MODULE 1

USING SCIENCE TO INFORM CLASSROOM PRACTICES

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Outline	Learning Goals
Educational Psychology: A Resource for Teachers	
	1 Explain why educational psychology is an important resource for teachers.
Educational Psychology: The Science	
• Research Designs • Samples • Measures	2 Describe three elements of research studies that help determine which studies are worthy of consideration.
Educational Psychology: Classroom Practices	
• Best Practices • Addressing Diversity • Using a Case Study Approach	3 Define best practices and explain why it is important for teachers to base them on scientific evidence. 4 Describe five diversity characteristics that can define an individual's group membership and explain why teachers need to understand differences between groups.

Educational Psychology: A Resource for Teachers

1 Explain why educational psychology is an important resource for teachers.

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People who work outside educational settings may assume that good teaching practices are simply common sense. Yet commonsense approaches to classroom management and instruction often are ineffective or even counterproductive. Assume, for example, that an elementary student continues to get out of his seat during a lesson. A commonsense approach would be to politely ask the student to sit down. However, if the student is misbehaving to attract attention from the teacher and classmates, this approach might simply encourage the behavior.

Research suggests that a more effective approach would be to ignore the unwanted behavior, *depending on the individual characteristics of the student*. Hence, scientific evidence helps teachers determine the best practices for effective teaching. As a teacher, you will encounter situations for which, despite all your training, you are unprepared. When that happens, research can help you formulate an informed response.

When teachers need help dealing with issues of diversity, motivation, achievement differences, behavioral problems, and other concerns, they turn to the field of educational psychology. **Educational psychology** links the science of psychology to educational practice and provides teachers with evidence-based knowledge to support their day-to-day decision-making in the classroom. Teachers who implement research-based practices have students with more academic engagement and fewer disruptive behaviors (Sanetti, Collier-Meek, Long, Kim, & Kratochwill, 2014). In short, educational psychology can help teachers become better teachers. We are writing this text to provide theories and empirical evidence you can use to develop a repertoire of skills and knowledge on your path to becoming an effective teacher.

To make the most of educational psychology, teachers need both a basic understanding of scientific principles (the science) and an awareness of how these principles can apply to real situations (classroom practices). In this text, you will be considering the same major challenges that scholars face in this field:

- The science: formulating theories and conducting research studies
- Classroom practices: developing applications of current theories and research to enhance teaching and learning

Educational Psychology: The Science

2 Describe three elements of research studies that help determine which studies are worthy of consideration.

The science of educational psychology involves formulating **theories**—sets of ideas that are used to explain a phenomenon and make predictions about behavior—and then conducting research to determine how well those theories explain the phenomenon. The relationship between theory and research is reciprocal. Research findings may support a theory, but researchers also may alter theories or develop new ones based on accumulated evidence. This process is ongoing—scientists today are building upon (or tearing down) the work of 20th century scientists.

For today's teachers, the amount and variety of research material available can be intimidating. The first step in evaluating research is to find appropriate resources (see Guidelines 1.1). After you have located good research articles, you need to determine which studies are worthy of consideration. To evaluate the quality of research, you need to understand three elements of it:

1. Design: What was the purpose of the study (to describe, to show cause and effect)?
2. Sample: Who was being studied (elementary-aged children, college students)?
3. Measures: How were constructs of interest measured (surveys, observations)?

Research Designs

Researchers must choose a method for investigating variables of interest. **Variables** are events, characteristics, or behaviors that can be measured, such as age, family divorce, medication, diagnosis of attention deficit hyperactivity disorder (ADHD), math scores, or aggression. To focus on a specific question about certain variables, researchers choose a particular **research design**—a method for investigating how and whether the variables selected are related. Table 1.1 describes four designs that are commonly used in educational research.

▼ GUIDELINES 1.1

Finding Reputable Research

Teachers need to become informed consumers of research. News stories and websites commonly misinterpret scientific findings. The first step in evaluating research is to find appropriate resources. Follow these guidelines to obtain reputable research:
• Don't use newspaper and magazine articles because they are not research articles.
• Don't do Internet searches using search engines because they may not yield credible sources.
• Do find peer-reviewed articles in scholarly journals at a local university library.
• Do find peer-reviewed articles in databases such as ERIC and PsycINFO.
• Do visit websites of professional associations to see if they have links to educational research groups such as the American Educational Research Association (AERA) and the American Psychological Association (APA).

▼ TABLE 1.1

Summary of Research Designs

	Descriptive	Correlational	Experimental	Quasi-Experimental
Definition	To systematically explain a situation factually and accurately	To assess how changes in one variable correspond with changes in another variable	To establish a cause–effect relationship between variables	To infer a cause–effect relationship between variables when the researchers cannot manipulate the independent variable
Researcher's questions	What percentage of students passed a state mastery test? Does the percentage differ by grade level or socioeconomic status?	To what extent are reading achievement scores correlated with socioeconomic status? How are science project scores correlated with parents' level of interest in science?	How is third-grade reading achievement affected by classroom reading training? (Researchers randomly assign students into two groups, one with reading training and one without, and then compare scores on reading achievement tests.)	How is third-grade reading achievement affected by classroom reading training? (Researchers study two existing classrooms at the same school, one with reading training and one without, and then compare scores on reading achievement tests.)
Limitations	Cannot show connections between different variables	Can show connections between variables, but cannot prove one variable causes changes in the other	Requires random assignment into experimental and control groups, which is often not possible	Can show connections between variables and even infer causation, but cannot confirm that the results were due solely to the independent variable

Descriptive designs provide basic information about variables in a population without making connections between behaviors, events, or conditions. For example, a descriptive research study might determine what percentage of school-age children are diagnosed with ADHD.

Two descriptive designs can provide in-depth perspectives:

- *Case study* research examines a single individual and creates a rich picture of that individual's psychological functioning. Researchers might observe a child diagnosed with autism both at home and at school, interview teachers and parents, and examine test scores, school records, and other sources of information.
- *Ethnographic study* research closely examines a particular group through direct participation within the group. For example, a researcher might attend a school of predominately Latino students, taking extensive field notes to capture the unique educational values and social challenges of this ethnic group.

To move beyond simply *describing* behaviors, researchers use **correlational designs,** which answer questions about the connections between two variables. For example, in exploring the connection between study time and grades, the researcher might ask whether students who spend more time studying get better grades. These connections are expressed in a statistical computation called a *correlation coefficient*, a number between −1.0 and +1.0 that indicates the type and strength of the relationship between two variables.

- The sign (positive or negative) indicates the type of relationship between the two variables. A positive correlation (+) between study time and grades means that as study time increases, grades also increase. A negative correlation (−) between school absences and grades means that as absences increase, grades decrease.

- The closer a correlation coefficient is to +1 or −1, the stronger the relationship between the two variables. For example, a correlation coefficient of −.56 indicates a stronger connection than a correlation coefficient of +.43 because the absolute value of the number is larger.

Although correlation studies measure the relationships between different variables, they *cannot* determine cause and effect. Although we may find that study time and grades are positively correlated, increased study time may or may not *cause* better grades. Instead, this positive correlation may suggest several possibilities: (a) more study time causes better grades, (b) better grades cause a person to enjoy academics and therefore to study more, or (c) some other variable, such as parental involvement, accounts for the high levels of study time and grades.

When researchers want to establish whether a cause–effect relationship exists, they turn to experimental and quasi-experimental designs. **Experimental designs** are used to establish a cause–effect relationship between an independent variable and a dependent variable. An independent variable is the variable of interest that is presumed to have an effect on the dependent variable, which is the outcome of the study. Researchers conduct experimental studies in two steps:

1. Randomly assign participants to one of two groups: an experimental group and a control group
2. Manipulate the independent variable (a treatment or intervention) with the experimental group but not the control group

Suppose researchers want to determine whether using computers in elementary classrooms (independent variable) affects the academic achievement of students (dependent variable). They might give an academic achievement test to students and then randomly assign some to a computer classroom (experimental group) and others to a no-computer classroom (control group). The experimental group would use computers in the classroom over a specified period of time, while the control group would not. At the end of the study, researchers would give the same academic achievement test to each student. If the experimental group showed greater improvement over time than the control group, researchers could make a claim about a cause–effect relationship: that the independent variable (the use of computers in the classroom) affected the dependent variable (academic achievement).

In situations in which researchers cannot randomly assign individuals to groups or manipulate an independent variable, they use **quasi-experimental designs** to *infer* a cause–effect relationship. Obviously, researchers cannot randomly assign children to divorced and nondivorced families, abusive and nonabusive homes, male and female genders, or high and low socioeconomic groups. In other cases, researchers' actions may be limited by school district rules or by time or expense, making the manipulation of experimental and control groups impossible. As a result, quasi-experimental designs cannot establish that an independent variable directly affects a dependent variable; therefore, they leave open the possibility that the outcome of the study may be due to other variables the researcher could not control. Say, for example, that researchers study an existing group of students in a computer classroom and compare their achievement to that of students enrolled in a no-computer classroom. Changes in the academic achievement of students in the computer classroom (dependent variable) may not depend *solely* on the presence of computers (independent variable) but may also be affected by variables beyond the researchers' control: the computer classroom having more high-level readers, fewer behaviorally challenging children,

or a teacher with more teaching experience than the teacher in the no-computer classroom. Researchers employ safeguards to account for and control all other possible variables that might affect the experimental and control groups, but their presence and the lack of random group assignment are limiting factors.

Despite these shortcomings, quasi-experimental research does allow researchers to examine questions involving differences between groups or differences over time. Two examples are cross-sectional studies and longitudinal designs, described here:

1. *Cross-sectional studies* examine two or more groups to compare behaviors. Researchers might examine whether middle school students have more or fewer hours of homework than high school students.
2. *Longitudinal designs* examine the same group of people repeatedly over time to provide information about how behaviors change or how earlier events can be connected to later events. A longitudinal study might follow children over time to determine whether children whose parents divorce in elementary school have more academic difficulties in adolescence than children whose parents did not divorce.

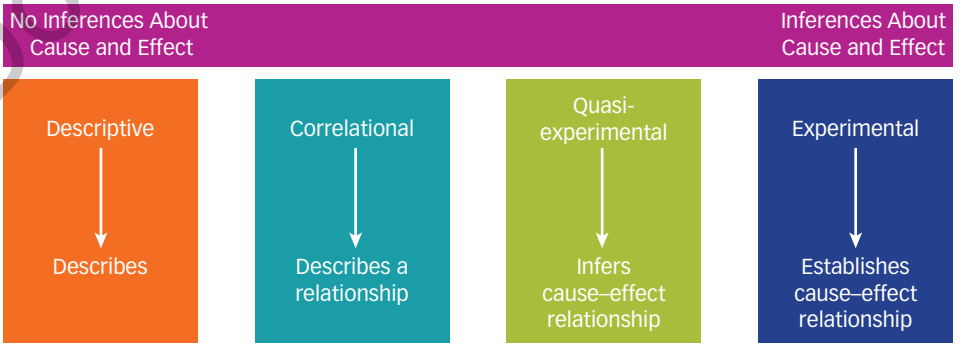
To use science effectively in decision-making, teachers need to be informed consumers of research. When you encounter scientific evidence presented in the media, in journals, or at workshops, you should be aware of the various inferences that can be made with each research design, as shown in Figure 1.1. Experimental studies are the only type that can answer questions about cause–effect relationships. However, correlational and quasi-experimental designs are more common in educational research because they are more practical than experimental designs for investigating many hypotheses regarding teaching and learning. They also provide more information than descriptive designs. Nevertheless, you must be cautious when interpreting correlational and quasi-experimental designs. You should always question whether other variables not identified in the studies might account for the findings.

Samples

Once the research design is determined, researchers must identify the population of interest and select a sample. Suppose researchers want to study how students of different ages respond to the stress of transferring to a new school. Because the researchers cannot observe or survey all transferring students—the population of interest—they rely on a **sample**, a smaller set of

▼ FIGURE 1.1

A Continuum of Research Design. This design dictates what inferences we can make from educational research studies.



Research Measures. Observations allow researchers to view the behaviors of teachers and students during instruction, such as whether boys or girls are called on more frequently by teachers. © iStockphoto.com/monkeybusinessimages

individuals from the population of interest. The sample needs to be representative, meaning that it has gender, ethnicity, and age characteristics similar to the population of interest. The best method for ensuring a representative sample is to use a **random sample**, meaning every person in the population of interest has an equal chance of being included. Many computer programs can take a large list of individuals (for example, all students registered in a school district) and create a random subset of individuals to be included in a study.

Even when a random sample of individuals within the population is selected, not all the people selected will agree to participate in the research study. (How many website surveys have you declined?) This is called **volunteer bias,** the tendency of those who choose to participate in research studies to differ in some way from those who do not participate. Typically, individuals who have strong feelings or opinions, or who are invested in the outcome of a particular research study, are more likely to participate than are those who do not have a vested interest. For example, a college student might be more willing to participate in surveys and interviews regarding opinions on the effectiveness of the university's financial aid office and less likely to participate in research on the effectiveness of the university president.

Measures

Once researchers have chosen a research design and representative sample, they must decide on a method for taking measurements, which will provide a framework for gathering information. If researchers are investigating the amount of time students spend during school hours completing assignments, they must decide whether to ask students verbally, have them complete a paper-and-pencil survey, or observe them within the school setting. Some measures commonly used in educational research are these:

- **Observations**, or watching or viewing the behavior of individuals, might be used to examine how many times a teacher calls on a girl versus a boy in relation to the number of students from each gender who raise their hands.
- **Interviews**, or questions presented to participants, can be highly structured lists of simple questions (*How many hours do you spend on homework each night?*) or can include open-ended questions (*How do you study for a test?*). Even though open-ended questions allow more information to be gathered, they often result in less consistency across participants. Participants might talk about the number of hours spent studying, the use of a study guide, or strategies they use for reading, note-taking, memorizing, and testing themselves.
- **Tests and surveys** typically are paper-and-pencil measures that include a number of questions. Test and survey research can be done very easily with large groups of individuals in a relatively short amount of time. One requirement for participation in survey research is the ability to read and write. This might exclude younger children and individuals with language barriers.

When you examine research findings, consider the measurement strategy the researchers chose. Each measurement approach has limitations. In interviews, the researcher must speak the same language as the participant. On a test or survey, the participant must be able to read and write in the same language. Observation research is less valid for measurements of internal states of mind such as self-confidence or sadness.

Consider the following research scenarios and see if you can classify them according to research design.

1. There are two sections of a class. Both sections are taught by the same instructor, cover the same content, and have the same number of students. In one class, the teacher uses a $150 textbook, and in the other class, the teacher uses no textbook. The final exam scores are compared to determine which practice is a better option.
2. An educational psychologist examines how students' levels of motivation toward studying compare with their IQ scores.
3. In an effort to decrease obesity and increase movement among students, a superintendent has all the gym teachers in a district record the average number of hours in a week spent doing cardio work in gym class.
4. A researcher goes to an urban school and a rural school to observe differences. After much study, the researcher writes a report comparing and contrasting the two schools.

Educational Psychology: Classroom Practices

3 Define best practices and explain why it is important for teachers to base them on scientific evidence.

4 Describe four diversity characteristics that can define an individual's group membership and explain why teachers need to understand differences between groups.

In addition to understanding educational research, teachers must be able to translate practical findings of specific research studies into school settings—diverse school settings. To do this, every teacher needs a systematic process for developing his or her personal educational philosophies.

Best Practices

Effective teachers develop **best practices** for instruction, classroom management, and assessment. Best practices are evidence-based strategies determined by science to help inform decisions. They are not a list of specific strategies that one should and should not use. For example, many states are relying on a new set of academic standards, Common Core. However, the Common Core standards do not inform teachers *how* to teach and *what* material to teach. Instead, educators must develop a set of skills needed to determine best practices for having students reach these standards. Education programs training our next generation of teachers use the standards set forth by the Interstate Teacher Assessment and Support Consortium (InTASC) to evaluate skills and competencies of preservice teachers. Table 1.2 shows the standards set forth by InTASC.

Note that best practices today may not be the same best practices in 5, 10, or 20 years from now. Best practices are fluid, changing with new research findings. We don't use the same teaching strategies, or best practices, from 50 years ago. It's likely we won't be using the best practices of today 50 years from now. The fluid nature of best practices means that teachers

▼ TABLE 1.2

InTASC Core Teaching Standards 2011

The standards have been grouped into four general categories to help users organize their thinking about them.
The Learner and Learning
Standard #1: Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.
Standard #2: Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.
Standard #3: Learning Environments. The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.
Content
Standard #4: Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.
Standard #5: Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem-solving related to authentic local and global issues.
Instructional Practice
Standard #6: Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision-making.
Standard #7: Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.
Standard #8: Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections and to build skills to apply knowledge in meaningful ways.
Professional Responsibility
Standard #9: Professional Learning and Ethical Practice. The teacher engages in ongoing professional learning and uses evidence to continually evaluate his or her practice, particularly the effects of his or her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.
Standard #10: Leadership and Collaboration. The teacher seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

Source: Council of Chief State School Officers. (2011, April). *Interstate Teacher Assessment and Support Consortium (InTASC) Model Core Teaching Standards: A Resource for State Dialogue*. Washington, DC: Author. Retrieved from http://www.ccsso.org/Documents/2011/InTASC_Model_Core_Teaching_Standards_2011.pdf

must continue to seek out evidence-based information, or current research, to assist them in making sound decisions regarding classroom management, instruction, and assessment.

Addressing Diversity

Determining effective classroom practices is made more complex by the increasingly diverse nature of the student body in U.S. schools. Aspects of diversity will shape your teaching and

Best Practices. Teachers need to examine current resources and up-to-date scientific evidence in making decisions about instructional methods and techniques, rather than relying on techniques used decades ago.

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Klaus Vedfelt/Taxi/Getty Images

the choices you make about the methods, techniques, and strategies you employ in the classroom. Because diversity can be found in all educational interactions, we discuss issues of diversity within specific educational contexts. To provide a basic understanding of diversity, some of the most important guidelines and concepts related to diversity and effective classroom practices are summarized in this section.

Effective teachers are aware of the diversity they are likely to encounter in the classroom. Individuals and environments can exhibit a wealth of diverse characteristics. To begin to understand individual and group differences, researchers often ask participants of studies to report their ethnicity or race, sex or gender, socioeconomic status, and disabilities. By grouping people based on these characteristics, researchers can divide any population into subsets for analysis. For example, in the 2010 U.S. Census, respondents were asked to report their race by choosing among the following categories:

- White
- Black or African American
- American Indian or Alaska Native
- Asian (with specific check box responses for Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, or Other Pacific Islander)
- Some other race (Individuals of "multiracial, mixed, interracial, or a Hispanic, Latino, or Spanish group" could respond in a write-in space under this category. Also, people of two or more races could fill in multiple race response check boxes and provide additional responses.)

A group may be considered a **minority group** if it has less power than the majority group, even if the group is not smaller in number. For example, more women than men live in the United States, but women are considered a minority group due to their relative lack of power in business (lower paying jobs), politics (fewer political positions), and religion

(in some religions, women still are not allowed to hold leadership positions). Let's examine group membership further:

- The terms *ethnicity* and *race* are often used interchangeably to express cultural differences, but they actually have different meanings (Spencer, 2014). Although each term has a definition that is so complex entire courses are taught to differentiate the two, our purpose here is to provide a basic distinction. **Ethnic group** includes people who share a similar culture—an environment with a unique history, traditions, rules, attitudes, and perhaps a specific language. In contrast, **racial group** categorizes people who share common biological traits (such as hair texture and skin color). The biological traits that distinguish races are socially defined. In other words, there is nothing particularly important about hair texture or skin color. Our society could have chosen, or defined as important, other biological traits (eye color, height, and so on). Certain traits were most likely chosen to establish social standing among groups (Markus, 2017; Moya & Markus, 2010). Most often, a person's ethnicity and racial group overlap. However, because ethnicity is based on environment and race is based on biology, they can diverge. For example, how would researchers categorize the race and ethnicity of an Asian-born child who is adopted and raised by a middle-class White family living in the rural Midwestern United States? Classrooms today are rich with such complexity.

- Like ethnicity and race, the terms *sex* and *gender* are often used interchangeably but differ technically. **Sex** refers to the biological status of male (penis) or female (vagina), whereas **gender** is a socially constructed definition or internal view of one's self. Traditionally, gender was binary, including only two categories (boy or girl). More recently, gender has been viewed as nonbinary, meaning a person may not identify as only boy or girl, but may identify as both or somewhere on a spectrum. Similar to race and ethnicity, sex and gender may overlap such that an individual who is born biologically as a male and who also identifies as male is labeled *cisgender*. Individuals who are born a particular sex and have a different gender identity are labeled *transgender*.

- Sexual orientation is another concept that has been used to denote diversity. The term **sexual orientation** refers to the romantic and sexual attraction one has to others with the same gender (homosexuality), the opposite gender (heterosexuality), both genders (bisexuality), or neither gender (asexual). Though typically referred to by these categories, one's sexual orientation may actually be more fluid.

- Many people believe that **socioeconomic status** (SES) is based solely on income, with families who have higher incomes being considered high-SES and families with low incomes considered low-SES. A more accurate definition of SES relies on the educational level and occupation of family members rather than on their level of income. Although in most circumstances educational attainment and occupation are highly related to income (more education and/or more prestigious occupations lead to higher incomes), in many circumstances less-educated individuals have higher incomes than those who are highly educated. An example would be an electrician or plumber who only attended trade school for a few months, but whose income is actually modest.

- **Disability** refers to being limited in one's ability to perform some behavior, task, or skill. The term can refer to physical disabilities (hearing impairment, cerebral palsy), cognitive disabilities (intellectual disabilities, learning disabilities, language delays), or behavioral or emotional disabilities (ADHD, anxiety). We consider disability to be a diversity characteristic because a student's disability will result in different learning needs and perhaps different levels of achievement in comparison with students who have no disabilities.

Effective teachers attempt to understand the possible causes of differences among groups. Teachers who understand why differences exist can learn to be sensitive to the individual needs of students from various backgrounds. Typically, environmental differences, not biological or genetic differences, are the root of group differences. Consider SES as an example. Students from high-SES homes tend to score higher on achievement tests, receive higher grades, and stay in school longer than students in lower SES homes (Dawson-McClure et al., 2015; Harwell, Maeda, Bishop, & Xie, 2017). These outcomes can be traced to several environmental differences (Goodman & Burton, 2012; National Center for Education Statistics, 2015):

Culturally responsive pedagogy: See Module 18

- Poorer nutrition and more exposure to pollution in lower SES homes
- Less exposure to school readiness materials such as books and computers in lower SES homes due to lack of financial resources or lack of knowledge about the importance of reading to children at a young age
- Less parental involvement in lower SES homes, which may be due to work schedules or less education
- Fewer well-qualified teachers and higher turnover rates among teachers in lower SES schools and preschools

Intelligence and SES: See Module 20

One might think these factors are most influential in early childhood, but the SES achievement gap for math actually widens around age 12, typically during the transition to middle school (Caro, McDonald, & Willms, 2009; Crawford, Macmillan, & Vignoles, 2017).

Social and political events have highlighted the connection between SES and academic achievement in underserved areas such as urban and rural communities. For example, in 2003 the University of Chicago Urban Education Institute began a two-year master's program for Urban Teacher Education. Similarly, the City University of New York (CUNY) Graduate Center has developed a doctoral program in Urban Education. Both programs focus on training individuals to work in urban educational systems and conducting research to determine the best classroom practices in these areas.

Achievement and SES. Achievement differences stemming from socioeconomic status may be due to differences in access to resources such as books and computers.

In a similar fashion, many universities have centers that are focused on rural education within their states. Washington State University has a Rural Education Center that focuses on exchanging information among rural schools and providing a voice in policy development. Likewise, Kansas State University established the Center for Rural Education and Small Schools, which focuses on improving education in those areas. Finally, the National Research Center on Rural Education Support (NRCRES) housed at the University of Nebraska–Lincoln was established in 2004 with funding from the U.S. Department of Education. The research center examines issues related to retaining qualified teachers, increasing opportunities for advanced courses, and decreasing student dropout rates in rural schools. Knowledge of current research can help inform teachers' best practices. For example, teachers may take extra time with students who lack readiness skills, allow students to borrow books from the

classroom for use at home, or find creative ways to involve parents in their children's education, particularly during the transition to middle school.

Effective teachers address and embrace diversity. Their teaching is not guided by assumptions about individuals from diverse groups. **Prejudice feelings** are rigid and irrational generalizations about a group or category of people. Prejudice feelings appear to emerge very early in life and peak at about 5 to 7 years of age, with more than half of 6-year-old White children and 85% of 5-year-old White children showing signs of pro-White, anti-Black biases (Gonzalez, Steele, & Baron, 2017; Katz, 2003; Raabe & Beelmann, 2011). Almost all individuals have some prejudice feelings toward one or more groups, even though they may not be aware of those feelings. Teachers themselves may believe that lower achieving students need to focus on basic skills. They may assume that students from lower socioeconomic backgrounds are lower achievers, that girls are not as capable in math as boys, that Asian American students are naturally smarter than members of other ethnic groups, and that gifted students are socially immature. Prejudice feelings tend to become more intense over time due to confirmation bias and belief perseverance. **Confirmation bias** is the tendency for people to seek evidence that confirms what they already believe to be true, rather than searching for facts that might refute their beliefs (Gregg, Mahadevan, & Sedikides, 2017; Nickerson, 1998). **Belief perseverance** is the tendency to continue or persevere in our beliefs even when presented with contradictory evidence (MacLean & Dror, 2016; Savion, 2009). For example, if a woman believes that green-eyed people are exceptionally intelligent, she will notice or pay attention to all instances in which a green-eyed person says something intelligent (confirmation bias). Likewise, she will ignore or assume it was just a fluke when a green-eyed person says something silly or unintelligent (belief perseverance).

Prejudice feelings can affect the way a teacher makes decisions about instruction, grouping, motivation, and assessment. Treating individuals differently based on prejudice feelings or biased beliefs about a particular group is **discrimination**. Research has found that 6- to 7-year-old White children discriminated against Black children when distributing coins, even in the presence of an adult. Slightly older White children, 9 to 10 years of age, also discriminated against Black children in the same task, but only when the adult was out of the room (Monteiro, de Franca, & Rodrigues, 2009). Children are not the only ones who might discriminate.

Teachers and educators must identify their own feelings of prejudice and educate themselves on the scientific evidence regarding diversity issues. However, even scientific evidence that points to group differences should be interpreted with caution due to individual differences within each group. For example, Figure 1.2 shows that average math scores are higher for boys than girls, but the amount of overlap in scores is great.

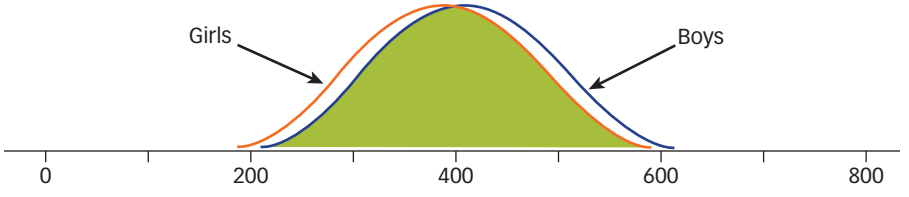
Consider your own experiences and group membership. Have you ever treated someone differently because of the person's race, socioeconomic status, gender, or disability? If you have experienced prejudice feelings—or been on the receiving end of prejudice feelings—how and why have those beliefs persevered?

Using a Case Study Approach

Did you read the opening case study on page 2? You may have skipped it, thinking, *Why do I need to read this? How will reading this before I read the content help me?* Case studies allow

▼ FIGURE 1.2

More Similarities Than Differences. Comparing boys' and girls' math performance historically has found mean differences, but the overlap of scores between these two groups is great, emphasizing the enormous variability within groups.



preservice teachers to develop decision-making skills by considering how to apply scientific evidence to specific classroom practices. In each unit, there are four cases: (1) early childhood, (2) elementary school, (3) middle school, and (4) high school. Your instructor may ask you to read one or more of the case studies, depending on which certification level you are pursuing. Reading one or more case studies before reading a module will provide you with a realistic classroom situation to consider as you learn about the theories, research, and their application as presented in the module. To get the most out of the case study approach, pay close attention to the different categories of questions we have provided. These prompts will help you uncover important elements, make connections between science and practice, and build problem-solving skills.

Prepare. The Prepare questions that precede each case study will help you identify the relevant pieces of information within the case study:

- *Who?* Pay attention to characteristics of teachers, students, and parents and the relationships among them. These characteristics may include gender, ethnicity, disabilities, or the SES of students, parents, the teacher, or the school district.
- *What?* Attempt to identify the main problem described in the case study. Is it a behavioral problem, a learning problem, an instructional problem, or a classroom management problem? Each case may address more than one problem.
- *Where?* Consider where the events take place. Is it in a traditional classroom, a chemistry lab, an art room, the gym, the hallway, or the principal's office? Try to envision that context and identify any characteristics that might contribute to the problem or to its solution.
- *When?* Identify time-relevant information. Does the story unfold in the morning or the late afternoon; at the beginning, middle, or end of the school year; before or after a holiday? Start thinking about how time might be related to the main problem.

Assess. At the end of each case study, you will find three or four Assess questions to help you evaluate your initial understanding and interpretation of the case. Because you will not yet have read the modules in the unit, you will not have the science and application to aid your thinking. Here, we will be asking you to use prior knowledge to make predictions or draw preliminary conclusions. These questions may focus on asking the following:

- *How* you might respond to the situation
- *What* characteristics of the individuals involved contributed to the situation
- *Why* solutions described did not work well

Reflect and Evaluate. At the end of each module, a series of Reflect and Evaluate questions will ask you to use the information presented in the module to formulate a more educated, scientific-based response to each case study:

- *How?* Rather than relying on your own opinions and experience, use the science and application discussed in the module to address the situation described in the case.
- *What?* Identify examples of key concepts in the modules.
- *Why?* Move beyond the facts of the case and focus on the characteristics and motivations of individuals. What aspects of the case study were most important, or why did one solution succeed when another failed?
- *What if . . . ?* Consider how the problem and solution presented in the case study would change if some aspect of the case were changed, such as the gender or ethnicity of students or teachers in the case study.

The Reflect and Evaluate questions will help you gauge your level of comprehension of important concepts. They will also encourage you to apply what you have learned in realistic contexts, letting you practice the same type of informed decision-making experienced teachers do.

SUMMARY

1. **Explain why educational psychology is an important resource for teachers.** Educational psychology links the science of psychology to educational practice and provides teachers with evidence-based knowledge to support their day-to-day decision-making in the classroom. Teachers' choices of techniques and strategies should rely not on commonsense approaches but on scientific research.
2. **Describe three elements of research studies that help determine which studies are worthy of consideration.** First, the sample selection process for conducting research studies should attempt to use randomized samples and minimize volunteer bias. Second, measures should be selected based on how well the measure answers the research question. Third, the findings of research studies should be interpreted accurately given the limitations of the research design used, such as whether cause and effect can be established.
3. **Define best practices and explain why it is important for teachers to base them on scientific evidence.** Best practices are evidence-based strategies determined by science to help inform decision. Because best practices of appropriate teaching methods have changed throughout history and will continue to change in the future, teachers should become lifelong learners by using current scientific information to make decisions about best practices.
4. **Describe five diversity characteristics that can define an individual's group membership, and explain why teachers need to understand differences between groups.** (1) Ethnic groups share a common culture or environment, while race denotes a group of people who share common biological traits. (2) An individual's sex refers to his or her biology, whereas gender refers to the social definitions or internal view of one's self. (3) Sexual orientation refers to the romantic and sexual attraction one has to others. (4) Socioeconomic status (SES) is defined by the educational level and occupational status of family members. (5) Disabilities also can be a characteristic of diversity because individuals differ in physical, cognitive, and emotional capabilities. Teachers need to understand that group differences typically result from environmental differences and to be aware of their own prejudice feelings, which may easily be reinforced by attending to information that confirms their beliefs and by ignoring information that contradicts their beliefs or prejudice feelings.

KEY CONCEPTS

belief perseverance, 16
best practices, 11
confirmation bias, 16
correlational designs, 7
descriptive designs, 7
disability, 14
discrimination, 16
educational psychology, 5
ethnic group, 14
experimental designs, 8
gender, 14
interviews, 10

minority group, 13
observations, 10
prejudice feelings, 16
quasi-experimental designs, 8
racial group, 14
random sample, 10
research design, 6
sample, 9
sex, 14
sexual orientation, 14
socioeconomic status (SES), 14
tests and surveys, 10
theories, 6
variables, 6
volunteer bias, 10

CASE STUDY: REFLECT AND EVALUATE

Middle School: Achievement Gap

These questions refer to the case study on page 2.

1. Why are the resources available in school districts important for understanding differences among teachers and students?
2. Why is knowledge that the sample was college students important for interpreting the results of the study?
3. Why is the survey measure used in the study problematic? What might be an alternative measure?
4. What type of research design was used in the study? What type of information can be interpreted from this type of research design?
5. Based on the information presented in the module about prejudice feelings, why would some people have a difficult time believing that African American students and White students can achieve at equal levels?
6. If the study had been done with K–12 students in various school districts assessing their GPA from official records over several years, how would this alter the way the results might be interpreted?