EDUCATIONAL RESEARCH

COMPETENCIES FOR ANALYSIS AND APPLICATIONS

TWELFTH EDITION

GEOFFREY E. MILLS | L.R. GAY

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Competencies for Analysis and Applications

TWELFTH EDITION

Geoffrey E. Mills
Southern Oregon University

L. R. Gay
Late of Florida International University

Pearson

330 Hudson Street, NY NY 10013

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Preface

NEW TO THIS EDITION

Like the 11th edition, the 12th edition reflects a combination of both unsolicited and solicited input. Positive feedback suggested aspects of the text that should not be changed—the writing style and the focus on ethical practice, for example. Those aspects remain. Part I, Foundational Concepts and Processes, retains the same six chapters from the 11th edition and adds a seventh chapter on ethics. Part II, Research Designs, includes all of the research design chapters that were covered in the 11th edition. Part III, Working with Quantitative and Qualitative Data, brings together discussions of descriptive statistics, inferential statistics, and qualitative data collection and analysis. New for this edition is the introduction of open source statistics software—R. Part IV, Reporting and Critiquing Research, effectively remains the same.

Content changes reflect the inclusion of new topics and the expansion or clarification of existing topics. There are many improvements in this edition, and we describe the more significant highlights here:

- Chapter 2 is new for this edition with the chapter dedicated to ethics in educational research. This chapter adds to the existing content on informed consent and protection from harm with a new and expanded section on action research and Institutional Review Boards (IRBs) that will be especially helpful for classroom-based, and school-based educational researchers.
- Chapter 4 has undergone significant revision because of the way technology has affected the literature review process. The use of online and digital technologies is growing in popularity and effectiveness for researchers in the field of education and other disciplines. Changes include an expanded Digital Research Tools feature that covers annotation, brainstorming, citation management, organization, and writing management.
- Chapter 7 has been significantly revised to provide an up-to-date discussion of selecting measuring instruments especially as it relates to the use of personality and affective tests in schools.
- Chapter 12 on single-subject experimental research has been updated and expanded to include a classroom-based special education example that breathes life in to the research process for classroom teachers.
- Chapters 18 and 19 on descriptive and inferential statistics have been updated, and new for this edition is the introduction of open-sourced statistical software R. R is a little different than Excel and SPSS in that it is open-source (read: free) but in order to operate R you need some very basic coding skills. This may frighten some readers from the start, but don't worry. We are going to send the reader off with a nice start to R programming and offer suggestions for future reading that will enhance one's skillset.

In addition, we have added new tables and figures throughout the text. Every chapter has been edited and updated. References have been updated as well.

MyLab for Education

One of the most visible changes in the new edition, also one of the most significant, is the expansion of the digital learning and assessment resources embedded in the etext and the inclusion of *MyLab* in the text. *MyLab for Education* is an online homework, tutorial, and assessment program designed to work with the text to engage learners and to improve learning. Within its structured environment, learners practice what they learn in the etext, test their understanding, and receive feedback to guide their learning and ensure their mastery of key learning outcomes. The *MyLab* portion of the new edition of *Educational Research* is

designed to help learners (1) understand the basic vocabulary of educational research, (2) get hands-on experiences in reading and evaluating research articles, and (3) get guided practice in planning and developing a research proposal and in collecting and analyzing research data. The resources in *MyLab for Education* with *Educational Research: Competencies for Analysis and Applications*, 12th edition include:

- *Self-Check* assessments with feedback throughout the etext help readers assess how well they have mastered content.
- Two kinds of *Application Exercises*, all with feedback, either help students learn how to read, understand, and evaluate research articles or give students opportunities to practice specific research tasks like collecting and analyzing research data or planning and writing up a proposal.

PHILOSOPHY AND PURPOSE

This text is designed primarily for use in the introductory course in educational research that is a basic requirement for many graduate programs. Because the topic coverage of the text is relatively comprehensive, it may be easily adapted for use in either a senior-level undergraduate course or a more advanced graduate-level course.

The philosophy that guided the development of the current and previous editions of this text was the conviction that an introductory research course should be more oriented toward skill and application than toward theory. Thus, the purpose of this text is for students to become familiar with research mainly at a "how-to" skill and application level. The authors do not mystify students with theoretical and statistical jargon. They strive to provide a down-to-earth approach that helps students acquire the skills and knowledge required of a competent consumer and producer of educational research. The emphasis is not just on what the student knows but also on what the student can do with what he or she knows. It is recognized that being a "good" researcher involves more than the acquisition of skills and knowledge; in any field, important research is usually produced by those who through experience have acquired insights, intuitions, and strategies related to the research process. Research of any worth, however, is rarely conducted in the absence of basic research skills and knowledge. A fundamental assumption of this text is that the competencies required of a competent consumer of research overlap considerably with those required of a competent producer of research. A person is in a much better position to evaluate the work of others after she or he has performed the major tasks involved in the research process.

ORGANIZATION AND STRATEGY

The overall strategy of the text is to promote students' attainment of a degree of expertise in research through the acquisition of knowledge and by involvement in the research process.

Organization

In the 12th edition, Part I, Foundational Concepts and Processes, includes discussion of the scientific and disciplined inquiry approach and its application in education. The main steps in the research process and the purpose and methods of the various research designs are discussed. In Part I, each student selects and delineates a research problem of interest that has relevance to his or her professional area. Throughout the rest of the text, the student then simulates the procedures that would be followed in conducting a study designed to investigate the research problem; each chapter develops a specific skill or set of skills required for the execution of such a research design. Specifically, the student learns about the application of the scientific method in education (Chapter 1) and the ethical considerations that affect the conduct of any educational research (Chapter 2), identifies a research problem and formulates hypotheses (Chapter 3), conducts a review of the related literature (Chapter 4), develops a research plan (Chapter 5), selects and defines samples (Chapter 6), and evaluates and selects measuring instruments (Chapter 7). Throughout these chapters are parallel discussions of quantitative and qualitative research constructs. This organization, with increased emphasis on ethical considerations in the conduct of educational research and the skills needed to conduct a comprehensive review of related literature, allows the student to see the similarities and

differences in research designs and to understand more fully how the nature of the research question influences the selection of a research design. Part II, Research Designs, includes description and discussion of different quantitative research designs, qualitative research designs, mixed methods research designs, and action research designs. Part III, Working with Quantitative and Qualitative Data, includes two chapters devoted to the statistical approaches and the analysis and interpretation of quantitative data, and two chapters describing the collection, analysis, and interpretation of qualitative data. Part IV, Reporting and Critiquing Research, focuses on helping the student prepare a research report, either for the completion of a degree requirement or for publication in a refereed journal, and an opportunity for the student to apply the skills and knowledge acquired in Parts I through III to critique a research report.

Strategy

This text represents more than just a textbook to be incorporated into a course; it is a total instructional system that includes stated learning outcomes, instruction, and procedures for evaluating each outcome. The instructional strategy of the system emphasizes the demonstration of skills and individualization within this structure. Each chapter begins with a list of learning outcomes that describes the knowledge and skills that the student should gain from the chapter. In many instances, learning outcomes may be assessed either as written exercises submitted by students or by tests, whichever the instructor prefers. In most chapters, a task to be performed is described next. Tasks require students to demonstrate that they can perform particular research skills. Because each student works with a different research problem, each student demonstrates the competency required by a task as it applies to his or her own problem. With the exception of Chapter 1, an individual chapter is directed toward the attainment of only one task (occasionally, students have a choice between a quantitative and qualitative task).

Text discussion is intended to be as simple and straightforward as possible. Whenever feasible, procedures are presented as a series of steps, and concepts are explained in terms of illustrative examples. In a number of cases, relatively complex topics or topics beyond the scope of the text are presented at a very elementary level, and students are directed to other sources for additional, in-depth discussion. There is also a degree of intentional repetition; a number of concepts are discussed in different contexts and from different perspectives. Also, at the risk of eliciting more than a few groans, an attempt has been made to sprinkle the text with touches of humor—a hallmark of this text spanning four decades—and perhaps best captured by the pictures and quotes that open each chapter. Each chapter includes a detailed, often lengthy summary with headings and subheadings directly parallel to those in the chapter. The summaries are designed to facilitate both the review and location of related text discussion. Finally, each chapter (or part) concludes with suggested criteria for evaluating the associated task and with an example of the task produced by a former introductory educational research student. Full-length articles, reprinted from the educational research literature, appear at the ends of all chapters presenting research designs and serve as illustrations of "real-life" research using that design. For the 12th edition all of these articles have been annotated with descriptive and evaluative annotations.

SUPPLEMENTARY MATERIALS

The following resources are available for instructors to download from **www.pearsonhighered.com/educator**. Enter the author, title of the text, or the ISBN number, then select this text, and click on the "Resources" tab. Download the supplement you need. If you require assistance in downloading any resources, contact your Pearson representative.

Instructor's Resource Manual With Test Bank

The *Instructor's Resource Manual with Test Bank* is divided into two parts. The *Instructor's Resource Manual* contains, for each chapter, suggested activities that have been effectively used in Educational Research courses, strategies for teaching, and selected resources to supplement the textbook content. The test bank contains multiple-choice items covering the content of each chapter, newly updated for this edition, and can be printed and edited or used with TestGen®.

TestGen®

TestGen is a powerful test generator available exclusively from Pearson Education publishers. You install TestGen on your personal computer (Windows or Macintosh) and create your own tests for classroom testing and for other specialized delivery options, such as over a local area network or on the Web. A test bank, which is also called a Test Item File (TIF), typically contains a large set of test items, organized by chapter, and ready for your use in creating a test based on the associated textbook material. Assessments may be created for both print and testing online.

The tests can be downloaded in the following formats:

TestGen Testbank file—PC
TestGen Testbank file—MAC
TestGen Testbank—Blackboard 9 TIF
TestGen Testbank—Blackboard CE/Vista (WebCT) TIF
Angel Test Bank (zip)
D2L Test Bank (zip)
Moodle Test Bank
Sakai Test Bank (zip)

PowerPoint® Slides

The PowerPoint® slides highlight key concepts and summarize text content to help students understand, organize, and remember core concepts and ideas. They are organized around chapter learning outcomes to help instructors structure class presentations.

ACKNOWLEDGMENTS

I sincerely thank everyone who provided input for the development of this edition. The following individuals made thoughtful and detailed suggestions and comments for improving the 12th edition: Jacqueline Swank, University of Florida; Raymond W. Francis, Central Michigan University; Robin Lund, University of Northern Iowa; Alane Starko, Eastern Michigan University; Vivian Ikpa, Temple University; Christian Kimm, California State University, Los Angeles. These reviewers contributed greatly to the 12th edition and their efforts are very much appreciated.

I would also like to acknowledge the staff at Pearson, without whose guidance (and patience!) this text would not have become a reality. In particular, I thank Kevin Davis, Director & Portfolio Manager, for working with me on the 12th edition of the text so as to build on what we achieved with the previous editions. Kevin has been my friend and mentor since he offered my first textbook contract in 1997, and I am indebted to him for his encouragement and support of my writing. Kevin worked diligently to ensure a quality, user-friendly, academically coherent text and patiently kept me on track in order to meet publication deadlines. His feedback on chapter drafts was insightful and important to the development of this 12th edition. Kevin has taught me a great deal about writing, and I will always be indebted to him for trusting me with stewardship of this wonderful text. The publication of this 12th edition also coincides with the end of my tenure at my academic home for the past 29 years: Southern Oregon University. I am now officially an Emeritus Professor and looking forward to dedicating more time to writing without the time commitment of teaching full time. At the risk of embarrassing Kevin, I can state with confidence that the past 20 years of my professorial career exceeded all of my expectations because of the opportunities Kevin has given me. Thank you.

This edition benefited from the efforts of my Developmental Editor Carolyn Schweitzer. This is my first collaboration with Carolyn and I am looking forward to working with her on future editions of *Educational Research* and *Action Research*. While we have never met face-to-face, I trust and respect all the contributions she has made to my work and benefit greatly from Carolyn's creative thinking about how to make an educational research textbook meaningful and fun. Also at Pearson, Janelle Rogers ably shepherded the manuscript through development and production. An author does not take on the task of a major revision of a text of this magnitude without the commitment and support of excellent editors. Kevin and Carolyn were instrumental in the development of this edition and I sincerely thank them for their professionalism, patience, caring, and sense of humor.

I believe that I have made a positive contribution to this text, now my fifth edition, and added to the wisdom of earlier editions by L. R. Gay and Peter Airasian. Long-time users of the text will still "hear"

Lorrie Gay's voice throughout the text, but increasingly there is an Aussie accent and sense of humor creeping its way into the pages!

I wish to thank my friend and colleague Dr. Adam Jordan (Associate Professor, University of North Georgia) for his thoughtful work on revising the descriptive and inferential statistics chapters and feedback and contributions on other quantitative chapters in the text. Similarly, my friend and colleague at Southern Oregon University, Dr. Dale Vidmar, was instrumental in the revision of the reviewing the literature chapter.

Finally, I want to thank my best friend and wife, Dr. Donna Mills (Emeritus Professor, Southern Oregon University), and my son, Jonathan, for their love, support, and patience. Their commitment to my work is always appreciated and never taken for granted. The completion of this edition signals another new era in my life as my son Jonathan has now graduated from college, and Donna and I prepare for retirement after long university careers.

Geoff Mills
Emeritus Professor
Southern Oregon University

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Brief Contents

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Contents

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Research Articles

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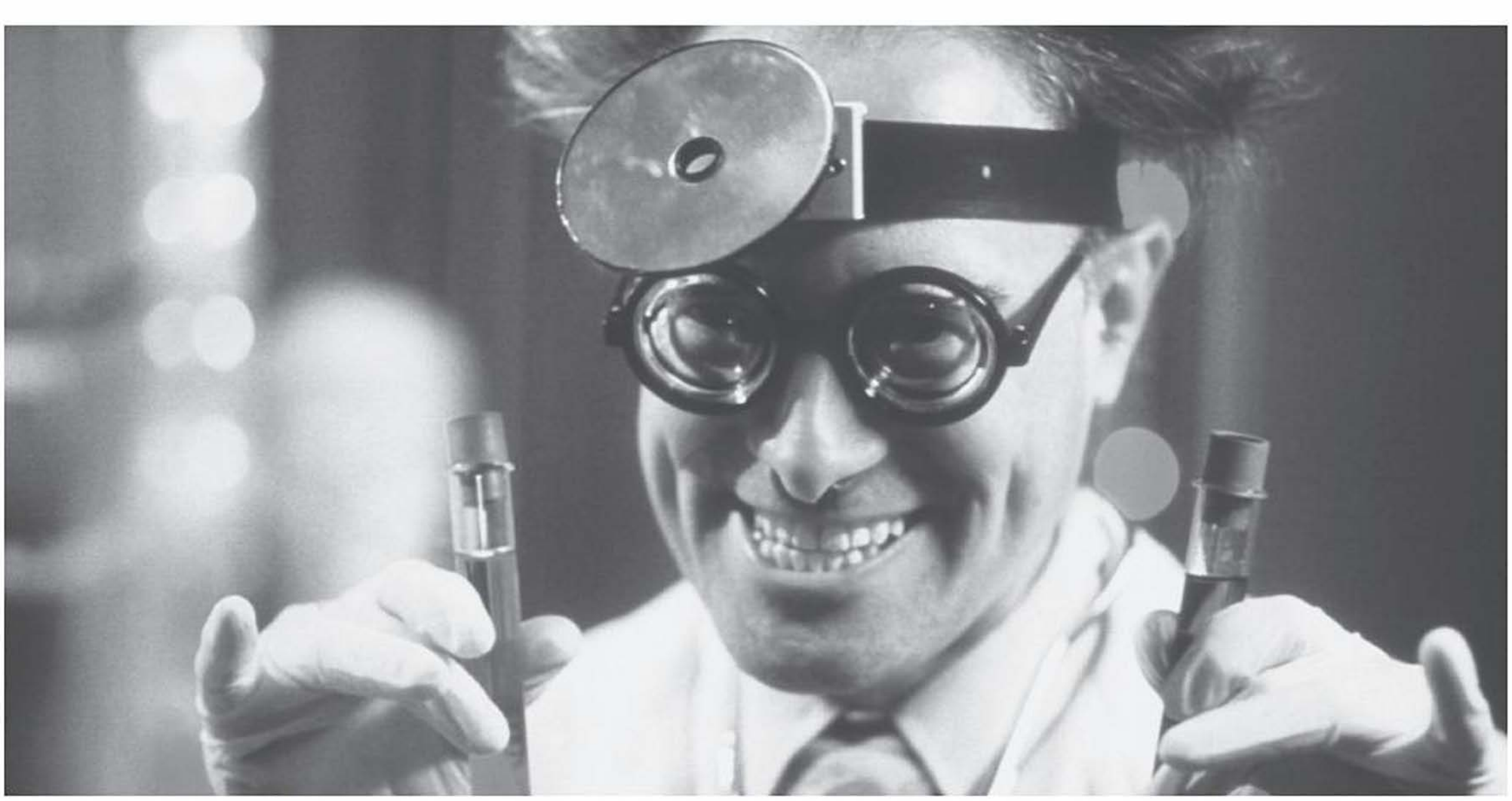
EDUCATIONAL RESEARCH

CHAPTER ONE

Introduction to Educational Research



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Little Heroes 3, 2002

"Despite a popular stereotype that depicts researchers as spectacled, stoop-shouldered, elderly gentlemen...who endlessly add chemicals to test tubes, every day thousands of men and women of all ages and postures conduct educational research in a wide variety of settings." (p. 3)

LEARNING OUTCOMES

After reading Chapter 1, you should be able to do the following:

1.1 Briefly describe the reasoning involved in the scientific method.
1.2 Explain why researchers would use quantitative, qualitative, mixed methods, or action research designs to address a specific research problem.
1.3 Briefly define and state the major characteristics of these research designs: survey, correlational, causal–comparative, experimental, single-subject, narrative, ethnographic, case study, mixed methods, and action research.
1.4 Explain the purposes of basic research, applied research, evaluation research, research and development (R&D), and action research.

Completing Chapter 1 should enable you to perform the following tasks:

TASKS 1A, 1B

Identify and briefly state the following for both research studies at the end of this chapter:

1. The research design
2. The rationale for the choice of the research design
3. The major characteristics of the research design, including research procedures, method of analysis, and major conclusions (See Performance Criteria, p. 23.)

TASK 1C

Classify given research studies based on their characteristics and purposes. (See Performance Criteria, p. 23.)

WELCOME!

If you are taking a research course because it is required in your program of studies, raise your right hand. If you are taking a research course because it seems like it will be a really fun elective, raise your left hand. We thought you may not be here of your own free will. Although you may be required to take this course, you are not the innocent victim of one or more sadists. Your professors have several legitimate reasons for believing this research course is an essential component of your education.

First, educational research findings contribute significantly to both educational theory and educational practice. As a professional, you need to know how to find, understand, and evaluate these findings. And when you encounter research findings in professional publications or in the media, you have a responsibility, as a professional, to distinguish between legitimate and ill-founded research claims. Second, although many of you will be primarily critical consumers of research, some of you will decide to become educational researchers. A career in research opens the door to a variety of employment opportunities in universities, research centers, and business and industry.

Despite a popular stereotype that depicts researchers as spectacled, stoop-shouldered, elderly gentlemen (a stereotype I am rapidly approaching!) who endlessly add chemicals to test tubes, every day thousands of men and women of all ages and postures conduct educational research in a wide variety of settings. Every year many millions of dollars are spent in the quest for knowledge related to teaching and learning. For example, in 2017 the U.S. Department of Education budget was $69.4 billion, which included an allocation of $180 million for "[e]ducation innovation and research" (www2.ed.gov/about/overview/budget/budget17/budgetfactsheet.pdf). Educational research has contributed many findings concerning principles of behavior, learning, and retention of knowledge—many of which can also be applied to curriculum, instruction, instructional materials, and assessment techniques. Both the quantity and the quality of research are increasing, partly because researchers are better trained. Educational research classes have become core components of preservice teacher education programs, as well as the cornerstone of advanced degree programs.

We recognize that educational research is a relatively unfamiliar discipline for many of you. Our

first goals, then, are to help you acquire a general understanding of research processes and to help you develop the perspective of a researcher. We begin by examining the scientific method.

THE SCIENTIFIC METHOD

What is knowledge? And how do we come to "know" something? Experience is certainly one of the fundamental ways we come to know about and understand our world. For example, a child who touches something hot learns that high heat hurts. We know other things because a trusted authority, such as a parent or a teacher, told us about them. Most likely, much of your knowledge of current world events comes secondhand, from things you have read or heard from a source you trust.

Another way we come to know something is through thinking, through reasoning. Reasoning refers to the process of using logical thought to reach a conclusion. We can reason *inductively* or *deductively*. **Inductive reasoning** involves developing generalizations based on observation of a limited number of related events or experiences. Consider the following example of inductive reasoning:

Observation: An instructor examines five research textbooks. Each contains a chapter about sampling.
Generalization: The instructor concludes that all research textbooks contain a chapter about sampling.

Deductive reasoning involves essentially the reverse process—arriving at specific conclusions based on general principles, observations, or experiences (i.e., generalizations)—as shown in the next example.

Observations: All research textbooks contain a chapter on sampling. The book you are reading is a research text.
Generalization: This book must contain a chapter on sampling. (Does it?)

Although people commonly use experience, authority, inductive reasoning, and deductive reasoning to learn new things and draw new conclusions from that knowledge, each of these approaches to understanding has limitations when used in isolation. Some problems associated with experience and authority as sources of knowledge are graphically illustrated in a story told about Aristotle. According to the story, one day Aristotle caught a fly and carefully counted and recounted the legs. He then announced that flies have five legs. No one questioned the word of Aristotle. For years his finding was accepted uncritically. Unfortunately, the fly that Aristotle caught just happened to be missing a leg! Whether or not you believe the story, it illustrates the limitations of relying on personal experience and authority as sources of knowledge.

The story also points out a potential problem with inductive reasoning: Generalizing from a small sample, especially one that is atypical, can lead to errors. Deductive reasoning, too, is limited by the evidence in the original observations. If every research text really does have a chapter on sampling, and if this book really is a research text, then it follows that this book must have a chapter on sampling. However, if one or more of the premises is false (perhaps some research texts do not have a chapter on sampling), your conclusion may also be wrong.

When we rely exclusively on these common approaches to knowing, the resulting knowledge is susceptible to error and may be of limited value to understanding the world beyond our immediate experience. However, experience, authority, and inductive and deductive reasoning are very effective when used together as integral components of the scientific method. The **scientific method** is an orderly process entailing a number of steps: recognition and definition of a problem, formulation of hypotheses, collection of data, analysis of data, and statement of conclusions regarding confirmation or disconfirmation of the hypotheses (i.e., a researcher forms a **hypothesis**—an explanation for the occurrence of certain behaviors, phenomena, or events—as a way of predicting the results of a research study and then collects data to test that prediction). These steps can be applied informally to solve everyday problems such as the most efficient route to take from home to work or school, the best time to go to the bank, or the best kind of computer to purchase. The more formal application of the scientific method is standard in research; it is more efficient and more reliable than relying solely on experience, authority, inductive reasoning, and deductive reasoning as sources of knowledge.

Limitations of the Scientific Method

The steps in the scientific method guide researchers in planning, conducting, and interpreting research studies. However, it is important to recognize some

limitations of the method. First, the scientific method cannot answer all questions. For example, applying the scientific method will not resolve the question "Should we legalize euthanasia?" The answers to questions like this one are influenced by personal philosophy, values, and ethics.

Second, application of the scientific method can never capture the full richness of the individuals and the environments under study. Although some applications of the method lead to deeper understanding of the research context than others, no application—and in fact no research approach—provides full comprehension of a site and its inhabitants. No matter how many variables one studies or how long one is immersed in a research context, other variables and aspects of context will remain unexamined. Thus, the scientific method and, indeed, all types of inquiry give us a simplified version of reality.

Third, our measuring instruments always have some degree of error. The variables we study are often proxies for the real behavior we seek to examine. For example, even if we use a very precisely constructed multiple-choice test to assess a person's values, we will likely gather information that gives us a picture of that person's beliefs about his or her values. However, we aren't likely to have an adequate picture of how that person acts, which may be the better reflection of the person's real values.

More broadly, all educational inquiry, not just the scientific method, is carried out with the cooperation of participants who agree to provide researchers with data. Because educational researchers deal with human beings, they must consider a number of ethical concerns and responsibilities to the participants. For example, they must shelter participants from real or potential harm. They must inform participants about the nature of the planned research and address the expectations of the participants. These factors can limit and skew results. All these limitations will be addressed in later sections of this book.

Application of the Scientific Method in Education

Research is the formal, systematic application of the scientific method to the study of problems; **educational research** is the formal, systematic application of the scientific method to the study of educational problems. The goal of educational research is essentially the same as the goal of all science: to describe, explain, predict, or control phenomena—in this case, educational phenomena. As we mentioned previously, it can be quite difficult to describe, explain, predict, and control situations involving human beings, who are by far the most complex of all organisms. So many factors, known and unknown, operate in any educational environment that it can be extremely difficult to identify specific causes of behaviors or to generalize or replicate findings. The kinds of rigid controls that can be established and maintained in a biochemistry laboratory, for instance, are impossible in an educational setting. Even describing behaviors, based on observing people, has limits. Observers may be subjective in recording behaviors, and people who are observed may behave atypically just because they are being watched. Chemical reactions, on the other hand, are certainly not aware of being observed! Nevertheless, behavioral research should not be viewed as less scientific than natural science research conducted in a lab.

Despite the difficulty and complexity of applying the scientific method in educational settings, the steps of the scientific method used by educational researchers are the same as those used by researchers in other more easily controlled settings:

1. *Selection and definition of a problem*. A problem is a question of interest that can be tested or answered through the collection and analysis of data. Upon identifying a research question, researchers typically review previously published research on the same topic and use that information to hypothesize about the results. In other words, they make an educated guess about the answer to the question.
2. *Execution of research procedures*. The procedures reflect all the activities involved in collecting data related to the problem (e.g., how data are collected and from whom). To a great extent, the specific procedures are dictated by the research question and the variables involved in the study.
3. *Analysis of data*. Data are analyzed in a way that permits the researcher to test the research hypothesis or answer the research

question. Analysis usually involves application of one or more statistical technique. For some studies, data analysis involves verbal synthesis of narrative data; these studies typically involve new insights about the phenomena in question, generate hypotheses for future research, or both.

4. *Drawing and stating conclusions.* The conclusions, which should advance our general knowledge of the topic in question, are based on the results of data analysis. They should be stated in terms of the original hypothesis or research question. Conclusions should indicate, for example, whether the research hypothesis was supported or not. For studies involving verbal synthesis, conclusions are much more tentative.

MyLab Education Self-Check 1.1

MyLab Education Application Exercise 1.1: Understanding the Scientific Method

DIFFERENT APPROACHES TO EDUCATIONAL RESEARCH

All educational inquiry ultimately involves a decision to study or describe something—to ask some question and seek an answer. All educational inquiry necessitates that data of some kind be collected, that the data be analyzed in some way, and that the researcher come to some conclusion or interpretation. In other words, all educational inquiry shares the same four basic actions we find in the scientific method. However, it is not accurate to say that all educational research is an application of the scientific method. Important differences exist between the types of problems researchers investigate and the questions they ask, the types of data they collect, the form of data analysis, and the conclusions that the researcher can draw meaningfully and with validity.

The Continuum of Research Philosophies

Historically, educational researchers used approaches that involved the use of the scientific method. However, over the last four decades, researchers have adopted diverse philosophies toward their research. Now, there are certain philosophical assumptions that underpin an educational researcher's decision to conduct research. These philosophical assumptions address issues related to the nature of reality (ontology), how researchers know what they know (epistemology), and the methods used to study a particular phenomenon (methodology), with an emphasis on quantitative or qualitative methods. As Creswell[1] notes, historically, researchers compared the philosophical assumptions that underpinned qualitative and quantitative research approaches in order to establish the legitimacy of qualitative research, but given the evolution of qualitative and quantitative research over the past four decades, there is no longer any need to justify one set of philosophical assumptions over another set of assumptions.

Quantitative Research

Educational researchers have also followed well-defined, widely accepted procedures for stating research problems, carrying out the research process, analyzing the resulting data, and verifying the quality of the study and its conclusions. Often, these research procedures are based on what has come to be known as a quantitative approach to conducting and obtaining educational understandings. The quantitative framework in educational research involves the application of the scientific method to try to answer questions about education. At the end of this chapter you will find an example of quantitative research published in *Child Development* (a refereed journal): "Can Instructional and Emotional Support in the First-Grade Classroom Make a Difference for Children at Risk of School Failure?" (Hamre & Pianta, 2005). As this title suggests, this research investigates the ways in which children's risk of school failure may be moderated by instructional and emotional support from teachers.

Quantitative research is the collection and analysis of numerical data to describe, explain, predict, or control phenomena of interest. Part II of the text will address in detail specific quantitative research designs that satisfy the assumptions

[1] *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (4th ed.) by J. W. Creswell and C. N. Poth, 2018, Thousand Oaks, CA: Sage.

underpinning a quantitative approach to research. A quantitative research design entails more than just the use of numerical data. At the outset of a study, quantitative researchers state the hypotheses to be examined and specify the research procedures that will be used to carry out the study. They also maintain control over contextual factors that may interfere with the data collection and identify a sample of participants large enough to provide statistically meaningful data. Many quantitative researchers have little personal interaction with the participants they study because they frequently collect data using paper-and-pencil, noninteractive instruments. The analysis of numerical data can be complex but addressed systematically it can be manageable, and Part III of the text will provide a detailed description for how to work with quantitative data.

Underlying quantitative research methods is the philosophical belief or assumption that we inhabit a relatively stable, uniform, and coherent world that we can measure, understand, and generalize about. This view, adopted from the natural sciences, implies that the world and the laws that govern it are somewhat predictable and can be understood by scientific research and examination. In this quantitative perspective, claims about the world are not considered meaningful unless they can be verified through direct observation.

Qualitative Research

Qualitative research is the collection, analysis, and interpretation of comprehensive narrative and visual (i.e., non-numerical) data to gain insights into a particular phenomenon of interest. Part II of the text will address in detail specific qualitative research designs that satisfy the underpinning assumptions of a qualitative approach to research. Qualitative research designs are based on different beliefs and purposes than quantitative research designs. For example, qualitative researchers do not necessarily accept the view of a stable, coherent, uniform world. They argue that all meaning is situated in a particular perspective or context and because different people and groups often have different perspectives and contexts, the world has many different meanings, none of which is necessarily more valid or true than another.

Qualitative research designs tend to evolve as understanding of the research context and participants deepens (think back to the discussion of inductive reasoning). As a result, qualitative researchers often avoid stating hypotheses before data are collected, and they may examine a particular phenomenon without a guiding statement about what may or may not be true about that phenomenon or its context. However, qualitative researchers do not enter a research setting without any idea of what they intend to study. Rather, they commence their research with "foreshadowed problems."[2] This difference is important—quantitative research usually tests a specific hypothesis; qualitative research often does not.

Additionally, in qualitative research, context is not controlled or manipulated by the researcher. The effort to understand the participants' perspectives requires researchers using qualitative methods to interact extensively and intimately with participants during the study, using time-intensive data collection methods such as interviews and observations. As a result, the number of participants tends to be small, and qualitative researchers analyze the data inductively by categorizing and organizing it into patterns that produce a descriptive, narrative synthesis.

Qualitative research differs from quantitative research in two additional ways: (1) Qualitative research often involves the simultaneous collection of a wealth of narrative and visual data over an extended period of time, and (2) as much as is possible, data collection occurs in a naturalistic setting. In quantitative studies, in contrast, research is most often conducted in researcher-controlled environments under researcher-controlled conditions, and the activities of data collection, analysis, and writing are separate, discrete activities. Because qualitative researchers strive to study people and events in their naturalistic settings, qualitative research is sometimes referred to as naturalistic research, naturalistic inquiry, or field-oriented research.

These two characteristics of qualitative research, the simultaneous study of many aspects of a phenomenon and the attempt to study things as they exist naturally, help in part to explain the growing enthusiasm for qualitative research in education, especially in applied teacher practitioner–oriented

[2] *Argonauts of the Western Pacific* (p. 9), by B. Malinowski, 1922, London: Routledge.

research. Some researchers and educators feel that certain kinds of educational problems and questions do not lend themselves well to quantitative methods, which use principally numerical analysis and try to control variables in very complex environments. As qualitative researchers point out, findings should be derived from research conducted in real-world settings to have relevance to real-world settings.

At the end of this chapter, you will find an example of qualitative research published in *Action in Teacher Education* (a refereed journal): "Developing Teacher Epistemological Sophistication about Multicultural Curriculum: A Case Study" (Sleeter, 2009). This research investigates how teachers' thinking about curriculum develops during a teacher preparation program and how the lessons from the case study might inform teacher education pedagogy. And, of course, the use of the word *epistemological* in the title introduces you to the language of educational research!

Mixed Methods Research

Mixed methods research combines quantitative and qualitative designs by including both quantitative and qualitative data in a single study. The purpose of mixed methods research is to build on the synergy and strength that exists between quantitative and qualitative research designs to understand a phenomenon more fully than is possible using either quantitative or qualitative approaches alone. Chapter 16 will describe in detail six mixed methods research designs (convergent-parallel, explanatory, exploratory, experimental, social justice, and multistage evaluation). However, the basic differences among the designs are related to the priority given to the following areas:

- The type of data collected (i.e., qualitative and quantitative data are of equal weight, or one type of data has greater weight than the other)
- The sequence of data collection (i.e., both types of data are collected during the same time period, or one type of data is collected in each sequential phase of the project)
- The analysis techniques (i.e., either an analysis that combines the data or one that keeps the two types of data separate)

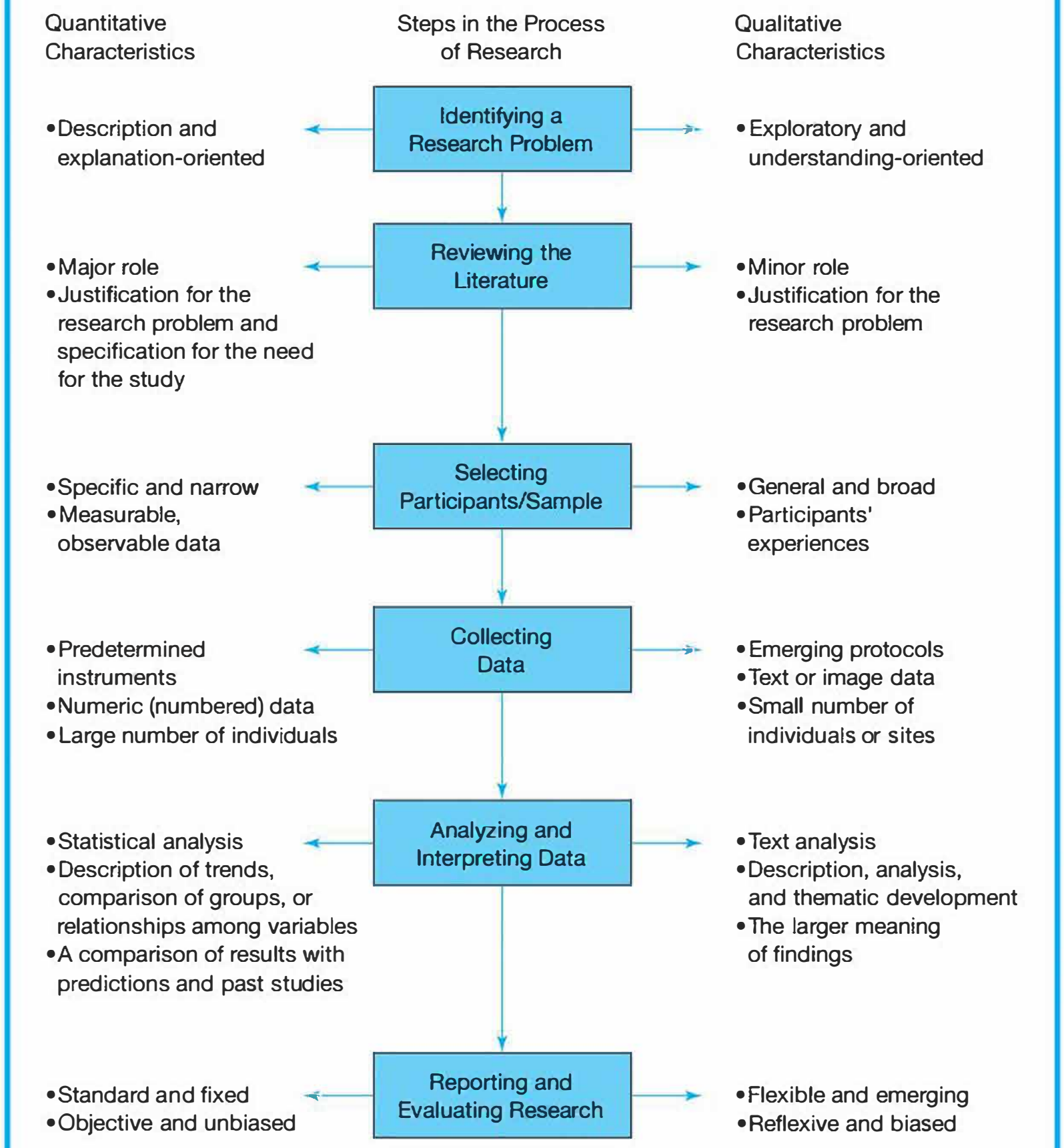
Characteristics of Quantitative and Qualitative Research Approaches

Earlier in this chapter, we presented four general, conceptual research steps used in the scientific method. In this section, we expand the number of steps to six, which are followed by both quantitative researchers and qualitative researchers. As we discuss in subsequent chapters in Part II, however, the application of the steps differs depending on the research design. For example, the research procedures in qualitative research are often less rigid than those in quantitative research. Similarly, although both quantitative and qualitative researchers collect data, the nature of the data differs. Figure 1.1 compares the six steps of qualitative and quantitative research approaches and lists traits that characterize each approach at every step:

1. *Identifying a research topic*
2. *Reviewing the literature*
3. *Selecting participants*
4. *Collecting data*
5. *Analyzing and interpreting data*
6. *Reporting and evaluating the research*

Table 1.1 provides another snapshot of quantitative and qualitative research characteristics. Despite the differences between them, you should not consider quantitative and qualitative research approaches to be oppositional. Taken together, they represent the full range of educational research designs. The terms *quantitative* and *qualitative* are used to differentiate one approach from the other conveniently. If you see yourself as a positivist—the belief that qualities of natural phenomena must be verified by evidence before they can be considered knowledge—that does not mean you cannot use or learn from qualitative research methods. The same holds true for nonpositivist, phenomenologist qualitative researchers. Depending on the nature of the question, topic, or problem to be investigated, one of these approaches will generally be more appropriate than the other, although selecting a primary approach does not preclude borrowing from the other. In fact, both may be utilized in the same studies, as when the administration of a (quantitative) questionnaire is followed by a small number of detailed (qualitative) interviews to obtain deeper explanations for the numerical data.

FIGURE 1.1 • Characteristics of quantitative and qualitative research



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MyLab Education **Self-Check 1.2**

MyLab Education **Application Exercise 1.2:** Evaluating Research Articles: Recognizing the Characteristics of Quantitative and Qualitative Research

MyLab Education **Application Exercise 1.3:** Evaluating Research Articles: Identifying Steps in the Research Process Part 1

MyLab Education **Application Exercise 1.4:** Evaluating Research Articles: Identifying Steps in the Research Process Part 2