PART I

# INTRODUCTION

## BRIEF OVERVIEW OF PART I: INTRODUCTION (CHAPTERS 1–3)

In Part I we provide an overview of science and educational research, give you a bird's-eye view (big picture) of the three major approaches to research, and explain how to make (action) research part of your life.

## CHAPTER 1. INTRODUCTION TO EDUCATIONAL RESEARCH

Here you will learn what educational research is and what science is and how they go together to produce trustworthy knowledge. We also introduce you to the idea of critical thinking. An emphasis on critical thinking about research will continue in all remaining chapters so that you can be a good consumer and producer of educational research when the need arises.

## CHAPTER 2. QUANTITATIVE, QUALITATIVE, AND MIXED METHODS RESEARCH

Here we provide a general overview of the major approaches to educational research (or the three big "research paradigms"): quantitative, qualitative, and mixed methods research. This chapter is important because it introduces terminology and provides you with the "big picture" that we elaborate on in the remaining chapters in the book. It is important that you remember the big picture because you don't want to get lost in the details of the later chapters. In other words, as you read this book, try to be aware of both the forest (the big picture) and the trees in the forest (the details). One last point: We explain the idea of a correlation coefficient in Chapter 2, but you will need to remember this "specific" idea in later chapters when we talk about correlations among variables.

## CHAPTER 3. ACTION RESEARCH FOR LIFELONG LEARNING

Here we explain how you can build "research thinking" into your everyday life. We specifically introduce you to action research, which is an applied form of research and is something *you* can do, for example, every day at your workplace as you try to grow and become a better professional over time. Action research is a way of life, where you continually explore and experiment with new ways to find solutions to the problems that you face. At the end of all the remaining chapters in this book, we include a section on "action research reflection" to help you think about how the chapter materials might apply to you as a lifelong learner.

# 1 INTRODUCTION TO EDUCATIONAL RESEARCH

## LEARNING OBJECTIVES

After reading this chapter, you should be able to

**1.1** Explain the importance of educational research.

**1.2** List at least five areas of educational research.

**1.3** Explain the difference between basic and applied research and describe evaluation research, action research, and orientational research.

**1.4** Discuss the sources of knowledge.

**1.5** Explain the scientific approach to knowledge generation, including the dynamics of science, basic assumptions in science, scientific methods, theory, principle of evidence, and differences between science and pseudoscience.

**1.6** Define the six major objectives of educational research with an example and describe the dispositions of a good researcher.

## Research in Real Life: Research Aids Decision Making

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It is 6:45 a.m., and 16-year-old Ethan is still in bed. School starts at 7:30, and his dad makes the trek upstairs to wake him for the third time this week. Ethan is tired, and it is a struggle to wake him. The experience with Ethan is not unlike one that many other parents have

with their adolescent children. What lies behind this phenomenon? Is it more common in one group of adolescents or another? What are the implications of going to school tired and sleep deprived? Research has something to say about this problem. Some researchers have found that adolescents' biological clocks are set differently than those of other age groups. Wolfson and Carskadon (2003) found that adolescents' bodies wanted them to go to sleep later and wake up later than their required school start time allowed. This kind of finding suggests that sleep deprivation might be negatively influencing adolescents' school success. These researchers suggested that later school start times might ameliorate these negative impacts.

Kirby et al. (2011) reviewed the impact of later start times and found relatively strong evidence that later start times had positive impacts on academic success, physical health, and mental health. The researchers claimed that this was sufficient evidence to suggest that it would be worthwhile to start school later for adolescents. These research findings and recommendations were published several years ago, but the US Centers for Disease Control and Prevention (2022) recently reported that 93% of high schools still started before 8:30 a.m. in 2014. Not all of the research has been supportive of a change in school start times. For example, Dunietz et al. (2017) conducted a survey of parents and found that they were split about whether changing the start time was a good idea. However, because of the better student outcomes resulting from later start times, research in this area has led several state legislatures to introduce laws to change school start times.

The evidence of improved outcomes from research informed policymakers that this change would make a net positive difference for students. Policymakers benefit when they examine the findings of educational research studies that compare the outcomes resulting from implementing different ideas and approaches. This can help eliminate personal bias and vested interests in particular approaches by providing evidence of what really works best. In short, research provides an effective and evidentiary way to sort out and resolve differing ideas and opinions on educational issues. Perhaps our most important goal in writing this book is to convince you that it is important and helpful to add the examination and conduct of research to your list of ingredients to use when you make decisions about education.

Welcome to the world of educational research! The word **research** refers to systematic investigation using appropriate methodologies to provide justified answers (that can be trusted) to questions about our world. "Educational research" focuses on education issues, problems, and opportunities for new knowledge, advancements, and continual improvement. Research has been conducted in virtually every area in the field of education. In fact, the research techniques described in this book are used all over the world to help people in many fields advance their knowledge and solve problems. The search for better and better answers to important questions will probably always continue. In this book, we discuss the way in which research is conducted in an attempt to provide answers to important questions. We hope you will enjoy learning about research, and we hope it opens up new ways of thinking for you.

As you read this book, you will learn how to think about research, how to evaluate the quality of published research reports, and how to conduct research on your own. In a sense, you will also be learning a new *language*, the language of researchers, because researchers use a specialized language or jargon. But remember, don't be afraid of new words. The words used in this book have definitions that represent ideas you can understand, and you have been learning new

words and ideas all of your life. On the lighter side, perhaps you can use some of the new words to impress your friends. In sum, we welcome you to the world of research and hope that you will enjoy it. Because this is likely to be a required course for you, we begin by discussing a few reasons for taking a course on educational research methods.

## WHY STUDY EDUCATIONAL RESEARCH?

You might have asked, "Why do I have to take a class on educational research?" First of all, research can be more interesting than you might think, and we hope that in time you will find the material and the ways of thinking not only interesting but also beneficial. Second, throughout this book, you will be learning critical thinking skills. Rather than assuming that what is written in a book or what someone says is "fact" or undeniable "truth," you can use the techniques that you will learn for evaluating arguments. In all cases, the question is one of evidence. As a start, we suggest that you take the word *proof* and eliminate it from your vocabulary this semester or quarter when you talk about research results. Proof exists in the realms of mathematics and deductive logic, but in science and research, the best we can do is to provide evidence. Sometimes the evidence is very strong and convincing; at other times, it will not be. You must use your critical thinking skills to judge the available evidence on any given topic. These critical thinking skills will be helpful to you as long as you live.

Another important reason to study research is to help you better understand discussions of research you hear and see in the media, such as on television and radio, on the Internet, or at professional meetings. Examples of research in our society abound. For example, when you watch a television program, what comes between those short segments of actual programming? Commercials! Do you ever wonder about those "research studies" that claim to "prove" that one laundry detergent is better than another? As you know, the purpose of commercials is to influence what you buy. Advertisers spend millions of dollars each year on marketing research to understand your thinking and behavior. If you watch a sporting event, you will likely see commercials for beer, cars, trucks, food, and tennis shoes. If you watch soap operas in the afternoon, you are likely to see very different commercials. The reason for this variation is that advertisers generally know who is watching what programs at which times. The commercials are developed to appeal to viewers' ways of thinking about what is fun, exciting, and important. And did you know that every major presidential candidate has a research consultant who tries to identify the most effective ways to get your vote and win the election? The point is that other people study you all the time and, in this book, you will learn about the techniques they use. Understanding these techniques should help you be more aware of their efforts.

You will learn here that not all research is created equal. That is, some research studies are more defensible than others. You will learn how to ask the right questions about research studies, and you will find out when to put confidence in a set of research findings. You will learn to ask questions such as these: Was the study an experiment, or was it nonexperimental? Were control groups included in the design? Did the researcher randomly assign participants to the different comparison groups? How did the researchers control for the influence of extraneous variables? How were the participants in the research selected? Did the researcher use techniques that help reduce the effects of human bias?

One day you might need to examine the research on a topic and make an informed judgment about what course of action to take or to recommend to someone else. Therefore, it is important that you understand how to review and evaluate research. Understanding research terminology, the characteristics of the different types of research, and how research can be designed to provide

solid evidence will allow you to evaluate research results critically and make informed decisions based on research literatures. A **research literature** is the set of published research studies on a particular topic. A fundamental point to remember is that you should always place more confidence in a research finding when several different researchers in different places and settings have found the same result. You should never treat a single research study as the final word on any topic.

On a practical level, understanding research techniques might even help you in your career as a student and as a professional teacher, counselor, or coach. Perhaps one day you will be asked to write a proposal to obtain a grant or conduct a research study on your own. If you study the contents of this book, you will learn how to design and conduct a defensible study, and you will learn about the different sections in a research grant proposal. You will learn how to construct a questionnaire and how to write a proposal. Furthermore, if you look at the bibliographies in the books you use in your other education courses, you will see that many of these references are research studies. After learning about research, you will be able to go back and evaluate the research studies on which your textbooks are based. In other words, you will not have to accept something as true just because someone said it was true. You might find that an article with what you believe to be a questionable finding is based on highly questionable research strategies.

## REVIEW QUESTION

***1.1*** Why should we study educational research?

## AREAS AND EXAMPLES OF EDUCATIONAL RESEARCH

To give you a feel for educational research, let's look at some of the areas of research in education. In Table 1.1 you will find a list of the major divisions and the special interest areas in the American Educational Research Association (AERA). (The AERA website is http://aera.net.) AERA is the largest and most prestigious research association in the field of education, and it has approximately 25,000 members. It is composed of university professors from all areas of education; governmental employees; teachers; and professionals from educational think tanks, consulting firms, and testing companies. Each year, approximately 11,000 of these members and many nonmembers attend a national conference sponsored by AERA, where many attendees present the results of their latest research.

**TABLE 1.1 ■ Divisions and Special Interest Groups in the American Educational Research Association, 2014***

| Major Divisions in AERA | |
|---|---|
| Division A: Administration, Organization, & Leadership | Division E: Counseling & Human Development |
| Division B: Curriculum Studies | Division F: History & Historiography |
| Division C: Learning & Instruction | Division G: Social Context of Education |
| Division D: Measurement & Research Methodologies | Division H: Research, Evaluation, & Assessment in Schools |
| [Division D now includes four separate "sections": (a) Measurement, Psychometrics, and Assessment, (b) Statistical Theory and Quantitative Methodologies, (c) Qualitative Methodologies, and (d) Multiple and Mixed Methodologies.] | Division I: Education in the Professions |
| | Division J: Postsecondary Education |
| | Division K: Teaching & Teacher Education |
| | Division L: Educational Policy & Politics |

| Special Interest Groups in AERA (Called SIGs) | |
|---|---|
| Accreditation, Assessment, and Program Evaluation in Education Preparation | Middle-Level Education Research |
| Action Research | Mixed Methods Research |
| Adolescence and Youth Development | Montessori Education |
| Adult Literacy and Adult Education | Moral Development and Education |
| Advanced Studies of National Databases | Motivation in Education |
| Advanced Technologies for Learning | Multicultural/Multiethnic Education: Theory, Research, and Practice |
| Arts and Inquiry in the Visual and Performing Arts in Education | Multilevel Modeling |
| Arts and Learning | Multiple Linear Regression: The General Linear Model |
| Arts-Based Educational Research | Music Education |
| Bilingual Education Research | NAEP Studies |
| Biographical and Documentary Research | Narrative Research |
| Bourdieu in Educational Research | Online Teaching and Learning |
| Brain, Neurosciences, and Education | Organizational Theory |
| Career and Technical Education | Out-of-School Time |
| Caribbean and African Studies in Education | Paulo Freire |
| Catholic Education | Philanthropy and Education |
| Charters and School Choice | Philosophical Studies in Education |
| Classroom Assessment | Politics of Education |
| Classroom Management | Portfolios and Reflection in Teaching and Teacher Education |
| Classroom Observation | Problem-Based and Project-Based Learning |
| Cognition and Assessment | Qualitative Research |
| Complexity Theories in Education | Queer Studies |
| Computer and Internet Applications in Education | Rasch Measurement |
| Confucianism, Taoism, Buddhism, and Education | Religion and Education |
| Constructivist Theory, Research, and Practice | Research Focus on Black Education |
| Cooperative Learning: Theory, Research, and Practice | Research Focus on Education and Sport |
| Critical Educators for Social Justice | Research in Mathematics Education |
| Critical Examination of Race, Ethnicity, Class, and Gender in Education | Research in Reading and Literacy |
| Critical Issues in Curriculum and Cultural Studies | Research on Evaluation |
| Critical Peace Education | Research on Giftedness, Creativity, and Talent |
| Critical Perspectives on Early Childhood Education | Research on Learning and Instruction in Physical Education |
| Critical Posthuman and Postfoundational Studies in Education | Research on Teacher Induction |
| Critical Quantitative Methodologies | Research on the Education of Asian and Pacific Americans |
| Cultural Historical Research | Research on the Superintendency |
| Data-Driven Decision Making in Education | Research on Women and Education |
| Deaf and Hard of Hearing Intersectionalities and Perspectives | Research Use |
| Decolonial, Postcolonial, and Anti-Colonial Studies in Education | Rural Education |
| Democratic Citizenship in Education | School Community, Climate, and Culture |
| Design and Technology | School Effectiveness and School Improvement |
| Dewey Studies | School Turnaround and Reform |
| Disability Studies in Education | School/University/Community Collaborative Research |
| Districts in Research and Reform | School-University Partnership Research |
| Early Education and Child Development | Science Teaching and Learning |
| Educational Change | |
| Educational Statisticians | |
| Elliot Eisner | |
| Environmental Education | |
| Experiential Education and Community Engagement: Scholarship and Practice | |
| Faculty Teaching, Evaluation, and Development | |
| Family, School, Community Partnerships | |
| Fiscal Issues, Policy, and Education Finance | |
| Graduate and Postdoctoral Education across the Disciplines | |
| Grassroots Community and Youth Organizing for Educational Justice | |

(*Continued*)

**TABLE 1.1 ■ Divisions and Special Interest Groups in the American Educational Research Association, 2014* (*Continued*)**

| | |
|---|---|
| Hip Hop Theories, Praxis, and Pedagogies | Second Language Research |
| Holistic Education | Self-Study of Teacher Education Practices |
| Improvement Science in Education | Semiotics in Education: Signs, Meanings, and Multimodality |
| Inclusion and Accessibility in Educational Assessment | Social and Emotional Learning |
| Indigenous Peoples of the Americas | Social Studies Research |
| Indigenous Peoples of the Pacific | Sociology of Education |
| Informal Learning Environments Research | Socio-Political Issues in Mathematics and Science Education |
| Innovative School Transformation and Reform | Special and Inclusive Education Research |
| Instructional Technology | Spirituality and Education |
| International Studies | Stress, Coping, and Resilience |
| Language and Social Processes | Structural Equation Modeling |
| Large Scale Assessment | Studying and Self-Regulated Learning |
| Latina/o/x Research Issues | Supervision and Instructional Leadership |
| Law and Education | Survey Research in Education |
| Leadership for School Improvement | Systematic Review and Meta-Analysis |
| Leadership for Social Justice | Systems Thinking in Education |
| Learning and Teaching in Educational Leadership | Talent Development of Students Placed at Risk |
| Learning Environments | Teacher as Researcher |
| Learning Sciences | Teacher's Work/Teachers Unions |
| Lesson Study | Teaching and Learning Research Methods |
| Literature | Teaching Educational Psychology |
| Lives of Teachers | Teaching History |
| Longitudinal Studies | Technology as an Agent of Change in Teaching and Learning |
| Marxian Analysis of Society, Schools, and Education | Technology, Instruction, Cognition, and Learning |
| Measurement and Assessment in Higher Education | Test Validity Research and Evaluation |
| Media, Culture, and Learning | Tracking and Detracking |
| Mentorship and Mentoring Practices | Urban Learning, Teaching, and Research |
| | Vocabulary |
| | Workplace Learning |
| | Writing and Literacies |

*For more information about any of these divisions or special interest groups, go to the AERA website at http://aera.net.

You can see in Table 1.1 that education is a broad field that includes many research areas. Do you see any areas of research in Table 1.1 that seem especially interesting? If you are writing a research paper, you might pick one of these as your starting point. The areas of research listed in Table 1.1 are still fairly general, however. To see the specific areas and topics of current interest to educational researchers, go to the library and browse through the education journals.

## Examples of Educational Research

The majority of journal articles in education include an abstract on the front page of the article. An **abstract** is a brief summary of what is included in the article. We have reproduced the abstracts of several research articles here so that you can get a feel for what is done in an actual research study. Abstracts are helpful because they are short and include the main ideas of the study. You can often decide whether you want to read a journal article by first reading its abstract. We recommend that you read some full-length research articles as soon as possible to see some full examples of educational research.

For the moment, just examine the following three abstracts and see if you can determine (a) the purpose of the study, (b) how the researchers studied the phenomenon, and (c) what the major results were.

**I.** "Teacher–Student Relationships and Students' Engagement in High School: Does the Number of Negative and Positive Relationships With Teachers Matter?" by Andrew J. Martin and Rebecca J. Collie (University of New South Wales), 2019, from *Journal of Educational Psychology, 111*(5), pp. 861–876. https://doi.org/10.1037/edu0000317

Teacher–student relationships are an important part of students' interpersonal context at school that impacts their academic development. This study extended prior research into teacher–student relationships by exploring the relative balance of negative and positive teacher–student relationships in high school students' academic lives (in each of English, mathematics, science, history, and geography subjects). Also examined was the role of this relational balance in predicting students' school engagement (operationalized by academic participation, enjoyment, and aspirations). The study involved a longitudinal sample of 2,079 students from 18 high schools. Findings identified a significant linear (main) effect, with an increase in the number of positive relationships (relative to negative relationships) with teachers predicting greater school engagement. This was accompanied by a significant curvilinear effect. Specifically, (a) when the relational balance became predominantly negative, students' engagement was lower, but did not decline with an increasing number of negative teacher–student relationships, and (b) when the relational balance became predominantly positive, students' engagement was higher and became increasingly more so as the number of positive teacher–student relationships outnumbered the negative. We conclude that the enhancing properties of positive teacher–student relationships seem to outweigh the limiting (or narrowing) properties of negative teacher–student relationships. Further, there is cumulative engagement yield through increasing the number of positive teacher–student relationships across students' school subjects.

**II.** "Preservice Teachers' Knowledge and Attitudes Toward Bullying: A Systematic Review" by Molly Dawes, Colleen Gariton, Angela Starrett, Greysi Irdam, and Mathew J. Irvin (University of South Carolina), 2023, from *Review of Educational Research, 93*(2), pp. 195–235. https://doi.org/ 10.3102/00346543221094081

Preservice teachers will one day be responsible for addressing bullying among their students but their readiness to fulfill this critical role is unknown. This article addressed this line of inquiry by conducting a systematic review assessing preservice teachers' knowledge, attitudes, sense of responsibility, and confidence to deal with bullying. A total of 42 studies met our inclusion criteria and were included in our review. Results suggest that few preservice teachers understand the hallmarks of bullying. In terms of their attitudes toward bullying, most preservice teachers report they are concerned about bullying, but some still believe it to be a normal part of growing up. Preservice teachers tended to view different forms of bullying as more serious than others, with many considering physical bullying to be the most serious form. Most preservice teachers report feeling responsible for dealing with bullying, yet many do not feel confident in their ability to do so. Implications for future research on preservice teachers, teacher preparation programs, and future efforts to reduce bullying in schools are discussed.

**III.** "Becoming a Bridge: Collaborative Autoethnography of Four Female Counseling Psychology Student Leaders," by Candice Hargons (University of Kentucky), Melanie Lantz (Louisiana Tech University), Laura Reid Marks (University of Memphis), and Emily Voelkel (Houston VA Medical Center), 2017, from *The Counseling Psychologist, 45*(7), pp. 1017–1047. https://doi.org/10.1177/0011000017729886

Women with multiply-marginalized identities remain underrepresented in the American Psychological Association and Society of Counseling Psychology leadership. As early entrants into the leadership pipeline, female student leaders can potentially shift that trend; however, we know little about their leadership emergence processes. In this study, we employed collaborative autoethnography to analyze the positional standpoints of four diverse female counseling psychology leaders. We identified themes in their leadership narratives, which began when they were students. The results focused on factors associated with participants' leadership emergence processes, the role of marginalized identities in participants' leadership emergence, and the interplay between counseling psychology values and leadership through the theoretical framework of bridge leadership. We found themes of (a) Leadership Attributes, including future orientation, determination, and connection, as well as (b) Opportunities and Mentorship. Other themes included counseling psychology values of Advocacy, Social Justice, Inclusion, Multiculturalism, and Enhancing Training. Recommendations for students and trainers are highlighted.

## GENERAL KINDS OF RESEARCH

In this section we introduce you to some of the general kinds of research conducted by educational researchers (see Table 1.2). Although these general research types can overlap at times, they have different purposes and are intended for different audiences.

**TABLE 1.2 ■ Summary of General Kinds of Research**

| Kind of Research | Key Characteristics |
|---|---|
| Basic research | Focuses on generating fundamental knowledge. |
| Applied research | Focuses on real-world questions and applications. |
| Evaluation research | Focuses on determining the worth, merit, or quality of intervention programs. |
| Action research | Focuses on solving local problems that practitioners face. |
| Orientational research | Focuses on reducing inequality and giving voice to the disadvantaged. |

### Basic and Applied Research

Research studies can be placed along a continuum with the words *basic research* at one end and the words *applied research* at the other end. The middle area of the continuum represents research that has some characteristics of both basic and applied research. Basic research and applied research are typically conducted by researchers at universities. Basic research and applied research are also conducted by researchers working for think tanks, corporations, government agencies, and foundations. The primary outlet for basic and applied research is academic and professional research journals.

**Basic research** is aimed at generating fundamental knowledge and theoretical understanding about basic human and other natural processes. An example of basic research is a study examining the effect of priming in memory. Priming is "an enhancement of the processing of a stimulus as a function of prior exposure" (Anderson, 1995, p. 459). Assume that a researcher asks you to name a fruit and you say, "Pineapple." Then on the second trial, the researcher either asks you to name another type of fruit or asks you to name a type of dog. Which response do you think you could provide more quickly? It turns out that research participants could name another type of fruit faster than they could name a type of dog when they were asked to name a type of fruit first (see example in Anderson, 1995). The naming of the fruit on the first trial primed the research participants' mental processing to name another fruit. It is believed that priming operates because the first exposure activates the complex of neurons in long-term memory, where the concept is being stored. Priming research (Goodrich & Lonigan, 2018) has extended our understanding of how bilingual children process language. Basic research is usually conducted by using the most rigorous research methods (e.g., experimental) under tightly controlled laboratory conditions. The primary audience includes the other researchers in the research area. The key purpose of basic research is to develop a solid foundation of reliable and fundamental knowledge and theory on which future research can be built.

At the other end of the continuum is applied research. **Applied research** focuses on answering real-world, practical questions to provide relatively immediate solutions. Topics for applied research are often driven by current problems in education and by policymakers' concerns. Applied research is often conducted in more natural settings (i.e., more realistic or real-world settings) than basic research. An applied research study might focus on the effects of retaining low-performing elementary school students in their present grade level or on the relative effectiveness of two approaches to counseling (e.g., behavior therapy versus cognitive therapy). In the former, the results would potentially have practical implications for education policy; in the latter, the results would potentially have implications for practicing counselors. The primary audiences for applied research are other applied researchers (who read the results in educational research journals) as well as policymakers, directors, and managers of programs who also read research journals. Applied research often leads to the development of interventions and programs aimed at improving societal conditions, which leads us to the next type of research.

## Evaluation Research

When interventions and social or educational programs aimed at improving various conditions are implemented, evaluation research is often carried out to determine how well the programs work in real-world settings and to show how they might be improved. Evaluation research, or, more simply, **evaluation**, specifically involves determining the worth, merit, or quality of an evaluation object, such as an educational program. Evaluation requires evaluators to make value judgments about evaluation objects (e.g., Program XYZ is a good program, and it should be continued; Program ABC is a bad program, and it should be discontinued). An evaluation object (also called the *evaluand*) is the thing being evaluated: a program, a person, or a product (Guba & Lincoln, 1981; Scriven, 1967; Fitzpatrick et al., 2022). An educational program might be an afterschool program for students with behavioral problems or a new curriculum at school. A person might be your new school district superintendent. A product might be a new textbook or a new piece of equipment that a school is considering purchasing.

**See Journal Article 1.1 on the Student Study Site.**

Evaluation traditionally is subdivided into two types according to the purpose of the evaluation. When the primary purpose of an evaluation is to lead to judgments about how a program

can be improved, it is called a **formative evaluation**. Formative evaluation information helps program developers and support staff design, implement, and improve their program so that it works well. When the primary purpose of an evaluation is to lead to judgments about whether a program is effective and whether it should be continued, it is called a **summative evaluation**. Summative evaluation information is important for policymakers and others who commission programs when they make funding decisions and when they have to make choices about which competing programs will be supported and which will be eliminated.

It is currently popular to divide evaluation into five areas or types (e.g., Rossi et al., 2004), each of which is based on a fundamental evaluation question:

1. Needs assessment: Is there a need for this type of program?
2. Theory assessment: Is this program conceptualized in a way that it should work?
3. Implementation assessment: Was this program implemented properly and according to the program plan?
4. Impact assessment: Did this program have an impact on its intended targets?
5. Efficiency assessment: Is this program cost-effective?

The first question, about *needs assessment*, tells us that each program must fulfill some important problem or need for particular kinds of people. The second question, about *theory assessment*, tells us that a program must be based on good social, behavioral, or educational science theory (if we are to expect it to be successful). The third question, about *implementation assessment*, tells us to continually collect process data and implementation data to make sure the program is being conducted properly. Note that if a program is found "not to work," this could be due to either **theory failure** (the program is based on a poor theory) or **implementation failure** (the program is not being implemented correctly). The fourth question, about *impact assessment*, tells us that we need to determine if a program causes or produces the intended outcomes; this issue of causation is best answered through the use of experimental research methods (discussed in Chapters 12 and 13). The fifth question, about *efficiency assessment*, tells us that evidence of impact alone is not enough to fully evaluate a program; we also need to determine if the benefits outweigh the costs and, comparatively speaking, whether there is another program with a higher benefit-to-cost ratio.

As you can see, evaluation can provide important information to educators. On the basis of the evidence collected and the recommendations made, program evaluators provide an important voice in decision making about educational and other social programs.

## Action Research

In Chapter 3, we devote an entire chapter to action research. Therefore, for the moment, we just want to get the basic idea and a definition into your thinking. **Action research** is a type of applied research that focuses on solving specific problems that local practitioners face in their schools and communities (Lewin, 1946; Stringer & Aragón, 2020). It views your classroom or other work environment as the place to conduct research. Action research is based on the idea that having a "researcher attitude" is helpful in dealing with your complex and changing environments. This attitude involves continuously identifying new problems that you want to work on and trying new strategies and actions to see what improves your situation. Many practitioners find action research helpful because it helps them to integrate theory and research with practice.

We hope all of our readers of this book will take the attitude of the "action researcher" as they go about their professional careers (i.e., think about how research can help you improve your practices and conduct research sometimes to empirically test your ideas).

### Orientational Research

The last general type of research, called **orientational research**, focuses on collecting information to help researchers advance a specific ideological or political position or orientation that they believe will improve some part of our society (e.g., Sandoval, 2000; L. T. Smith, 2021). Orientational research also focuses on "giving voice" and increased power to the disadvantaged in society. Orientational researchers are concerned about such issues as social discrimination and the inequitable distribution of power and wealth in society. Although all orientational researchers are concerned with *reducing* inequality of some form, there are several variants of orientational research. The most common areas of focus are class stratification (i.e., income and wealth inequality), sex and gender inequality, racial and ethnic inequality, sexual orientation inequality, and international inequality (i.e., rich and poor nations).

All researchers are ideological to some degree (e.g., in their selection of their research topics, in the recommendations they make), but orientational researchers make their ideology and political agendas very explicit. Orientational research is sometimes called *critical theory research* (Anyon, 2009). This is appropriate because these researchers often are critical of "mainstream research," which they argue supports the current power structure in society. If orientational research sounds interesting, you will find a wealth of information on the web (using search terms such as *critical theory, ethnic studies, feminism, postcolonialism*, and *queer theory*).

**See Journal Article 1.2 on the Student Study Site.**

## REVIEW QUESTIONS

***1.2*** What are the definitions of the five general kinds of research?
***1.3*** Why is it important that both basic and applied research be done?
***1.4*** What is the difference between formative and summative evaluation?
***1.5*** What is the key question associated with each of the following forms of evaluation: needs assessment, theory assessment, implementation assessment, impact assessment, and efficiency assessment?

## PRIMARY SOURCES OF KNOWLEDGE

Take a moment now to consider how you have learned about the world around you. Try to identify the source or sources of one of your particular beliefs (e.g., parents, friends, books, tradition, culture, thinking, experiences). For example, consider your political party identification (i.e., Democrat, Republican, independent, or something else). Political scientists have shown that college students' party identification can often be predicted by their parents' party identification. How does your party identification compare with that of your parents? Obviously, many additional influences affect party identification. Can you identify some of them?

In this section, we examine the primary ways in which people relate to the world and how they generate knowledge. The study of knowledge—including its nature, how it is gained or generated, how it is warranted, and the standards that are used to judge its adequacy—is known

as **epistemology**. Epistemology sometimes is called the *theory of knowledge*. We group the sources of knowledge into the primary areas discussed in the field of epistemology.

## Experience

**Empiricism** is the idea that all knowledge comes from experience. We learn by observing, and when we observe, we rely on our sensory perception. Each day of our lives, we look, feel, hear, smell, and taste so that we can understand our surroundings. According to the philosophical doctrine of empiricism, what we observe with our senses is said to be *true.* John Locke (1632–1704), a proponent of this idea, said that our mind at birth is a *tabula rasa*, a blank slate ready to be written on by our environment. Throughout our lives, our slate is filled up with knowledge based on our experiences. The statement "I know the car is blue because I saw it" is an example of an **empirical statement**: a statement based on observation, experiment, or experience. *Empirical* is a fancy word meaning "based on observation, experiment, or experience." The word *empirical* denotes that a statement is capable of being verified or disproved by observation, experiment, or experience. In the next paragraph, we try to trace some of the sources of experiences you might have had during your lifetime.

Throughout our lives, we participate in and learn about the world around us. We interact with people and generate our personal knowledge. In the beginning, we are born at a certain time, in a certain place, into a specific family that uses a specific language. When we are young, our family is the most important source of our knowledge, our attitudes, and our values. As we grow older, other people and social institutions around us—including our peers, our religion, our schools (and libraries), our economy, our government, and the various media we are exposed to or seek out—influence us more and more. We learn the customs, beliefs, and traditions of the people around us. As we learn "how things are," we construct our personal knowledge and viewpoints about our worlds. Over time, many of our actions and beliefs become automatic and unquestioned.

## Reasoning

**Rationalism** is the philosophical idea that reason is the primary source of knowledge. One famous rationalist philosopher was René Descartes (1596–1650). Reason involves thinking about something and developing an understanding of it through reasoning. In its strong form, rationalism means that many truths are knowable independent of observation. In its weaker form, rationalism simply refers to our use of reason in developing understandings about the world. Deductive reasoning and inductive reasoning are the two major kinds of reasoning.

**Deductive reasoning** is the process of drawing a conclusion that is necessarily true if the premises are true. One form of deductive reasoning is the syllogism. Here is an example:

> Major Premise: All schoolteachers are mortal.
>
> Minor Premise: John is a schoolteacher.
>
> Conclusion: Therefore, John is mortal.

According to this deductive argument, John *necessarily* is a mortal. Keep in mind, however, that reasoning like this depends on the validity of the premises. Just try replacing the word *mortal* with the word *Martian*; you then conclude that John is a Martian. Deductive reasoning is useful as we reason about things in our world, but we must always make sure that our premises are true,

and we must use valid argument forms. We need to be careful about what we assume when we draw our conclusions.

**Inductive reasoning** is the form of reasoning in which the premises "provide good reasons, but not conclusive reasons to accept the conclusion" (Salmon, 2007, p. 79). We engage in inductive reasoning frequently in our everyday lives when we observe many specific instances of some phenomenon and draw conclusions about it. For example, you have certainly observed all of your life that the sun appears every morning (except on cloudy days). On the basis of your observations, you probably feel comfortable concluding that the sun will make its appearance again tomorrow (if it is not cloudy). In this case, you are indeed likely to be correct. But notice that, when you use inductive reasoning, you are using a **probabilistic** form of reasoning. That is, you are stating what is likely to occur, not what will necessarily occur. Because of this, you are taking a risk (albeit a very small risk in this case) because induction involves making conclusions that go beyond the evidence in the premises (e.g., going from some to more, from the examined to the unexamined, from the observed to the unobserved). This is not necessarily a problem, but you should be aware that it could be one if you expect certainty in your conclusions.

The famous philosopher David Hume (1711–1776) pointed out what is called the **problem of induction**: Although something might have happened many times in the past, it is still possible that it will not happen in the future. In short, *the future might not resemble the past.* Let's say that every cat you have ever seen had a tail. Using inductive reasoning, you might be led to conclude that all cats have tails. You can see the problem here: One day you might run across a Manx cat, which has no tail. The point is that inductive reasoning is useful in helping us come up with useful conclusions, predictions, and generalizations about the world; however, we must remember that we have not *proven* these to be true. Induction only provides statements of probability.

## REVIEW QUESTIONS

***1.6*** What are the different sources of knowledge? Which ones are especially important for educational research?

***1.7*** What is the key difference between inductive reasoning and deductive reasoning?

## THE SCIENTIFIC APPROACH TO KNOWLEDGE GENERATION

Although the word *science* has become a hot-button or loaded word in some circles, the root of the word is the Latin *scientia*, which simply means "knowledge." We define *science* in this book in a way that is inclusive of the different approaches to educational research. We define it as an approach to the generation of knowledge that holds empirical data in high regard and follows certain norms and practices that developed over time because of their usefulness. Many of these norms and effective practices are explained in this book.

**Science** includes any systematic or carefully done actions that are carried out to answer research questions or meet other needs of a developing research domain (e.g., describing things, exploring, experimenting, explaining, predicting). Science often involves the application of a scientific method; however, as philosophers and historians of science have pointed out, science includes many methods and activities that are carried out by researchers as they attempt to generate scientific knowledge. Science does not accept at face value taken-for-granted knowledge

(i.e., things that we assume to be true); instead, it uncovers and justifies descriptions and explanations of people, groups, and the world around us. In this book, we generally treat the term *science* (as just defined) and the term *research* as synonyms.

## Dynamics of Science

Over time, science results in an accumulation of specific findings, theories, and other knowledge. In this sense, science is said to be progressive. When researchers conduct new research studies, they try to build on and extend current research theories and results. Sir Isaac Newton expressed it well when he said, "We stand on the shoulders of giants." Newton's point was that researchers do not and cannot start completely from scratch, and Newton knew that he was no exception to this rule. In short, researchers usually build on past findings and understandings.

At the same time, science is dynamic and open to new ideas and theories that show promise. Different researchers approach research differently, and they often describe, explain, and interpret things in different though often complementary ways. New ideas emerge. As new ideas are generated and evidence is obtained, results are presented at conferences and are published in monographs, books, and journals so that other members of the research community can examine them. Before findings are published in journals, the studies are usually evaluated by a group of experts, called referees, to make sure there are no major flaws and that the procedures are defensible. Researchers are usually required to report exactly how they conducted their research so that other researchers can evaluate the procedures or even replicate the study. Once published, research findings are openly discussed and are critically evaluated by members of the research community. Overall, we can say that science is a never-ending process that includes rational thinking, reliance on empirical observation, constant peer evaluation and critique, and—very importantly—active creativity and attempts at discovery.

## Basic Assumptions of Science

Educational researchers must make a few general assumptions so that they can go about their daily business of doing research. Most practicing researchers do not think much about these philosophical assumptions as they carry out their daily research activities; nonetheless, it is helpful to examine some of them. The most common assumptions are summarized in Table 1.3.

**TABLE 1.3 Summary of Common Assumptions Made by Educational Researchers**

1. There is a world that can be studied. This can include studying the inner worlds of individuals.
2. Some of the world is unique, some of it is regular or patterned or predictable, and some of it is dynamic and complex.
3. The unique, the regular, and the complex in the world all can be examined and studied by researchers.
4. Researchers should try to follow certain agreed-on norms and practices.
5. It is possible to distinguish between more and less plausible claims and between good and poor research.
6. Science cannot provide answers to all questions.

First, at the most basic level, educational researchers assume that there is a world that can be studied. In education, this includes studying many phenomena that are internal to people (e.g., attitudes, values, beliefs, lived experiences), as well as many broader phenomena or institutions

that are either connected to people or external to them (e.g., schools, cultures, and physical environments). Educational researchers study how the following factors relate to educational issues: **psychological factors** (e.g., characteristics of individuals and individual-level phenomena), **social psychological factors** (e.g., examining how individuals interact and relate to one another and how groups and individuals affect one another), and **sociological factors** (e.g., examining how groups form and change; documenting the characteristics of groups; studying intergroup relations; and studying group-level phenomena, such as cultural, social, political, familial, and economic institutions).

Second, researchers assume that part of the world is unique, part of the world is regular or patterned or predictable, and much of the world is dynamic (i.e., changing) and complex (e.g., involving many pieces or factors). One important task of educational research is to document the stories and experiences of particular people and groups. Another important task is to identify the predictable part of the world in order to generate findings that will apply to more than one person, group, kind of person, context, or situation. As you can imagine, conducting research would be very difficult if we had to do so on every single individual! To see an example of regularity in the world, the next time you go to your research class, note the seats that you and a few people around you are sitting in. When your class meets again, see whether you and the others you observed sit in the same seats as during the previous meeting. You will probably notice that many of the people sit in the same seats. Why is this? This happens because humans are to some degree predictable. Understanding the predictable part of the world allows researchers to generalize and apply their findings beyond the people and places used in their particular studies.

Third, the unique, the regular, and the complex in the world can be examined and studied by researchers. In other words, "discoverability" exists in our world (i.e., it is possible to document the unique, discover the regularity in human behavior, and, in time, better understand many of the complexities of human behavior). This does not mean that the task of discovering the nature of educational phenomena is simple. For example, although significant progress has been made, we still do not know all of the causes of many learning disabilities. Research must continue, and over time, we hope to find more and more pieces to the puzzles we are trying to solve. One day we hope we will be able to solve many educational problems.

The fourth assumption is that researchers should follow certain agreed-on norms and practices. A few of these are the selection of educational and social problems in need of attention, collection of empirical data, open discussion of findings, integrity, honesty, competence, systematic inquiry, empathic neutrality and respect toward research participants, a healthy skepticism toward results and explanations, a sense of curiosity and openness to discovery, the active search for negative evidence (e.g., instances that do not fit your emerging or current explanation of a phenomenon), the careful examination of alternative explanations for your findings, and an adherence to the principle of evidence. One of this book's authors (Johnson) likes to tell his students that a researcher is a lot like the slogan on Missouri's license plates: "The Show Me State." If you have a claim to make, then "show me the evidence, please!" A good researcher tries to collect and assemble high-quality evidence and expects other researchers to do the same. Obviously, it is all but impossible for a researcher to follow fully all of the ideals listed here. Furthermore, because science is a human activity, it is also affected by social and power relationships among researchers and society (Kuhn, 1962, 2012; Lincoln & Guba, 2000). That's why it is so important that researchers strive to follow the norms we have listed.

The fifth assumption is that it is possible to distinguish between more and less plausible claims and between good and poor research. For example, through empirical research, we can choose between competing theories by determining which theory best fits the data. We can also judge the quality of a research study by examining the research strategies used and the evidence

that is provided for each of the conclusions drawn by a researcher. We say that high-quality research is more trustworthy or more valid than low-quality research. We will explain throughout this textbook how to identify and carry out research that is trustworthy, valid, credible, and, therefore, defensible.

The sixth assumption made by researchers is that science cannot provide answers to all questions. For example, science cannot answer philosophical questions such as what the meaning of life is, what virtue is, or what beauty is. Science cannot settle issues of which position is morally correct (e.g., human cloning versus no human cloning; pro-choice versus pro-life in the abortion debate) or politically correct (e.g., Republican or Democrat) and cannot explain ideas such as the difference between good and evil in the world. Ultimately, science cannot directly answer moral and metaphysical questions because these questions go beyond empirical data. However, science usually can provide very important facts, scientific information, and critical reasoning processes to help individuals and policymakers who must consider and make judgments about moral issues.

## Scientific Methods

Science is not a perfectly orderly process (Kuhn, 1962, 2012). It is a dynamic process that includes countless activities. However, several of the key features of science are (1) making empirical observations, (2) generating and testing **hypotheses** (predictions or educated guesses), (3) generating or constructing and testing or justifying **theories** (explanations or explanatory systems), and (4) attempting to predict and influence the world to make it a better place to live (American Association for the Advancement of Science, 1990). Although the conduct of research is clearly not a perfectly orderly process and is composed of many activities, it still is helpful to start with some commonly used *scientific methods*.

We distinguish two major scientific methods here: the exploratory method and the confirmatory method. (Several additional methods are listed in Research Exercise 3 at the end of this chapter.) Although both of these methods use empirical data, their purpose is different. The basic **exploratory method** includes three steps. First, the researcher starts by making observations. Second, the researcher studies the observations and searches for patterns (i.e., a statement of what is occurring). Third, the researcher makes a tentative conclusion or a generalization about the pattern or how some aspect of the world operates. The basic **confirmatory method** also includes three steps. First, the researcher states a hypothesis, which is frequently based on existing theory (i.e., currently available scientific explanations). Second, the researcher collects data to be used to test the hypothesis empirically. Third, the researcher decides tentatively to accept or reject the hypothesis on the basis of the data.

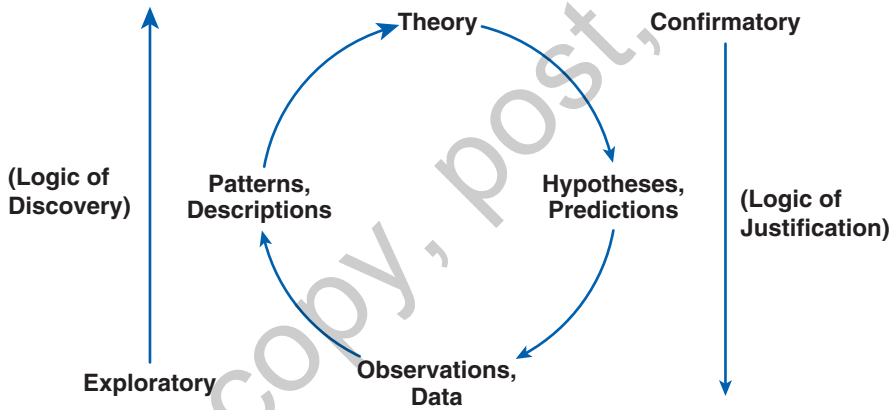
The exploratory method can be thought of as a *bottom-up approach* because it emphasizes starting with particular data and observations and discovering what is occurring more generally (i.e., movement from data to patterns to theory). This exploratory method is sometimes called the *inductive method* because it moves from the "particular to the general." On the other hand, the confirmatory method can be thought of as a *top-down approach* because it emphasizes the process of starting with a general theory and testing it with particular data (i.e., movement from theory to hypothesis to data). This confirmatory method is sometimes called the *deductive method* because it moves from the "general to the particular."

The exploratory method is the theory-*generation* approach: It follows a "logic of discovery" that says to look at your world and try to generate ideas and construct theories about how it operates. The confirmatory method is the traditional theory-*testing* approach: It follows a "logic of justification" that says always to test your theories and hypotheses with new data to see if they

are justified. New knowledge is generated using the exploratory or inductive method, and this tentative knowledge is tested or justified using the confirmatory or deductive method. The bottom line is this: The exploratory scientific method focuses on theory discovery, generation, and construction, and the confirmatory scientific method focuses on theory testing or justification.

Although we have talked about two separate scientific methods (the exploratory method and the confirmatory method), it is important to understand that researchers use both of these methods in practice. As you can see in Figure 1.1, the use of the methods follows a cyclical process. One researcher might focus on the theory-testing process, and another researcher might focus on theory generation, but both researchers will usually go through the full cycle many, many times as they think about and carry out their research programs over time. In fact, **quantitative researchers** (i.e., educational researchers who like "hard" quantitative data, such as standardized test results, and focus on hypothesis testing) and **qualitative researchers** (i.e., educational researchers who like to explore educational issues using qualitative data, such as open-ended interviews that provide data based on the participants' perspectives and their actual words) both go through the full research cycle, but they emphasize different parts. Quantitative researchers emphasize movement from theory to hypotheses to data to conclusions (i.e., the "logic of justification"), and qualitative researchers emphasize movement directly from observations and data to descriptions and patterns and, *sometimes*, to theory generation (i.e., the "logic of discovery").

**FIGURE 1.1 ■ The Research Wheel**




## Theory

The exploratory and confirmatory methods both involve the concept of theory (i.e., explanation). The term *theory* as used in this book most simply refers to an explanation or an explanatory system that discusses *how* a phenomenon operates and *why* it operates as it does. Theory often refers to a generalization or set of generalizations that are used systematically to explain some phenomenon. In other words, a well-developed theory explains how something operates in general (i.e., for many people), and it enables one to move beyond the findings of any single research study. Using a well-developed theory, you should be able to explain a phenomenon, make sense of it, and make useful predictions. When you need to judge the quality of a theory or explanation, you should try to answer the nine questions listed in Table 1.4. We now define and briefly elaborate on the *criterion of falsifiability* and the *rule of parsimony*.

Sir Karl Popper (1902–1994), one of the most famous philosophers of science of the 20th century, contended that the most important criterion used to judge theories is the **criterion of falsifiability**

**TABLE 1.4 ■ How to Evaluate the Quality of a Theory or Explanation**

1. Is the theory or explanation logical and coherent?
2. Is it clear and parsimonious?
3. Does it fit the available data?
4. Does it provide testable claims?
5. Have theory-based predictions been tested and supported?
6. Has it survived numerous attempts by researchers to identify problems with it or to falsify it?
7. Does it work better than competing or rival theories or explanations?
8. Is it general enough to apply to more than one place, situation, or person?
9. Can practitioners use it to control or influence things in the world (e.g., a good theory of teaching helps teachers to influence student learning positively; a good theory of counseling helps counselors to influence their clients' mental health positively)?

(Popper, 1965, 1974, 1934/1985). The criterion of falsifiability is "the property of a statement or theory that it is open to falsifiability" (i.e., capable of being refuted by experience; Blackburn, 2016, p. 174). If someone said, "I don't care what the results of my research study are because I'm going to conclude that my theory is supported, no matter what," then that person would obviously not be doing the kind of research that could ever reject or falsify a theory. There must be two sorts of possible outcomes for empirical research: (a) outcomes that would support the theory (that would "confirm" the theory) and (b) outcomes that would not support the theory (that would "not confirm" the theory and over many tests would be used to reject or falsify the theory). Then you conduct your research to find out which type of outcome occurs. In practice, researchers do not give up on promising theories based on a single negative test, but if a theory fails many times, then the theory will be abandoned. The criterion of falsifiability also says that we should not selectively search for confirming evidence for our beliefs and explanations and then stop with that so-called evidence. Good researchers carefully search for and examine any negative evidence that operates against their beliefs, research conclusions, and theoretical explanations.

Another criterion for evaluating theories is called the **rule of parsimony**. A theory is parsimonious when it is simple, concise, and succinct. If two competing theories explain and predict a phenomenon equally well, then the more parsimonious theory is preferred according to the rule of parsimony. In other words, simple theories are preferred over highly complex ones, other things being equal.

Now let's briefly examine an educational theory to give you an idea of what a relatively well-developed theory looks like. According to *expectation theory*, teachers' expectations about their students affect their behavior toward their students, which in turn affects their students' behavior. The theory is based on the self-fulfilling prophecy (Merton, 1948). Robert Rosenthal and Lenore Jacobson (1968) studied the effects of teachers' expectations and found that students whom teachers expected to perform well had higher increases in IQ than did other students. These authors labeled this the *Pygmalion effect.* Rosenthal also found that "those children in whom intellectual growth was expected were described as having a significantly better chance of becoming successful in the future, as significantly more interesting, curious, and happy" (Rosenthal, 1991, p. 6). Students who had IQ increases but had not been expected to have increases by the teachers were not viewed more favorably by the teachers. These results suggest that teacher expectations can sometimes affect student performance. Note, however, that

additional research has suggested that the power of expectations is not as great as had originally been concluded (Goldenberg, 1992). Nonetheless, the theory of expectations is a useful idea.

There are many theories in education. A few are attribution theory, constructivism, labeling theory, Kohlberg's theory of moral development, operant conditioning, proximal development, rational emotive therapy, site-based management, situated learning, and social learning theory. If you want to find out more about any of these theories, just go to the library (or, using your computer, go to https://eric.ed.gov) and conduct a search using ERIC or one of the other computerized search tools, which are discussed in Chapter 4. You can also find nice descriptions of many educational and psychological theories at http://www.instructionaldesign.org/theories/.

Keep in mind as you read research articles that you will not always find the word *theory* in the article because often a well-developed or *explicit theory* will not be available to the researcher, or the researcher might not have a fancy name for their theory. In this case, you can view the authors' explanations of their findings as the theory. Remember that some theories are highly developed and others are very brief or not well developed. When we use the word *theory* in this book, you might replace it with the word *explanation* until you get used to the idea that *theory* most simply means "explanation."

## The Principle of Evidence

Many beginning students believe that science and research are processes in which researchers constantly prove what is true. You might be surprised to learn that researchers rarely use the word *prove* when discussing their research findings. In fact, as we mentioned earlier, we recommend that you eliminate the word *prove* from your vocabulary when you are talking about research because most researchers hold knowledge to be ultimately tentative (D. C. Phillips & Burbules, 2000; Shadish et al., 2002). They recognize that principles that are believed to be true today might change eventually; some of today's findings will later be found to be partially true or even patently false. What we obtain in research is scientific "evidence." It is essential that you understand this idea. An important educational methodologist, the late Fred Kerlinger (1986), made this point very clearly:

> The interpretation of research data culminates in conditional probabilistic statements of the "If p, then q" kind. We enrich such statements by qualifying them in some such way as: If p, then q, under conditions r, s, and t. *Let us flatly assert that nothing can be "proved" scientifically. All one can do is to bring evidence to bear that such-and-such a proposition is true.* Proof is a deductive matter, and experimental methods of inquiry are not methods of proof [emphasis added]. (p. 145)

Here is the way the American Association for the Advancement of Science (1990) put it:

> Science is a process for producing knowledge. The process depends on making careful observations of phenomena and on inventing theories for making sense out of those observations. Change in knowledge is inevitable because new observations may challenge prevailing theories. No matter how well one theory explains a set of observations, it is possible that another theory may fit just as well or better, or may fit a still wider range of observations. In science, the testing and improving and occasional discarding of theories, whether new or old, go on all the time. (p. 2)

As you learn more about research, keep these points in mind. It is also important to understand that you should never place too much weight on a single research study. **Replication** by other researchers (i.e., research examining the same variables with different people and in different ways) should make you more confident about a research finding because the resulting

evidence is much stronger. The Reproducibility Project by the Open Science Collaboration (2015) in psychology has demonstrated the need for replication. In a systematic, well-organized attempt to replicate 100 studies from 2008, approximately half or more of the new studies failed to replicate the findings of the original study. This reminds us that one study is not proof and that replication is an important part of science. Even in the face of replication, strong evidence rather than proof is all that is obtained because we always leave open the possibility that future researchers will come up with new theories and new conclusions.

Whenever you are tempted to use the word *prove*, please stop and think and remind yourself about the fundamental nature of educational research. For now, whenever you want to use the word *proof*, just use the word *evidence* instead. Sometimes I (Johnson) like to tell my students that proof is what television commercials claim for their products' performance, but in research the best we can do is to obtain strong *evidence.* During a presidential election in the 1990s, a campaign manager kept a slogan posted in the campaign office that read, "It's the economy, stupid!" to keep the staff focused on the economic performance of the current administration as the primary campaign issue. In research our slogan goes like this: "It's about evidence, not proof!" We call this idea the **principle of evidence**.

## Critical/Scientific Reasoning Versus Pseudoscience

This book teaches you about scientific reasoning, which is important in research and in your lifelong learning. We will explain how to critically evaluate empirical research articles (e.g., see Tables 4.2, 4.3, and 4.4 in Chapter 4) and how you can determine appropriate methods of data collection (Chapter 8) and the best research designs for answering different kinds of research questions (Chapters 4 and 12–17). In Chapter 10 we show you the ways to obtain representative samples of research participants. Chapter 11 is especially important because you will learn about the different types of validity required for high-quality quantitative, qualitative, and mixed methods research. In short, from the beginning to the end, this book promotes critical thinking that should help you with lifelong learning.

Please remember the following summary point: Whenever researchers (or you) are conducting (or evaluating) empirical research, they will need to provide sufficient justification for each claim (including the kinds of validity that were achieved) and "delimit" the claims (i.e., indicate where and for whom the claims should apply and where they should not apply). Regarding the last point, it is very rare in social, behavioral, or educational research for a claim to apply "universally" (i.e., applying to every person and every group in all places at all times). Always remember that good research provides evidence (not final proof), and this evidence provides the "justification" or "warrant" for the claim, meaning it can be trusted. *When you hear others make claims about people and the natural world, you should always critically evaluate their claim by examining the evidence for each claim, and then you can judge the claim accordingly.*

The opposite of scientific reasoning and research practice is known as **pseudoscience**, which is any set of beliefs or practices that purport to be scientific but are not. You have probably been confronted with many pseudoscientific claims, for example, in television commercials, from biased politicians, and other claims such as with ESP, levitation, flat earth, fortune-telling, astrology, and various superstitions. Table 1.5 lists some strategies that are popular in pseudoscience—please avoid these strategies! One additional and systematic way that is used in social, behavioral, and educational research to help avoid pseudoscientific claims is through the use of **anonymous peer review**—the majority of works published in high-quality journals have been critically reviewed and revised before they are published. (For a fun list of some "logical fallacies" also to be avoided, do a quick Google search of "The Ten Commandments of Logic." That provides a nice "starter list" of common logical fallacies.)

**TABLE 1.5 ■ Strategies Used in Pseudoscience**

- Appealing to trust/faith rather than empirical/observable evidence.
- Reversal of the burden of proof (someone tells you to prove that their claim is "not" true).
- Using only confirmatory or supportive information when making a claim.
- Ignoring negative evidence.
- Ignoring *plausible* alternatives to a claim.
- Overreliance on testimonials and anecdotal evidence.
- Use of confusing language in the attempt to make a claim sound "scientific."

## REVIEW QUESTIONS

***1.8*** Describe the two forms of the scientific method and explain why both are important.
***1.9*** Explain why researchers do not use the word *proof* when they write up the results of their empirical research in journal articles.
***1.10*** What criteria can you use to determine the quality of a theory or an explanation?
***1.11*** What does the principle of evidence state?
***1.12*** What do you think is required for justified claims about the social/natural world?
***1.13*** What strategies do you think are most commonly used when someone or some group makes pseudoscientific claims?

## SIX MAJOR OBJECTIVES OF EDUCATIONAL RESEARCH

Discussions of science and empirical research often focus on the importance of explanation. However, several additional objectives are also important if the field of educational research is to continue to operate effectively and to progress. The first objective is **exploration**, or attempting to learn about and generate ideas about phenomena. Exploration is especially important in the early phases of research because researchers must generate ideas about phenomena before additional research can progress. To determine whether exploration was the objective of a particular research study, answer the following questions:

1. Were the researchers studying a phenomenon or some aspect of a phenomenon about which little was previously known?
2. Did the researchers choose to ignore previous research or explanations so that they could study a phenomenon without any preconceived notions?
3. Were the researchers trying to "discover" important factors or "generate" new ideas for further research?

If you answer yes to any of these questions, then the researchers were probably operating in the exploratory mode of research.

As is implied in the second and third questions, exploration does not always have to be done in the early phases of research. Sometimes researchers might want to enter the field without fixed or preconceived notions about what they are studying so that they can explore a phenomenon in a new way and so that they can avoid being biased or blinded by previous findings or theories. For example, the interesting, but dated, article titled "Giving Voice to High School Students" (Farrell et al., 1988) was exploratory because the researchers tried to uncover what at-risk students thought was important in their lives, why the students acted in the ways they did, and how the students viewed various formal and informal groups (e.g., teachers). The researchers tried to describe the at-risk adolescents' beliefs and circumstances to explain why they acted as they did. One finding was that some at-risk students formed subcultures that were in conflict with the teachers' culture; that is, the groups differed on such criteria as values, beliefs, and activities that were considered appropriate. These differences made it difficult for the teachers and the students to communicate, which resulted in student apathy and boredom in the classroom.

Exploration sometimes is focused on describing the nature of something that previously was unknown; it also is used when the researcher tries to understand the specifics of some phenomenon or some situation to develop tentative hypotheses or generalizations about it. Exploration is similar to basic descriptive activities in that it often includes description. However, attempts are also frequently made in exploratory research to generate preliminary explanations or theories about how and why a phenomenon operates as it does.

The second objective is **description**, or attempting to describe the characteristics of a phenomenon. To determine whether description was the main objective of a particular research study, answer the following questions:

1. Were the researchers primarily describing a phenomenon?
2. Were the researchers documenting the characteristics of some phenomenon?

Description is one of the most basic activities in research. It might simply involve observing a phenomenon and recording what one sees. For example, a seasoned teacher might observe the behavior of a student teacher and take notes. At other times, description might rely on the use of quantitative measuring instruments such as standardized tests. For example, a researcher might want to measure the intangible construct called intelligence quotient, or IQ. To do this, the researcher must rely on some type of test that has been constructed specifically for this purpose. At other times, description might involve reporting attitudes and opinions about certain issues. For an example, see the September 2018 issue of *Phi Delta Kappan*, which reports national attitudes toward education each year. The study was conducted for the honor society Phi Delta Kappa (2018) by an independent research organization using a national sample designed to represent US adults. One of the questions asked about teachers going on strike for higher pay ("If public school teachers in your community went out on strike for higher pay, would you support them or oppose them?"); 73% of respondents said they would support them compared to 27% who said they would oppose them. Digging a little deeper, these descriptive results varied by region, with 78% of Southerners supporting a strike compared to 67% of Northeasterners, 69% of Midwesterners, and 74% of Westerners. Differences were also seen according to political party affiliation, with 87% of Democrats supporting a strike compared to 57% of Republicans and 71% of independents. As you can see, we can learn more when we break down overall results into subgroups. In case you are interested, here is a link to the survey: http://pdkpoll.org/. The Phi Delta Kappa survey has been conducted every year since 1969, so you can also examine the results for changes over time.

The third major objective is **understanding** or, more specifically, *subjective* understanding or understanding participants' meanings. This is the goal of what is called, in the remainder of this book, *qualitative research*, which is the kind of research that seeks to go into particular places with particular people and learn about their unique world from their perspectives. You might go into people's places as a participant observer or interview them and have them tell you what their culture means to them and what life is like for them as individuals and members of their group. For example, you might interview members of a Hopi Native American group in Arizona, USA, to learn what it's like in their place as a member of their group (e.g., what's important to them, what games they play, their educational practices and learning, their religious practices, their political activities, their family structure[s], their jobs, and their shared cultural values and beliefs). If you conduct qualitative research well, you end up with *understanding*.

The fourth objective is **explanation**, or attempting to show how and why a phenomenon operates as it does. According to many writers, this is the key purpose of science (McCain, 2022). To determine whether explanation was the primary objective of a particular research study, answer the following questions:

1. Were the researchers trying to develop or test a theory about a phenomenon to explain how and why it operates as it does?
2. Were the researchers trying to explain how certain phenomena operate by identifying the factors that produce change in them? More specifically, were the researchers studying cause-and-effect relationships?

If the answer to either of these questions is yes, then the researchers' primary objective is probably explanation. The objective of the majority of educational research is explanation. An example of a research study focusing on explanation is a study titled "Are Effects of Small Classes Cumulative?" by Nye et al. (2001). In that study, the researchers were interested in determining the effect of class size on student performance. They found that smaller classes in Grades 1 through 3 resulted in improved reading and mathematics achievement scores and that the effect continued to occur over time. The study used a strong experimental design that provided relatively solid evidence about cause and effect. In a study like this, the cause (i.e., smaller class sizes) is used to explain the effect (i.e., improved achievement scores).

The fifth objective is **prediction**, or attempting to predict or forecast a phenomenon. To determine whether prediction was the primary objective of a particular research study, answer the following question: Did the researchers conduct the research so that they could predict or forecast some event in the future? A researcher is able to make a prediction when certain information that is known in advance can be used to determine what will happen at a later point in time. Sometimes predictions can also be made from research studies in which the primary focus is on explanation. That is, when researchers determine cause-and-effect operations (explanations), they can use this information to form predictions.

One research study in which the focus was on prediction was conducted by Swanson and Cole (2022). These researchers conducted a 3-year research study and found that university students' academic performance could be predicted by a number of cognitive and noncognitive factors. Interestingly, students' tendency to interact with faculty and to feel valued in their first year of college was related to college GPA in their third year.

The sixth objective is called control or **influence**, or attempting to apply research to make certain outcomes occur. This objective refers to the application of research knowledge rather

than the generation of research knowledge. It refers to the application of previous research to control various aspects of the world. Here you should ask the following questions:

1. Were the researchers applying research knowledge to make something useful happen in the world?
2. Were the researchers checking a "demonstration program" to see if it works in practice?

The ultimate objective of most social, behavioral, and educational research is improvement of the world or social betterment. Therefore, influence is important. For teachers, influence involves things like helping students learn more than they previously knew, helping children with special needs, and preventing negative outcomes such as dropping out of school or disruptive behavior in the classroom. For counselors, influence might involve helping clients overcome psychological problems such as depression, personality disorders, and dysfunctional behaviors.

As you work through this book and learn about the different methods of research, you will be learning more about these objectives. At this point, you should be able to examine a research article and determine what the researcher's objectives were. Don't be surprised if there appears to be more than one objective. That is not at all uncommon. You should also be aware that researchers often use the terms *descriptive research, exploratory research, explanatory research*, and *predictive research.* When they do this, they are simply describing the primary objective of the research.

## Dispositions of a Good Researcher

In this chapter, you have now learned a lot about science and research. Before we finish, let's think about some of the attitudes or "dispositions" of good researchers. Not all researchers will be the same, and they will enjoy different kinds of research, but good researchers generally hold the following characteristics in common:

- Researchers are curious about how people, groups, and the world work.
- Researchers are patient and committed to systematic inquiry because advances often come through hard work over time.
- Researchers let reality and the world "push back," and they document what they learn about the world.
- Researchers are creative and open to change, so that knowledge can continually grow in new ways.
- Researchers always respect their human participants in the research process and follow good ethical guidelines (see Chapter 6).
- Researchers (and students) always write with integrity, avoid any possibility of plagiarism, and give credit to others' previous works and ideas when relevant.

## REVIEW QUESTIONS

***1.14*** What are the six main objectives of science? (Hint: The first letters form the acronym EDUEPI.)
***1.15*** Why is each of the six main objectives of science important?
***1.16*** What are the major dispositions of a good researcher (including your own ideas and additions to what we have provided)?

## OVERVIEW OF THIS BOOK

We have organized your textbook to follow the general steps involved in the research process. In Part I we introduce you to the kinds of educational research and the process and assumptions of research. In Part II we show how to come up with a research idea and how to plan a research study. In Part III we introduce some concepts required to design and conduct a good study. In Part IV we discuss the major methods of research. In Part V we show how to analyze data resulting from a research study. In Part VI we explain how to write a research manuscript.

To master the material fully, you will need to take advantage of some of the application exercises provided in the book and on the companion study site because they will give you some practice applying the material. As you start to review for exams, you can test your overall knowledge of the material by taking the practice quizzes on the companion site and by answering the chapter review questions. You can also print the definitions of the terms given in the chapters. Don't look at the answers in the book or on the study site until you have stated your own answers; then compare and identify your areas of strength and weakness. Use the concept maps on the companion study site to keep what you learn organized in terms of the big picture and its parts.

We also strongly recommend that you read some examples of published research to see full-length examples of how research is done. In empirical research, the researchers collect data, analyze the data, and publish the purpose, methods, and findings in journal articles.

Our practical conclusion for this chapter is clear: Anyone can learn the material in this book if they work hard at it, and that means that *you* can do it! We hope to show you that learning about research can actually be fun. Good luck, and *don't forget to use the many learning tools that are available at the companion site to make your learning experience easier and more productive.*

**See Journal Article 1.3 on the Student Study Site.**

## SUMMARY

It is important that educators and counselors be research literate because of the importance of research in education and our society. By learning about research, you will be able to find published research articles that are relevant for your profession, evaluate those research articles, and propose and conduct research studies on your own if the need ever arises in your career (e.g., perhaps one day your principal or manager will ask you to conduct a survey or to write a grant proposal). Educational researchers generate evidence about educational phenomena by collecting empirical data and using the exploratory and confirmatory scientific methods. We also explained that six general objectives of research are to explore, to describe, to understand, to explain, to predict, and to influence or control things in our world. When reading research articles, you should determine the primary objective researchers had when they conducted their research studies. In the next chapter, we will finish our introduction to educational research by describing the key features of the three major research paradigms: quantitative research, qualitative research, and mixed methods research.

## KEY TERMS

*The following terms are listed according to order of appearance within the chapter.*

Research
Research literature
Abstract
Basic research

Applied research
Evaluation
Formative evaluation
Summative evaluation
Theory failure
Implementation failure
Action research
Orientational research
Epistemology
Empiricism
Empirical statement
Rationalism
Deductive reasoning
Inductive reasoning
Probabilistic
Problem of induction
Science
Psychological factors
Social psychological factors
Sociological factors
Hypothesis
Theory
Exploratory method
Confirmatory method
Quantitative researcher
Qualitative researcher
Criterion of falsifiability
Rule of parsimony
Replication
Principle of evidence
Pseudoscience
Anonymous peer review
Exploration
Description
Understanding
Explanation
Prediction
Influence

## DISCUSSION QUESTIONS

1. Which of the following do you think is the most important kind of research: basic, applied, evaluation, action, or critical theory research? Why?
2. Why is it asserted in this chapter that one does not obtain necessary or final *proof* in educational research?
3. How does the presentation of exploratory and confirmatory scientific methods fit with your prior understanding of the methods of scientific research?
4. Based on a research study's major finding that you have found in the news, another class, or in a journal article, what evidence did the study provide to suggest that it was true?

## RESEARCH EXERCISES

1. Please go to Google and learn about "cognitive biases." Then, summarize these biases and explain how they enter into the research process. What strategies do you suggest for minimizing the problematic effect of cognitive biases in educational research?
2. Search on the web for more information on some of the terms that you found most interesting in the chapter. For example, you might want to search for more material on critical theory, inductive reasoning, program evaluation, or epistemology.
3. In this chapter we distinguished between the exploratory and confirmatory methods of science. As we mentioned, however, researchers use many approaches to gain knowledge. As an exercise, find the needed information on the web and summarize (in a two-page paper) one of these scientific methods: inference to best explanation, Mill's methods,

abductive reasoning, analogical reasoning, deductive-nomothetic model, hypothetico-deductive model, inductive methods, or deductive methods.

4. Take a moment, right now, to examine what is available at the companion study site that goes with this book. Here are some of the many features you will find: lectures, concept maps, answers to the review questions, quizzes, web resources, chapter supplements, and more. If you think of something else that will help you learn the material in this book, please email us (bjohnson@southalabama.edu or Burke.Johnson@gmail.com) and let us know because we are always adding new features to the companion site.

## RELEVANT INTERNET SITES

Action Research Special Interest Group

http://www.aera.net/SIG002/ActionResearchSIG2/tabid/11391/Default.aspx

American Educational Research Association (AERA)

http://www.aera.net

Definitions of Educational Research

http://www.aera.net/About-AERA/What-is-Education-Research;

http://www.aera.net/About-AERA/Key-Programs/Education-Research-Research-Policy/AERA-Offers-Definition-of-Scientifically-Based-Res;

https://www.youtube.com/user/AERANews

American Evaluation Association (program evaluation)

http://www.eval.org

Center for Philosophy of Science

http://www.pitt.edu/~pittcntr/About/links.htm

Evaluation Center at Western Michigan University (evaluation checklists)

https://wmich.edu/evaluation/checklists

## RECOMMENDED READING

Bradbury, H. (2015). *The SAGE handbook of action research*. Sage.

Chilisa, B. (2011). *Indigenous research methods*. Sage.

Davidson, E. J. (2005). *Evaluation methodology basics: The nuts and bolts of sound evaluation*. Sage.

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Leavy, P., & Harris, A. (2019). *Contemporary feminist research from theory to practice*. Guilford Press.

Phillips, D. C., & Burbules, N. C. (2000). *Postpositivism and educational research*. Rowman & Littlefield.