the student can reach higher standards.

Self and Peer Assessment

In order to reach a learning goal, students need to understand the meaning of the goal, the steps necessary to achieve a goal, and if they are making satisfactory progress towards that goal (Sadler, 1989). This involves self-assessment and recent research has demonstrated that well-designed self-assessment can enhance student learning and motivation (Black & Wiliam, 2006). For self-assessment to be effective, students need explicit criteria such as those in an analytical scoring rubric. These criteria are either provided by the teacher or developed by the teacher in collaboration with students. Because students seem to find it easier to understand criteria for assessment tasks if they can examine other students' work alongside their own, self-assessment often involves peer assessment. An example of a strategy used by teachers involves asking students to use "traffic lights" to indicate their

confidence in their assignment or homework. Red indicates that they were unsure of their success, orange that they were partially unsure, and green that they were confident of their success. The students who labeled their own work as orange and green worked in mixed groups to evaluate their own work while the teacher worked with the students who had chosen red (Black & Wiliam, 2006).

If self and peer assessment are used, it is particularly important that the teachers establish a classroom culture for assessment that is based on incremental views of ability and learning goals. If the classroom atmosphere focuses on interpersonal competition, students have incentives in self and peer assessment to inflate their own evaluations (and perhaps those of their friends) because there are limited rewards for good work.

Adjusting Instruction Based on Assessment

Using assessment information to adjust instruction is fundamental to the concept of assessment *for* learning. Teachers make these adjustments "in the moment" during classroom instruction as well as during reflection and planning periods. Teachers use the information they gain from questioning and observation to adjust their teaching during classroom instruction. If students cannot answer a question, the teacher may need to rephrase the question, probe understanding of prior knowledge, or change the way the current idea is being considered. It is important for teachers to learn to identify when only one or two students need individual help because they are struggling with the concept, and when a large proportion of the class is struggling so whole group intervention is needed.

After the class is over, effective teachers spend time analyzing how well the lessons went, what students did and did not seem to understand, and what needs to be done the next day. Evaluation of student work also provides important information for teachers.

If many students are confused about a similar concept the teacher needs to reteach it and consider new ways of helping students understand the topic. If the majority of students complete the tasks very quickly and well, the teacher might decide that the assessment was not challenging enough. Sometimes teachers become dissatisfied with the kinds of assessments they have assigned when they are grading—perhaps because they realize there was too much emphasis on lower-level learning, that the directions were not clear enough, or the scoring rubric needed modification. Teachers who believe that assessment data provide information about their own teaching and that they can find ways to influence student learning have high teacher efficacy or beliefs that they can make a difference in students' lives. In contrast, teachers who think that student performance is mostly due to fixed student characteristics or the homes they come from (e.g. "no wonder she did so poorly considering what her home life is like") have low teacher efficacy (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998).

Grading and Reporting

Assigning students grades is an important component of teaching and many school districts issue progress reports, interim reports, or midterm grades as well as final semester grades. Traditionally these reports were printed on paper and sent home with students or mailed to students' homes. Increasingly, school districts are using web-based grade management systems that allow parents to access their child's grades on each individual assessment as well as the progress reports and final grades.

Grading can be frustrating for teachers as there are many factors to consider. In addition, report cards typically summarize in brief format a variety of assessments and so cannot provide much information about students' strengths and weaknesses. This means that report cards focus more on the assessment *of* learning than assessment *for* learning. There are a number of decisions that have to be made when assigning students' grades and schools often have detailed policies that teachers have to follow. In the next section, we consider the major questions associated with grading.

Weighting Assignments and Assessments

Students typically complete a variety of assignments during a grading period such as homework, quizzes, performance assessments, etc. Teachers have to decide—preferably before the grading period begins—how each assignment will be weighted. For example, a sixth-grade math teacher may decide to weigh the grades in the following manner:

- Weekly quizzes 35%
- Homework 15%
- Performance Assessment 30%

- Class participation 20%

Deciding how to weight assignments should be done carefully as it communicates to students and parents what teachers believe is important, and also may be used to decide how much effort students will exert (e.g. "If homework is only worth 5 percent, it is not worth completing twice a week").

Should social skills or effort be included? Elementary school teachers are more likely than middle or high school teachers to include some social skills in report cards (Popham, 2005). These may be included as separate criteria in the report card or weighted into the grade for that subject. For example, the grade for mathematics may include an assessment of group cooperation or self-regulation during mathematics lessons. Some schools and teachers endorse including social skills arguing that developing such skills is important for young students and that students need to learn to work with others and manage their own behaviors in order to be successful. Others believe that grades in subject areas should be based on the cognitive performances—and that if assessments of social skills are made they should be clearly separated from the subject grade on the report card. Obviously, clear criteria such as those contained in analytical scoring rubrics should be used if social skills are graded.

Teachers often find it difficult to decide whether effort and improvement should be included as a component of grades. One approach is for teachers to ask students to submit drafts of an assignment and make improvements based on the feedback they received. The grade for the assignment may include some combination of the score for the drafts, the final version, and the amount of improvement the students made based on the feedback provided. A more controversial approach is basing grades on effort when students try really hard day after day but still cannot complete their assignments well. These students could have identified special needs or be recent immigrants that have limited English skills. Some school districts have guidelines for handling such cases. One

disadvantage of using improvement as a component of grades is that the most competent students in the class may do very well initially and have little room for improvement—unless teachers are skilled at providing additional assignments that will help challenge these students.

Teachers often use "hodgepodge grading," i.e. a combination of achievement, effort, growth, attitude or class conduct, homework, and class participation. A survey of over 8,500 middle and high school students in the US state of Virginia supported the hodgepodge practices commonly used by their teachers (Cross & Frary, 1999).

Calculating Grades

Two options are commonly used: absolute grading and relative grading. In **absolute grading**, grades are assigned based on criteria the teacher has devised. If an English teacher has established a level of proficiency needed to obtain an A and no student meets that level then no As will be given. Alternatively, if every student meets the established level then all the students will get A's (Popham, 2005). Absolute grading systems may use letter grades or pass/fail.

In **relative grading**, the teacher ranks the performances of students from worst to best (or best to worst) and those at the top get high grades, those in the middle moderate grades, and those at the bottom low grades. This is often described as "grading on the curve" and can be useful to compensate for an examination or assignment that students find much easier or harder than the teacher expected. However, relative grading can be unfair to students because the comparisons are typically within one class, so an A in one class may not represent the level of performance of an A in another class. Relative grading systems may discourage students from helping each other improve as students are in competition for limited rewards. In fact, Bishop (1999) argues that grading on the

curve gives students a personal interest in persuading each other not to study as a serious students makes it more difficult for others to get good grades.

Grade Descriptions

Traditionally a letter *grade system* is used (e.g. A, B, C, D, F) for each subject. The advantages of these grade descriptions are they are convenient, simple, and can be averaged easily. However, they do not indicate what objectives the student has or has not met nor students' specific strengths and weaknesses (Linn & Miller 2005). Elementary schools often use a *pass-fail* (or satisfactory-unsatisfactory) system and some high schools and colleges do as well. Pass-fail systems in high school and college allow students to explore new areas and take risks on subjects that they may have limited preparation for, or is not part of their major (Linn & Miller 2005). While a pass/fail system is easy to use, it offers even less information about students' level of learning.

A pass-fail system is also used in classes that are taught under a mastery-learning approach in which students are expected to demonstrate mastery of all the objectives in order to receive course credit. Under these conditions, it is clear that a pass means that the student has demonstrated mastery of all the objectives.

Some schools have implemented a *checklist of the objectives* in subject areas to replace the traditional letter grade system, and students are rated on each objective using descriptors such as Proficient, Partially Proficient, and Needs Improvement. For example, the checklist for students in a fourth-grade class in California may include the four types of writing that are required by the English language state content standards.

- writing narratives
- writing responses to literature

- writing information reports
- writing summaries

The advantages of this approach are that it communicates students' strengths and weaknesses clearly, and it reminds the students and parents of the objectives of the school. However, if too many objectives are included then the lists can become so long that they are difficult to understand.

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Communication with Parents

Clear communication with parents about classroom assessment is important—but often difficult for beginning teachers. The same skills that are needed to communicate effectively with students are also needed when communicating with parents and guardians. Teachers need to be able to explain to parents the purpose of the assessment, why they selected this assessment technique, and what the criteria for success are. Some teachers send home newsletters monthly or at the beginning of a major assessment task explaining the purpose and nature of the task, any additional support that is needed (e.g. materials, library visits), and due dates. Some parents will not be familiar with performance assessments or the use of self and peer assessment so teachers need to take time to explain these approaches carefully.

Many school districts now communicate through websites that have mixtures of public information available to all parents in the class (e.g. curriculum and assessment details) as well as information restricted to the parents or guardians of specific students (e.g. the attendance and grades). Teachers report this is helpful as parents have access to their child's performance immediately and when necessary, can talk to their child and teacher quickly.

The recommendations we provided above on the type of feedback that should be given to students also apply when talking to parents. That is, the focus should be on students' performance on the task, what was done well and what needs work, rather than general comments about how "smart" or "weak" the child is. If possible, comments should focus on strategies that the child uses well or needs to improve (e.g. reading test questions carefully, organization in a large project). When the teacher is white and the student or parents are a minority, trust can be an issue so using "wise" feedback when talking to parents may help.

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Standardized Tests

Standardized tests are created by a team—usually test experts from a commercial testing company who consult classroom teachers and university faculty—and are administered in standardized ways. Students not only respond to the same questions they also receive the same directions and have the same time limits. Explicit scoring criteria are used. Standardized tests are designed to be taken by many students within a state, province, or nation, and sometimes across nations. Teachers help administer some standardized tests and test manuals are provided that contain explicit details about the administration and scoring. For example, teachers may have to remove all the posters and charts from the classroom walls, read directions out loud to students using a script, and respond to student questions in a specific manner.

Criterion-referenced standardized tests measure student performance against a specific standard or criterion. For example, newly hired firefighters in the Commonwealth of Massachusetts in the United States have to meet physical fitness standards by successfully completing a standardized physical fitness test that includes stair climbing, using a ladder, advancing a hose, and simulating a rescue through a doorway (Human Resources Division, n.d.). Criterion-referenced tests currently used in US schools are often tied to state content standards and provide information about what students can and cannot do. For example, one of the content standards for fourth-grade reading in Kentucky is "Students will identify and describe the characteristics of fiction, nonfiction, poetry or plays" (Combined Curriculum Document Reading 4.1, 2006) and so a report on an individual student would indicate if the child can accomplish this skill. The report may state the number or percentage of items that were successfully completed (e.g. 15 out of 20, i.e. 75 percent) or include descriptions such as basic, proficient,

or advanced which are based on decisions made about the percent of mastery necessary to be classified into these categories.

Norm-referenced standardized tests report students' performance relative to others. For example, if a student scores on the seventy-second percentile in reading it means she outperforms 72 percent of the students who were included in the test's norm group. A norm group is a representative sample of students who completed the standardized test while it was being developed. For state tests, the norm group is drawn from the state whereas for national tests the sample is drawn from the nation. Information about the norm groups is provided in a technical test manual that is not typically supplied to teachers but should be available from the person in charge of testing in the school district.

Reports from criterion and norm-referenced tests provide different information. Imagine a nationalized mathematics test designed for basic test skills in second grade. If this test is norm-referenced, and Alisha receives a report indicating that she scored in the eighty-fifth percentile this indicates that she scored better than 85 percent of the students in the norm group who took the test previously. If this test is criterion-referenced Alisha's report may state that she mastered 65 percent of the problems designed for her grade level. The relative percentage reported from the norm-referenced test provides information about Alisha's performance compared to other students whereas the criterion-referenced test attempts to describe what Alisha or any student can or cannot do with respect to whatever the test is designed to measure. When planning instruction classroom teachers need to know what students can and cannot do so criterion-referenced tests are typically more useful (Popham, 2004). The current standard-based accountability and NCLB rely predominantly on criterion-based tests to assess the attainment of content-based standards. Consequently, the use of standardized norm-referenced tests in schools has diminished and is largely limited to the diagnosis and placement of children with specific cognitive disabilities or exceptional abilities (Haertel & Herman, 2005).

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://edpsych.pressbooks.sunycreate.cloud/?p=149#oembed-1

Video 10.8.1. *Criterion vs. Norm-Referenced Assessment* explains the difference between these types of assessments and provides examples.

Some recent standardized tests can incorporate both criterion-referenced and norm-referenced elements in the same test (Linn & Miller, 2005). That is, the test results not only provide information on mastery of a content standard but also the percentage of students who attained that level of mastery.

Standardized tests can be high stakes i.e. performance on the test has important consequences. These consequences can be for students, e.g. passing a high school graduation test is required in order to obtain a diploma, or passing PRAXIS II is a prerequisite to gaining a teacher license. These consequences can be for schools, e.g. under NCLB an increasing percentage of students in every school must reach proficiency in math and reading each year. Consequences for schools that fail to achieve these gains include reduced funding and restructuring of the school building. Under NCLB, the consequences are designed to be for the schools not individual students (Popham, 2005) and their test results may not accurately reflect what they know because students may not try hard when the tests have low stakes for them (Wise & DeMars, 2005).

Uses of Standardized Tests

Standardized tests are used for a variety of reasons and the same test is sometimes used for multiple purposes.

Assessing students' progress in a wider context

Well-designed teacher assessments provide crucial information about each student's achievement in the classroom. However, teachers vary in the types of assessments they use so teacher assessments do not usually provide information on how students' achievement compares to externally established criteria. Consider two eighth-grade students, Brian and Joshua, who received As in their middle school math classes. However, on the standardized norm-referenced math test Brian scored in the fiftieth percentile whereas Joshua scored in the ninetieth percentile. This information is important to Brian and Joshua, their parents, and the school personnel. Likewise, two third-grade students could both receive Cs on their report cards in reading but one may pass 25 percent and the other 65 percent of the items on the Criterion-Referenced State Test.

There are many reasons that students' performance on teacher assessments and standardized assessments may differ. Students may perform lower on the standardized assessment because their teachers have easy grading criteria, or there is poor alignment between the content they were taught and that on the standardized test, or they are unfamiliar with the type of items on the standardized tests, or they have test anxiety, or they were sick on the day of the test. Students may perform higher on the standardized test than on classroom assessments because their teachers have hard grading criteria, or the student does not work consistently in class (e.g. does not turn in homework) but will focus

on a standardized test, or the student is adept at the multiple-choice items on the standardized tests but not at the variety of constructed response and performance items the teacher uses. We should always be very cautious about drawing inferences from one kind of assessment.

In some states, standardized achievement tests are required for home-schooled students in order to provide parents and state officials with information about the students' achievement in a wider context. For example, in New York, home-schooled students must take an approved standardized test every other year in grades four through eight, and every year in grades nine through twelve. These tests must be administered in a standardized manner and the results filed with the Superintendent of the local school district. If a student does not take the tests or scores below the thirty-third percentile the homeschooling program may be placed on probation (New York State Education Department, 2005).

Diagnosing Student's Strengths and Weaknesses

Standardized tests, along with interviews, classroom observations, medical examinations, and school records are used to help diagnose students' strengths and weaknesses. Often the standardized tests used for this purpose are administered individually to determine if the child has a disability. For example, if a kindergarten child is having trouble with oral communication, a standardized language development test could be administered to determine if there are difficulties with understanding the meaning of words or sentence structures, noticing sound differences in similar words, or articulating words correctly (Peirangelo & Guiliani, 2002). It would also be important to determine if the child was a recent immigrant, had a hearing impairment, or had an intellectual disability. The diagnosis of learning disabilities typically involves the administration of at least two types of standardized tests—an

aptitude test to assess general cognitive functioning and an achievement test to assess knowledge of specific content areas (Peirangelo & Guiliani, 2006). We discuss the difference between aptitude and achievement tests later in this chapter.

Selecting Students for Specific Programs

Standardized tests are often used to select students for specific programs. For example, the SAT (Scholastic Assessment Test) and ACT (American College Test) are norm-referenced tests used to help determine if high school students are admitted to selective colleges. Norm-referenced standardized tests are also used, among other criteria, to determine if students are eligible for special education or gifted and talented programs. Criterion-referenced tests are used to determine which students are eligible for promotion to the next grade or graduation from high school. Schools that place students in ability groups including high school college preparation, academic, or vocational programs may also use norm-referenced or criterion-referenced standardized tests. When standardized tests are used as essential criteria for placement they are obviously high stakes for students.

Assisting Teachers' Planning

Norm-referenced and criterion-referenced standardized tests, among other sources of information about students, can help teachers make decisions about their instruction. For example, if a social studies teacher learns that most of the students did very well on a norm-referenced reading test administered early in the school year he may adapt his instruction and use additional primary sources. A reading teacher after reviewing the poor end-of-the-

year criterion-referenced standardized reading test results may decide that next year she will modify the techniques she uses. A biology teacher may decide that she needs to spend more time on genetics as her students scored poorly on that section of the standardized criterion-referenced science test. These are examples of assessment for learning which involves data-based decision-making. It can be difficult for beginning teachers to learn to use standardized test information appropriately, understanding that test scores are important information but also remembering that there are multiple reasons for students' performance on a test.

Accountability

Standardized test results are increasingly used to hold teachers and administrators accountable for students' learning. Prior to 2002, many States required public dissemination of students' progress but under NCLB school districts in all states are required to send report cards to parents and the public that include results of standardized tests for each school. Providing information about students' standardized tests is not new as newspapers began printing summaries of students' test results within school districts in the 1970s and 1980s (Popham, 2005). However, public accountability of schools and teachers has been increasing in the US and many other countries and this increased accountability impacts the public perception and work of all teachers including those teaching in subjects or grade levels not being tested.

For example, Erin, a middle school social studies teacher, said:

> *As a teacher in a "non-testing" subject area, I spend substantial instructional time supporting the standardized testing requirements. For example, our school has instituted "word of the day," which encourages teachers to use, define, and incorporate terminology often used in the tests (e.g.*

> *"compare," "oxymoron," etc.). I use the terms in my class as often as possible and incorporate them into written assignments. I also often use test questions of similar formats to the standardized tests in my own subject assessments (e.g. multiple choice questions with double negatives, short answer and extended response questions) as I believe that practice in the test question formats will help students be more successful in those subjects that are being assessed.*

Accountability and standardized testing are two components of Standards-Based Reform in Education that were initiated in the USA in the 1980s. The two other components are academic content standards and teacher quality.

Types of Standardized Tests

Achievement Tests

K-12 **achievement tests** are designed to assess what students have learned in a specific content area. These tests include those specifically designed by states to access mastery of state academic content standards as well as general tests such as the California Achievement Tests, The Comprehensive Tests of Basic Skills, Iowa Tests of Basic Skills, Metropolitan Achievement Tests, and the Stanford Achievement Tests. These general tests are designed to be used across the nation and so will not be as closely aligned with state content standards as specifically designed tests. Some states and Canadian Provinces use specifically designed tests to assess the attainment of content standards and also a general achievement test to provide normative information.

Standardized achievement tests are designed to be used for students in kindergarten through high school. For young children,

questions are presented orally, and students may respond by pointing to pictures, and the subtests are often not timed. For example, on the Iowa Test of Basic Skills designed for students who are young as kindergarten the vocabulary test assesses listening vocabulary. The teacher reads a word and may also read a sentence containing the word. Students are then asked to choose one of three pictorial response options.

Achievement tests are used as one criterion for obtaining a license in a variety of professions including nursing, physical therapy, social work, accounting, and law. Their use in teacher education is recent and is part of the increased accountability of public education and most States require that teacher education students take achievement tests in order to obtain a teaching license. For those seeking middle school and high school licensure, these tests are in the content area of the major or minor (e.g. mathematics, social studies); for those seeking licenses in early childhood and elementary the tests focus on knowledge needed to teach students of specific grade levels. The most commonly used tests, the PRAXIS series, tests I and II, developed by Educational Testing Service, include three types of tests:

- Subject Assessments, these test general and subject-specific teaching skills and knowledge. They include both multiple-choice and constructed-response test items.
- Principles of Learning and Teaching (PLT) Tests assess general pedagogical knowledge at four grade levels: Early Childhood, K–6, 5–9, and 7–12. These tests are based on case studies and include constructed-response and multiple-choice items. Much of the content in this textbook is relevant to the PLT tests.
- Teaching Foundations Tests assess pedagogy in five areas: multi-subject (elementary), English, Language Arts, Mathematics, Science, and Social Science.

These tests include constructed-response and multiple-choice

items which test teacher education students. The scores needed in order to pass each test vary and are determined by each state.

Diagnostic Tests

Some standardized tests are designed to diagnose strengths and weaknesses in skills, typically reading or mathematics skills. For example, an elementary school child may have difficulty in reading and one or more diagnostic tests would provide detailed information about three components: (1) word recognition, which includes phonological awareness (pronunciation), decoding, and spelling; (2) comprehension which includes vocabulary as well as reading and listening comprehension, and (3) fluency (Joshi 2003). Diagnostic tests are often administered individually by school psychologists, following standardized procedures. The examiner typically records not only the results on each question but also observations of the child's behavior such as distractibility or frustration. The results from the diagnostic standardized tests are used in conjunction with classroom observations, school, and medical records, as well as interviews with teachers, parents, and students to produce a profile of the student's skills and abilities, and where appropriate diagnose a learning disability.

Aptitude tests

Aptitude tests, like achievement tests, measure what students have learned, but rather than focusing on specific subject matter learned in school (e.g. math, science, English, or social studies), the test items focus on verbal, quantitative, and problem-solving abilities that are learned in school or in the general culture (Linn & Miller, 2005). These tests are typically shorter than achievement tests and

can be useful in predicting general school achievement. If the purpose of using a test is to predict success in a specific subject (e.g. language arts) the best prediction is past achievement in language arts and so scores on a language arts achievement test would be useful. However, when the predictions are more general (e.g. success in college) aptitude tests are often used. According to the test developers, both the ACT and SAT Reasoning tests are used to predict success in college, assess general educational development and reasoning, analysis, and problem-solving as well as questions on mathematics, reading, and writing. The SAT Subject Tests that focus on mastery of specific subjects like English, history, mathematics, science, and language are used by some colleges as entrance criteria and are more appropriately classified as achievement tests than aptitude tests even though they are used to predict the future.

Tests designed to assess general learning ability have traditionally been called Intelligence Tests but are now often called learning ability tests, cognitive ability tests, scholastic aptitude tests, or school ability tests. The shift in terminology reflects the extensive controversy over the meaning of the term intelligence and that its traditional use was associated with inherited capacity (Linn & Miller 2005). The more current terms emphasize that tests measure developed ability in learning not innate capacity. The Cognitive Abilities Test assesses K-12 students' abilities to reason with words, quantitative concepts, and nonverbal (spatial) pictures. The Woodcock-Johnson III contains cognitive abilities tests as well as achievement tests for ages 2 to 90 years.

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High-Stakes Testing

While many states had standardized testing programs prior to 2000, the number of state-wide tests has grown enormously since then because the No Child Left Behind Act (NCLB) required that all states test students in reading and mathematics annually in grades third through eighth and at least once in high school by 2005–06. Twenty-three states expanded their testing programs during 2005–06 and additional tests are being added as testing in science is required by 2007–08. Students with disabilities and English language learners must be included in the testing and provided a variety of accommodations so the majority of staff in school districts are involved in testing in some way (Olson, 2005). In this section, we focus on these tests and their implications for teachers and students.

Standards-Based Assessment

Academic content standards

NCLB mandates that states must develop academic content standards that specify what students are expected to know or be able to do at each grade level. These content standards used to be called goals and objectives and it is not clear why the labels have changed (Popham, 2004). Content standards are not easy to develop—if they are too broad and not related to grade level, teachers cannot hope to prepare students to meet the standards.

An example, a broad standard in reading is:

- "Students should be able to construct meaning through

experiences with literature, cultural events and philosophical discussion" (no grade level indicated). (American Federation of Teachers, 2006, p. 6).

Standards that are too narrow can result in a restricted curriculum. An example of a narrow standard might be:

- Students can define, compare and contrast, and provide a variety of examples of synonyms and antonyms.

A stronger standard is:

- "Students should apply knowledge of word origins, derivations, synonyms, antonyms, and idioms to determine the meaning of words" (grade 4) (American Federation of Teachers, 2006, p. 6).

The American Federation of Teachers conducted a study in 2005-6 and reported that some of the standards in reading, math, and science were weak in 32 states. States set the strongest standards in science followed by mathematics. Standards in reading were particularly problematic and with one-fifth of all reading standards redundant across the grade levels, i.e. word-by-word repetition across grade levels at least 50 percent of the time (American Federation of Teachers, 2006).

Even if the standards are strong, there are often so many of them that it is hard for teachers to address them all in a school year. Content standards are developed by curriculum specialists who believe in the importance of their subject area so they tend to develop large numbers of standards for each subject area and grade level. At first glance, it may appear that there are only several broad standards, but under each standard, there are subcategories called goals, benchmarks, indicators or objectives (Popham, 2004). For example, Idaho's first-grade mathematics standard, judged to be of high quality (AFT 2000) contains five broad standards, including 10 goals and a total of 29 objectives (Idaho Department of Education, 2005-6).

Alignment of standards, testing and classroom curriculum

The state tests must be aligned with strong content standards in order to provide useful feedback about student learning. If there is a mismatch between the academic content standards and the content that is assessed then the test results cannot provide information about students' proficiency on the academic standards. A mismatch not only frustrates the students taking the test, teachers, and administrators it undermines the concept of accountability and the "theory of action" that underlies the NCLB. Unfortunately, the 2006 Federation of Teachers study indicated that in only 11 states were all the tests aligned with state standards (American Federation of Teachers, 2006).

State standards and their alignment with state assessments should be widely available—preferably posted on the state's websites so they can be accessed by school personnel and the public. A number of states have been slow to do this. Table 10.9.1 summarizes which states had strong content standards, tests that were aligned with state standards, and adequate documents online. Only 11 states were judged to meet all three criteria in 2006.

Table 10.9.1. Strong content standards, alignment, and transparency: evaluation for each state in 2006 (Adapted from American Federation of Teachers, 2006).

State	Standards are strong	Test documents match standards	Testing documents are online
Alabama			+
Alaska		+	+
Arizona		+	+
Arkansas		+	
California	+	+	+
Colorado			+
Connecticut		+	
Delaware			
District of Columbia	+	+	
Florida		+	+
Georgia	+		+
Hawaii		+	
Idaho	+		+
Illinois			+
Indiana		+	+
Iowa		+	
Kansas		+	+
Kentucky		+	+
Louisiana	+	+	+
Maine		+	
Maryland		+	
Massachusetts	+	+	
Michigan	+	+	
Minnesota		+	+
Mississippi			+

Table 10.9.1. Strong content standards, alignment, and transparency: evaluation for each state in 2006 (Adapted from American Federation of Teachers, 2006).

Missouri			
Montana			
Nebraska			
Nevada	+	+	+
New Hampshire		+	+
New Jersey	+		
New Mexico	+	+	+
New York	+	+	+
North Carolina	+		
North Dakota	+	+	
Ohio	+	+	+
Oklahoma		+	+
Oregon		+	+
Pennsylvania			+
Rhode Island		+	+
South Carolina			
South Dakota	+		+
Tennessee	+	+	+
Texas		+	+
Utah			+

Sampling Content

When numerous standards have been developed it is impossible for tests to assess all of the standards every year, so the tests *sample* the content, i.e. measure some but not all the

standards every year. Content standards cannot be reliably assessed with only one or two items so the decision to assess one content standard often requires not assessing another. This means if there are too many content standards a significant proportion of them are not measured each year. In this situation, teachers try to guess which content standards will be assessed that year and align their teaching on those specific standards. Of course, if these guesses are incorrect students will have studied content not on the test and not studied content that is on the test. Some argue that this is a very serious problem with current state testing and Popham (2004) an expert on testing even said: "What a muddleheaded way to run a testing program" (p. 79).

Adequate Yearly Progress (AYP)

Under NCLB three levels of achievement, basic, proficient, and advanced, must be specified for each grade level in each content area by each state. States were required to set a time table from 2002 that insured an increasing percentage of students would reach the proficient levels such that by 2013–14, so every child is performing at or the proficient level. Schools and school districts that meet this timetable are said to meet adequate yearly progress (AYP).

Because every child must reach proficiency by 2013–14 greater increases are required for those schools that had larger percentages of initially lower-performing students.

Figure 1 illustrates the progress needed in three hypothetical schools. School A, initially the lowest-performing school, has to increase the number of students reaching proficiency by an average of 6 percent each year, the increase is 3 percent for School B, and the increase is only 1 percent for School C. Also, the checkpoint targets in the timetables are determined by the lower performing schools. This is illustrated on the figure by the arrow—it is obvious

that School A has to make significant improvements by 2007–08 but School C does not have to improve at all by 2007–08. This means that schools that are initially lower-performing are much more likely to fail to make AYP during the initial implementation years of NCLB.

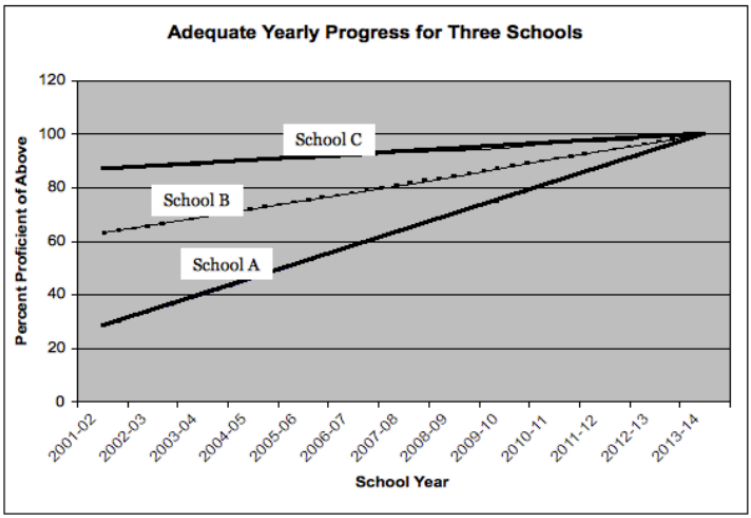

Figure 10.9.1. Adequate Yearly Progress requires greater student improvement in schools with lower levels of initial proficiency.

Schools A, B, and C all must reach 10 percent student proficiency by 2013–14. However, the school that initially has the lowest level of performance (A) has to increase the percentage of students proficient at a greater rate than schools with middle (B) or high (C) levels of initial proficiency rates.

Subgroups

For a school to achieve AYP not only must overall percentages of

the students reach proficiency but subgroups must also reach proficiency in a process called desegregation. Prior to NCLB state accountability systems typically focused on overall student performance but this did not provide incentives for schools to focus on the neediest students, e.g. those children living below the poverty line (Hess & Petrilli, 2006). Under NCLB the percentages for each racial/ethnic group in the school (white, African American, Latino, Native American, etc.), low-income students, students with limited English proficiency, and students with disabilities are all calculated if there are enough students in the subgroup. A school may fail AYP if one group, e.g. English language learners do not make adequate progress. This means that it is more difficult for large diverse schools (typically urban schools) that have many subgroups to meet the demands of AYP than smaller schools with homogeneous student body (Novak & Fuller, 2003). Schools can also fail to make AYP if too few students take the exam. The drafters of the law were concerned that some schools might encourage low-performing students to stay home on the days of testing in order to artificially inflate the scores. On average, at least 95 percent of any subgroup must take the exams each year or the school may fail to make AYP (Hess & Petrilli, 2006).

Sanctions

Schools failing to meet AYP for consecutive years, experience a series of increasing sanctions. If a school fails to make AYP for two years in row it is labeled "in need of improvement" and school personnel must come up with a school improvement plan that is based on "scientifically based research." In addition, students must be offered the option of transferring to a better performing public school within the district. If the school fails for three consecutive years, free tutoring must be provided to needy students. A fourth-year of failure requires "corrective actions" which may include

staffing changes, curriculum reforms or extensions of the school day or year. If the school fails to meet AYP for five consecutive years the district must "restructure" which involves major actions such as replacing the majority of the staff, hiring an educational management company, turning the school over to the state.

Growth or Value-Added Models

One concern with how AYP is calculated is that it is based on an absolute level of student performance at one point in time and does not measure how much students improve during each year. To illustrate this, Figure 2 shows six students whose science test scores improved from fourth to fifth grade. The circle represents a student's score in fourth grade and the tip of the arrow the test score in fifth grade. Note that students 1, 2, and 3 all reach the level of proficiency (the horizontal dotted line) but students 4, 5, and 6 do not. However, also notice that students 2, 5, and 6 improved much more than students 1, 3, and 4. The current system of AYP rewards students for reaching the proficiency level rather than students' growth. This is a particular problem for low performing schools who may be doing an excellent job of improving achievement (students 5 and 6) but do not make the proficiency level. The US Department of Education in 2006 allowed some states to include growth measures into their calculations of AYP. While growth models traditionally tracked the progress of individual students, the term is sometimes used to refer to the growth of classes or entire schools (Shaul, 2006).

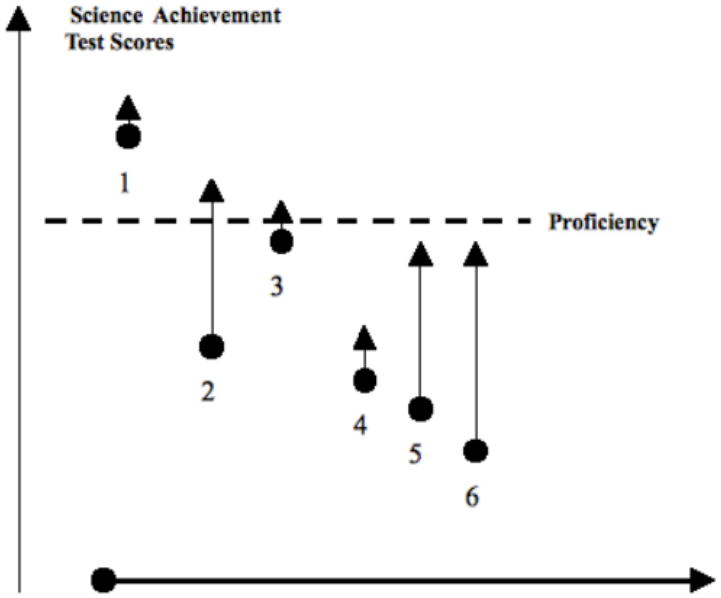

Figure 10.9.2. An illustration of the value-added vs. proficiency approach to assessment. Each arrow represents the mathematics achievement results of one student who was tested in the fourth grade (shown by the dot) and also the fifth grade (shown by the tip of the arrow).

Some states include growth information on their report cards. For example, Tennessee provides details on which schools meet the AYP but also whether the students' scores on tests represent average growth, above average, or below-average growth within the state. Figure 3 illustrates in a simple way the kind of information that is provided. Students in schools A, B, and C all reached proficiency and AYP but in Schools D, E, and F did not. However, students in schools A and D had low growth, schools B and E had average growth, in schools C and F had high growth. Researchers have found that in some schools students have high levels of achievement but do not grow as much as expected (School A), and also that in some

schools, the achievement test scores are not high but the students are growing or learning a lot (School F). These are called "school effects" and represent the effect of the school on the learning of the students.

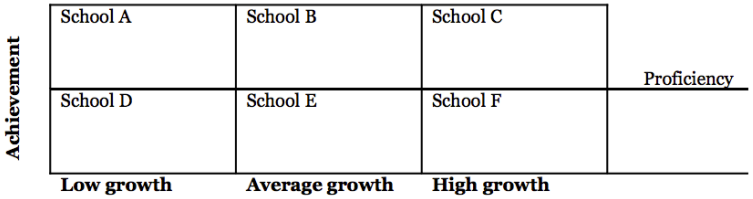

Figure 10.9.3. Proficiency and growth information

Growth Over One Year

Schools can vary on overall school achievement (proficiency) as well as the amount of growth in student learning, For example, schools A, B, and C all have high achievement levels but only in School C do students have, on average, high growth. Schools D, C, and F all have low levels of proficiency but only in school D do students, on average, have low growth.

Growth models have an intuitive appeal to teachers as they focus on how much a student learned during the school year—not what the student knew at the start of the school year. The current research evidence suggests that teachers matter a lot—i.e. students learn much more with some teachers than with others. For example, in one study low-achieving fourth-grade students in Dallas, Texas were followed for three years and 90 percent of those who had effective teachers passed the seventh-grade math test whereas only 42 percent of those with ineffective teachers passed (cited in Bracey, 2004). Unfortunately, the same study reported that low achieving students were more likely to be assigned to ineffective teachers

for three years in a row than high achieving students. Some policymakers believe that teachers who are highly effective should receive rewards including higher salaries or bonuses and that a primary criterion of effectiveness is assessed by growth models, i.e. how much students learn during a year (Hershberg, 2004). However, using growth data to make decisions about teachers is controversial as there is much more statistical uncertainty when using growth measures for a small group of students (e.g. one teacher's students) than for larger groups (e.g. all fourth graders in a school district).

Growth models are also used to provide information about the patterns of growth among subgroups of students that may arise from the instructional focus of the teachers. For example, it may be that the highest-performing students in the classroom gain the most and the lowest-performing students gain the least. This suggests that the teacher is focusing on the high-achieving students and giving less attention to low-achieving students. In contrast, it may be the highest performing students gain the least and the low-performing students grow the most suggesting the teacher focuses on the low-performing students and pays little attention to the high-performing students. If the teacher focuses on the students "in the middle" they may grow the most and the highest and lowest performing students grow the least. Proponents of the value-added or growth models argue that teachers can use this information to help them make informed decisions about their teaching (Hershberg, 2004).

Differing state standards

Under NCLB each state devises its own academic content standards, assessments, and levels of proficiency. Some researchers have suggested that the rules of NCLB have encouraged states to set low levels of proficiency so it is easier to meet AYP each year (Hoff, 2002). The stringency of state levels of proficiency can be

examined by comparing state test scores to scores on a national achievement test called the National Assessment of Educational Progress (NAEP). NCLB requires that states administer reading and math NAEP tests to a sample of fourth and eighth-grade students every other year. The NAEP is designed to assess the progress of students at the state-wide or national level, not individual schools or students, and is widely respected as a well-designed test that uses current best practices in testing. A large percentage of each test includes constructed-response questions and questions that require the use of calculators and other materials.

Figure 10.9.4 illustrates that two states, Colorado and Missouri had very different state performance standards for the fourth-grade reading/language arts tests in 2003. On the state assessment, 67 percent of the students in Colorado but only 21 percent of the students in Missouri were classified as proficient. However, on the NAEP tests 34 percent of Colorado students and 28 percent of Missouri students were classified as proficient (Linn 2005). These differences demonstrate that there is no common meaning in current definitions of "proficient achievement" established by the states.

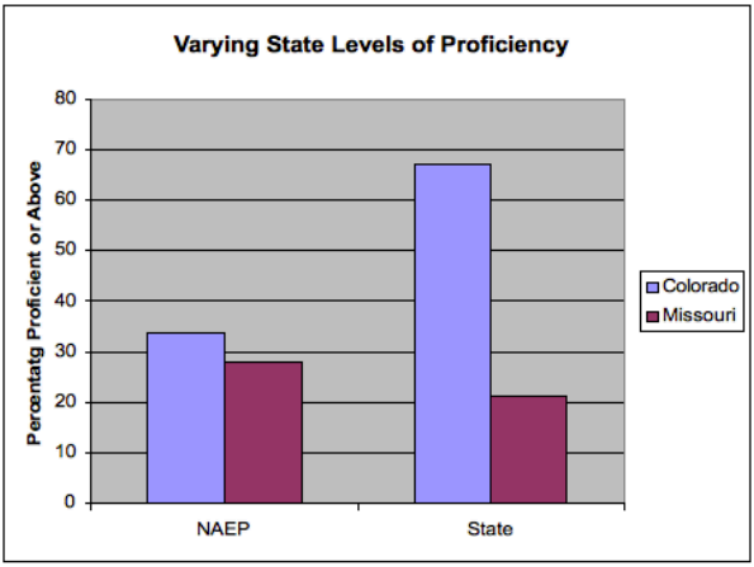

Figure 10.9.4. Relationship between state proficiency levels and scores on NAEP (Adapted from Linn 2005).

IMPLICATIONS FOR BEGINNING TEACHERS

Dr. Mucci is the principal of a suburban fourth through sixth-grade school in Ohio that continues to meet AYP. We asked her what beginning teachers should know about high-stakes testing by the states. She responded as follows:

I want beginning teachers to be familiar with the content standards in Ohio because they clearly define what all students should know and be able to do. Not only does teaching revolve around the standards, I only approve requests for materials or professional development if these are related to the standards. I want beginning teachers to understand the concept of data-based decision-making. Every year I meet with all the teachers in each grade level (e.g. fourth grade) to look for trends in the previous year's test results and consider remedies based on these trends.

I also meet with each teacher in the content areas that are tested and discuss every student's achievement in his or her class so we can develop an instructional plan for every student. All interventions with students are research-based. Every teacher in the school is responsible for helping to implement these instructional plans, for example, the music or art teachers must incorporate some reading and math into their classes.

I also ask all teachers to teach test-taking skills, by using similar formats to the state tests, enforcing time limits,

making sure students learn to distinguish between questions that required an extended response using complete sentences versus those that only require one or two words, and ensuring that students answer what is actually being asked. We begin this early in the school year and continue to work on these skills, so by spring, students are familiar with the format, and therefore less anxious about the state test. We do everything possible to set each student up for success.

The impact of testing on classroom teachers does not just occur in Dr. Mucci's middle school. A national survey of over 4,000 teachers indicated that the majority of teachers reported that the state-mandated tests were compatible with their daily instruction and were based on curriculum frameworks that all teachers should follow. The majority of teachers also reported teaching test-taking skills and encouraging students to work hard and prepare. Elementary school teachers reported a greater impact of the high-stakes tests: 56 percent reported the tests influenced their teaching daily or a few times a week compared to 46 percent of middle school teachers and 28 percent of high school teachers. Even though the teachers had adapted their instruction because of the standardized tests they were skeptical about them with 40 percent reporting that teachers had found ways to raise test scores without improving student learning and over 70 percent reporting that the test scores were not an accurate measure of what minority students know and can do (Pedulla, Abrams, Madaus, Russell, Ramos, & Miao; 2003).
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International Comparisons

Along with the increasing globalization has come an interest in international comparisons in educational achievement and practices and more than 40 countries participate in two major testing initiatives. The Trends in International Mathematics and Science Study (TIMSS) have assessed students in fourth and eighth grades four times through 2007. The Programme for International Assessment (PISA) has assessed 15-year-olds in reading, mathematical and science literacy in more than forty countries on three times since 2000. The items on both series of tests include multiple-choice, short answer, and constructed response formats and are translated into more than 30 languages.

Policymakers are often interested in the comparison of average students' scores across countries. For example, in eighth-grade science on the 2003 TIMMS students from Canada, the United States, Hong Kong, and Australia scored significantly higher than the international average whereas students from Egypt, Indonesia, and the Philippines scored significantly below the international average (TIMMS 2003). On the mathematics test in the 2003 PISA, 15- year-old students from Hong Kong, China, and Finland scored higher than students from Canada and New Zealand who in turn scored higher than the students from the United States and Spain, who in turn scored higher than the student from Mexico and Brazil (OECD, 2004).

Both series of tests also collect survey data from students, teachers, or school principals allowing for information about instructional practices and student characteristics. For example, teachers from the Philippines report spending almost twice as much time teaching science to fourth graders than in the United States (Martin, Mullis, Gonzalez, & Chrostowski, (2004). Student reports from PISA indicate that there is considerable cross-country variation in how much students feel anxiety when doing

mathematics. Students in France, Italy, Japan, and Korea report feeling the most anxious whereas students in Denmark, Finland, the Netherlands, and Sweden feel the least anxious (OECD 2004).

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Understanding Test Results

In order to understand test results from standardized tests, it is important to be familiar with a variety of terms and concepts that are fundamental to "measurement theory," the academic study of measurement and assessment. Two major areas in measurement theory, reliability and validity, were discussed earlier in this chapter we focus on concepts and terms associated with test scores.

The Basics of Statistics

Frequency Distributions

A frequency distribution is a listing of the number of students who obtained each score on a test. If 31 students take a test, and the scores range from 11 to 30 then the frequency distribution might look like Table 10.11.1. We also show the same set of scores on a histogram or bar graph in Figure 10.11.1. The horizontal (or *x*-axis) represents the score on the test and the vertical axis (*y*-axis) represents the number or frequency of students. Plotting a frequency distribution helps us see what scores are typical and how much variability there is in the scores. We describe more precise ways of determining typical scores and variability next.

Table 10.11.1, Frequency distribution for 30 scores		
Score on test	**Frequency**	**Central tendency measures**
17	1	
18	1	
19	0	
20	3	
21	2	
22	6	Mode
23	3	Median
24	2	Mean
25	0	
26	2	
27	6	Mode
28	2	
29	2	
30	1	
TOTAL	**31**	

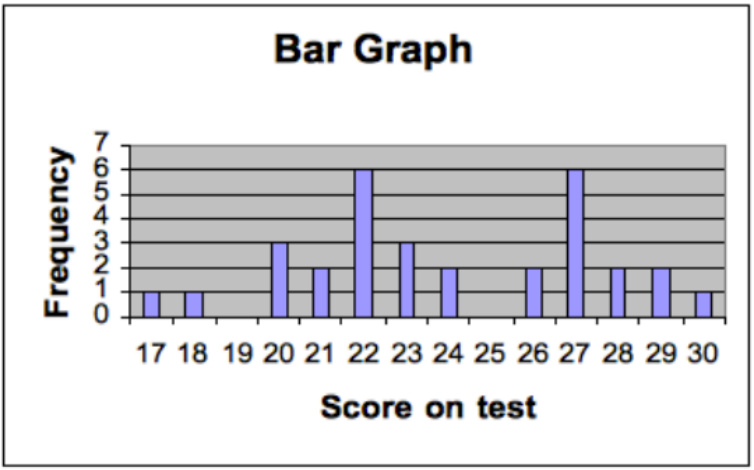

Figure 10.11.1. Tests scores from Table 1 represented as a bar graph

Central Tendency and Variability

There are three common ways of measuring central tendency or which score(s) are typical. The **mean** is calculated by adding up all the scores and dividing by the number of scores. In the example in Table 1, the mean is 24. The **median** is the "middle" score of the distribution—that is half of the scores are above the median and half are below. The median on the distribution is 23 because 15 scores are above 23 and 15 are below. The **mode** is the score that occurs most often. In Table 1 there are actually two modes: 22 and 27. Thus, this distribution is described as **bimodal**. Calculating the mean, median and mode are important as each provides different information for teachers. The median represents the score of the "middle" students, with half scoring above and below, but does not tell us about the scores on the test that occurred most often. The mean is important for some statistical calculations but is highly influenced by a few extreme scores (called outliers) but the median is not. To illustrate this, imagine a test out of 20 points taken by 10 students, and most do very well but one student does very poorly. The scores might be 4, 18, 18, 19, 19, 19, 19, 19, 20, 20. The mean is 17.5 (175/10) but if the lowest score (4) is eliminated the mean is now 1.5 points higher at 19 (171/9). However, in this example, the median remains at 19 whether the lowest score is included. When there are some extreme scores the median is often more useful for teachers in indicating the central tendency of the frequency distribution.

The measures of central tendency help us summarize scores that are representative, but they do not tell us anything about how variable or how spread out are the scores. Figure 2 illustrates sets of scores from two different schools on the same test for fourth graders. Note that the mean for each is 40 but in School A the scores

are much less spread out. A simple way to summarize variability is the **range**, which is the lowest score subtracted from the lowest score. In School A with low variability the range is (45 − 35) = 10; in the school B the range is (55 − 22 = 33).

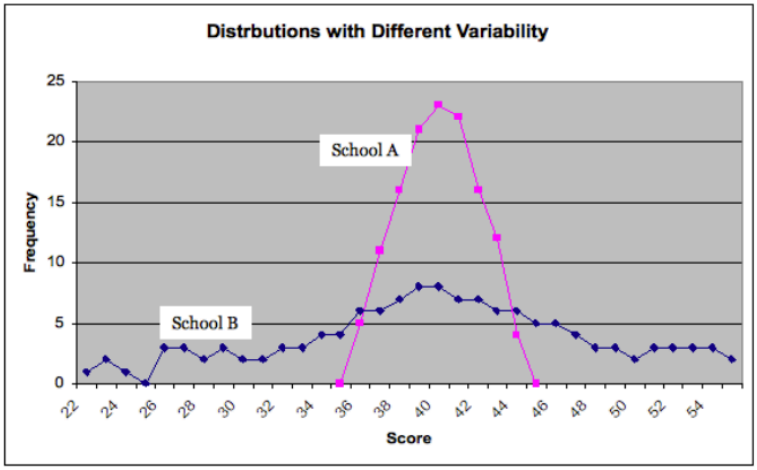

Figure 10.11.2. Fourth-grade math scores in two different schools with the same mean but different variability

However, the range is only based on two scores in the distribution, the highest and lowest scores, and so does not represent variability in all the scores. The standard deviation is based on how much, on average, all the scores deviate from the mean. In the example, in Figure 10.11.2 the standard deviations are 7.73 for School A and 2.01 for School B. In Exhibit 1 below we demonstrate how to calculate the standard deviation.

EXHIBIT 1: CALCULATING A STANDARD DEVIATION

The scores from 11 students on a quiz are 4, 7, 6, 3, 10, 7, 3, 7, 5, 5, and 9. Complete the following steps:

1. Order scores.
2. Calculate the mean score.
3. Calculate the deviations from the mean.
4. Square the deviations from the mean.
5. Calculate the mean of the squared deviations from the mean (i.e. sum the squared deviations from the mean then divide by the number of scores). This number is called the variance.
6. Take the square root and you have calculated the standard deviation.

Completing the Steps

Score (Step 1: Order)	Deviation from the mean	Squared deviation from the mean
3	−3	9
3	−3	9
4	−2	4
5	−1	1
5	−1	1
6	0	0
7	1	1
7	1	1
7	1	1
9	3	9
10	4	4
Total: 66		**52**

The Normal Distribution

Knowing the standard deviation is particularly important when the distribution of the scores falls on a normal distribution. When a standardized test is administered to a very large number of students the distribution of scores is typically similar, with many students scoring close to the mean, and fewer scoring much higher or lower than the mean. When the distribution of scores looks like the bell

shape shown in Figure 3 it is called a normal distribution. In the diagram we did not draw in the scores of individual students as we did in Figure 2, because distributions typically only fall on a normal curve when there are a large number of students; too many to show individually. A normal distribution is symmetric, and the mean, median, and mode are all the same.

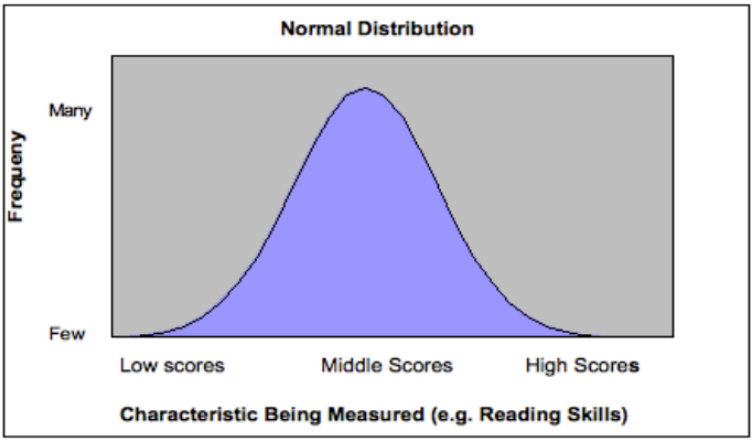

Figure 10.11.3. Bell-shaped curve of normal distribution

Normal curve distributions are very important in education and psychology because of the relationship between the mean, standard deviation, and percentiles. In all normal distributions, 34 percent of the scores fall between the mean and one standard deviation of the mean. Intelligence tests often are constructed to have a mean of 100 and a standard deviation of 15 and we illustrate that in the figure below.

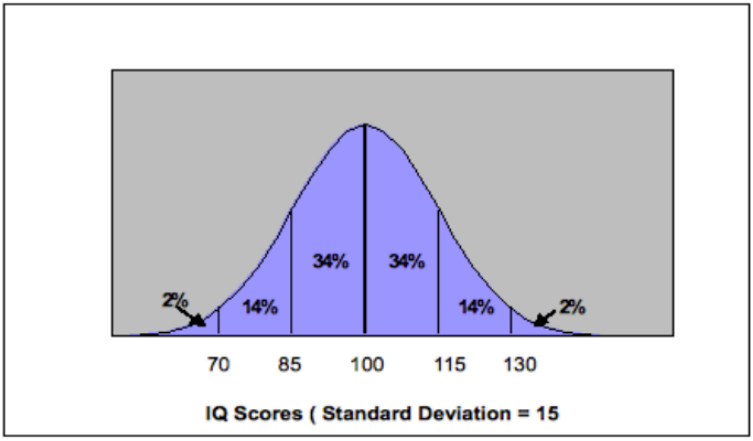

Figure 10.11.4. Normal distribution for an IQ test with a mean of 100 and standard deviation of 15

In the above figure, 34 percent of the scores are between 100 and 115 and as well, and 34 percent of the scores lie between 85 and 100. This means that 68 percent of the scores are between -1 and +1 standard deviations of the mean (i.e. 85 and 115). Note that only 14 percent of the scores are between +1 and +2 standard deviations of the mean and only 2 percent fall above +2 standard deviations of the mean.

In a normal distribution, a student who scores the mean value is always in the fiftieth percentile because the mean and median are the same. A score of +1 standard deviation above the mean (e.g. 115 in Figure 4) is the 84 percent tile (50 percent and 34 percent of the scores were below 115). In Exhibit 10 we represent the percentile equivalents to the normal curve and we also show standard scores.

Kinds of Test Scores

A **standard score** expresses performance on a test in terms of

standard deviation units above or below the mean (Linn & Miller, 2005). There are a variety of standard scores, including z-scores, T-scores, and stanines.

One type of standard score is a **z-score**, in which the mean is 0 and the standard deviation is 1. This means that a z-score tells us directly how many standard deviations the score is above or below the mean. For example, if a student receives a z score of 2 her score is two standard deviations above the mean or the eighty-fourth percentile. A student receiving a z score of -1.5 scored one and one-half deviations below the mean. Any score from a normal distribution can be converted to a z score if the mean and standard deviation is known.

A **T-score** has a mean of 50 and a standard deviation of 10. This means that a T-score of 70 is two standard deviations above the mean and so is equivalent to a z-score of 2.

Stanines (pronounced "staynines") are often used for reporting students' scores and are based on a standard nine-point scale with a mean of 5 and a standard deviation of 2.

Grade Equivalent Scores

A grade equivalent score provides an estimate of test performance based on grade level and months of the school year (Popham, 2005, p. 288). A grade equivalent score of 3.7 means the performance is at that expected of a third-grade student in the seventh month of the school year. Grade equivalents provide a continuous range of grade levels and so can be considered developmental scores. Grade equivalent scores are popular and seem easy to understand however they are typically misunderstood. If, James, a fourth-grade student, takes a reading test and the grade equivalent score is 6.0; *this does not mean that James can do sixth-grade work*. It means that James performed on the *fourth-grade* test as a sixth-grade student is expected to perform.

Testing companies calculate grade equivalents by giving one test to several grade levels. For example, a test designed for fourth graders would also be given to third and fifth graders. The raw scores are plotted and a trend line is established and this is used to establish the grade equivalents. Note that in Figure 10.11.5 the trend line extends beyond the grade levels actually tested so a grade equivalent above 5.0 or below 3.0 is based solely on the estimated trend lines.

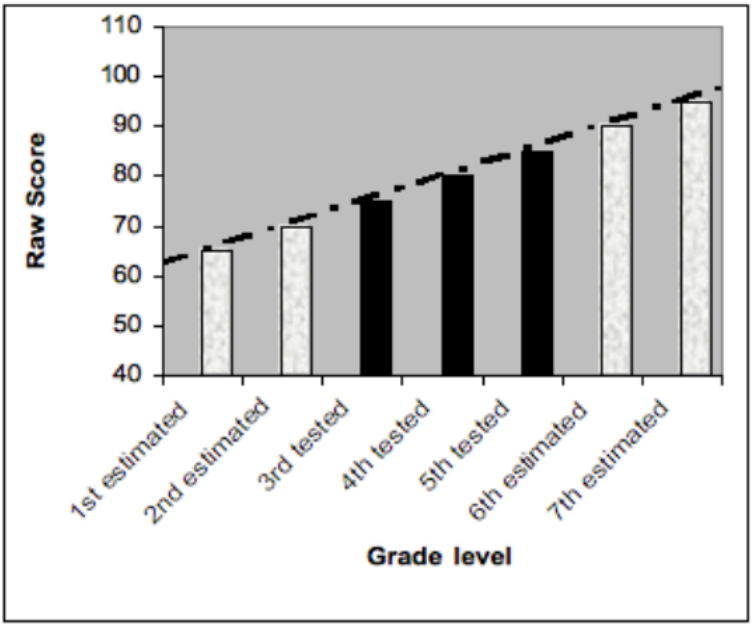

Figure 10.11.5. Using trend lines to estimate grade equivalent scores.

Grade equivalent scores also assume that the subject matter that is being tested is emphasized at each grade level to the same amount and that mastery of the content accumulates at a mostly constant rate (Popham, 2005). Many testing experts warn that grade equivalent scores should be interpreted with considerable

skepticism and that parents often have serious misconceptions about grade equivalent scores. Parents of high-achieving students may have an inflated sense of their child's levels of achievement.
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Issues with Standardized Tests

Many people have very strong views about the role of standardized tests in education. Some believe they provide an unbiased way to determine an individual's cognitive skills as well as the quality of a school or district. Others believe that scores from standardized tests are capricious, do not represent what students know, and are misleading when used for accountability purposes. Many educational psychologists and testing experts have nuanced views and make distinctions between the information standardized tests can provide about students' performances and how the test results are interpreted and used. In this nuanced view, many of the problems associated with standardized tests arise from their high stakes use such as using the performance on one test to determine selection into a program, graduation, or licensure, or judging a school as high vs low performing.

Bias in Standardized Tests

In a multicultural society, one crucial question is: Are standardized tests biased against certain social class, racial, or ethnic groups? This question is much more complicated than it seems because bias has a variety of meanings. An everyday meaning of bias often involves the fairness of using standardized test results to predict the potential performance of disadvantaged students who have previously had few educational resources. For example, should Dwayne, a high school student who worked hard but had limited educational opportunities because of the poor schools in his neighborhood and few educational resources in his home, be denied

graduation from high school because of his score on one test. It was not his fault that he did not have the educational resources and if given a chance with a change in his environment (e.g. by going to college) his performance may blossom. In this view, test scores reflect societal inequalities and can punish students who are less privileged and are often erroneously interpreted as a reflection of a fixed inherited capacity. Researchers typically consider bias in more technical ways and three issues will be discussed: item content and format; the accuracy of predictions, and stereotype threat.

Item content and format. Test items may be harder for some groups than others. An example of social class bias in a multiple-choice item asked students the meaning of the term *field*. The students were asked to read the initial sentence in italics and then select the response that had the same meaning of field (Popham 2004, p. 24):

1. My dad's *field* is computer graphics.
    1. The pitcher could field his position
    2. We prepared the field by plowing it
    3. The doctor examined my field of vision
    4. What field will you enter after college?

Children of professionals are more likely to understand this meaning of field as doctors, journalists and lawyers have "fields," whereas cashiers and maintenance workers have jobs so their children are less likely to know this meaning of the field. (The correct answer is 4).

Testing companies try to minimize these kinds of content problems by having test developers from a variety of backgrounds review items and by examining statistically if certain groups find some items easier or harder. However, problems do exist and recent analyses of the verbal SAT tests indicated that whites tend to score better on *easy* items whereas African Americans, Hispanic Americans, and Asian Americans score better on *hard* items (Freedle, 2002). While these differences are not large, they can

influence test scores. Researchers think that the easy items involving words that are used in everyday conversation may have subtly different meanings in different subcultures, whereas the hard words (e.g. vehemence, sycophant) are not used in every conversation and do not have these variations in meaning. Test format can also influence test performance. Females typically score better at essay questions and when the SAT recently added an essay component, the females overall SAT verbal scores improved relative to males (Hoover, 2006).

Accuracy of Predictions

Standardized tests are used among other criteria to determine who will be admitted to selective colleges. This practice is justified by predictive validity evidence—i.e. that scores on the ACT or SAT are used to predict first-year college grades. Recent studies have demonstrated that the predictions for black and Latino students are less accurate than for white students and that predictors for female students are less accurate than for male students (Young, 2004). However, perhaps surprisingly the test scores tend to slightly over-predict success in college for black and Latino students, i.e. these students are likely to attain *lower* freshman grade point averages than predicted by their test scores. In contrast, test scores tend to slightly underpredict success in college for female students, i.e. these students are likely to attain higher freshman grade point averages than predicted by their test scores. Researchers are not sure why there are differences in how accurately the SAT and ACT test predict freshman grades.

Stereotype Threat

Groups that are negatively stereotyped in some areas, such as women's performance in mathematics, are in danger of stereotype threat, i.e. concerns that others will view them through the negative or stereotyped lens (Aronson & Steele, 2005). Studies have shown that test performance of stereotyped groups (e.g. African Americans, Latinos, women) declines when it is emphasized to those taking the test that (a) the test is high stakes, measures intelligence or math and (b) they are reminded of their ethnicity, race or gender (e.g. by asking them before the test to complete a brief demographic questionnaire). Even if individuals believe they are competent, stereotype threat can reduce working memory capacity because individuals are trying to suppress the negative stereotypes. Stereotype threat seems particularly strong for those individuals who desire to perform well. Standardized test scores of individuals from stereotyped groups may significantly underestimate actual their competence in low-stakes testing situations.

Teaching to the Test

There is evidence that schools and teachers adjust the curriculum so it reflects what is on the tests and also prepares students for the format and types of items on the test. Several surveys of elementary school teachers indicated that more time was spent on mathematics and reading and less on social studies and sciences in 2004 than in 1990 (Jerald, 2006). Principals in high minority enrollment schools in four states reported in 2003 that they had reduced time spent on the arts. Recent research in cognitive science suggests that reading comprehension in a subject (e.g. science or social studies) requires that students understand a lot of vocabulary and background

knowledge in that subject (Recht & Leslie, 1988). This means that even if students gain good reading skills they will find learning science and social studies difficult if little time has been spent on these subjects.

Taking a test with an unfamiliar format can be difficult so teachers help students prepare for specific test formats and items (e.g. double negatives in multiple-choice items; constructed response). Earlier in this chapter, a middle school teacher, Erin, and Principal Dr. Mucci described the test preparation emphasis in their schools. There is growing concern that the amount of test preparation that is now occurring in schools is excessive and students are not being educated but trained to do tests (Popham, 2004).

Cheating

It is difficult to obtain good data on how widespread cheating is but we know that students taking tests cheat and others, including test administrators, help them cheat (Cizek, 2003; Popham 2006). Steps to prevent cheating by students include protecting the security of tests, making sure students understand the administration procedures, preventing students from bringing in their notes or unapproved electronic devices as well as looking at each other's answers. Some teachers and principals have been caught using unethical test preparation practices such as giving actual test items to students just before the tests, giving students more time than is allowed, answering students' questions about the test items, and actually changing students' answers (Popham, 2006). Concerns in Texas about cheating led to the creation of an independent task force in August 2006 with 15 staff members from the Texas Education Agency assigned investigate test improprieties. (Jacobson, 2006). While the pressure on schools and teachers to have their students perform well is large these practices are clearly

unethical and have led to school personnel being fired from their jobs (Cizek, 2003).
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Chapter Summary: Assessment and Evaluation

Classroom assessment is the process of gaining information about students' learning, and judging the quality of their learning. It can be used either to enhance students' learning (assessment for learning) or to verify the extent of students' learning (assessment of learning). Essential steps of assessment for learning include 1) communicating instructional goals clearly; 2) selecting appropriate, high-quality assessments that match the instructional goals and students' backgrounds; 3) using assessments that enhance student motivation and confidence; 4) adjusting instruction based on results of assessment; and 5) communicating assessment results to students, parents, and guardians. Different types of test questions and assessment practices affect the success of each of these steps. Action research can help teachers understand and improve their teaching. A number of questions are important to consider when devising grading systems.

Standardized tests are assessments developed by a team of experts and administered in consistent ways. They are used primarily to ensure accountability about students' education—to provide evidence that students are learning desired skills and knowledge. Most elementary and middle school teachers are likely to be responsible for helping students attain state content standards and achieve proficiency on criterion-referenced achievement tests. In order to interpret test scores and communicate that information to students and parents, teachers have to understand basic information about measures of central tendency and variability, the normal distribution, and several kinds of test scores. Current evidence suggests that standardized tests can be biased against certain groups and that many teachers tailor their curriculum and classroom tests to match the standardized

tests. A few educators have even been caught cheating—falsifying or "fudging" test results.
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About the Author

Contact

Email: n.arduinivanhoos@hvcc.edu

Website: https://sites.google.com/view/profavh
LinkedIn: https://www.linkedin.com/in/nicolearduinivanhoose/

Affiliations

Associate Professor of Psychology

Social Sciences & Education Department

Hudson Valley Community College, Troy, NY

Ph.D., Educational Psychology

Education Department

The State University of New York at Albany

Post-Graduate Study, Counseling

M.S.Ed., Educational Psychology

B.S., Education

Lally School of Education

The College of Saint Rose, Albany, NY

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