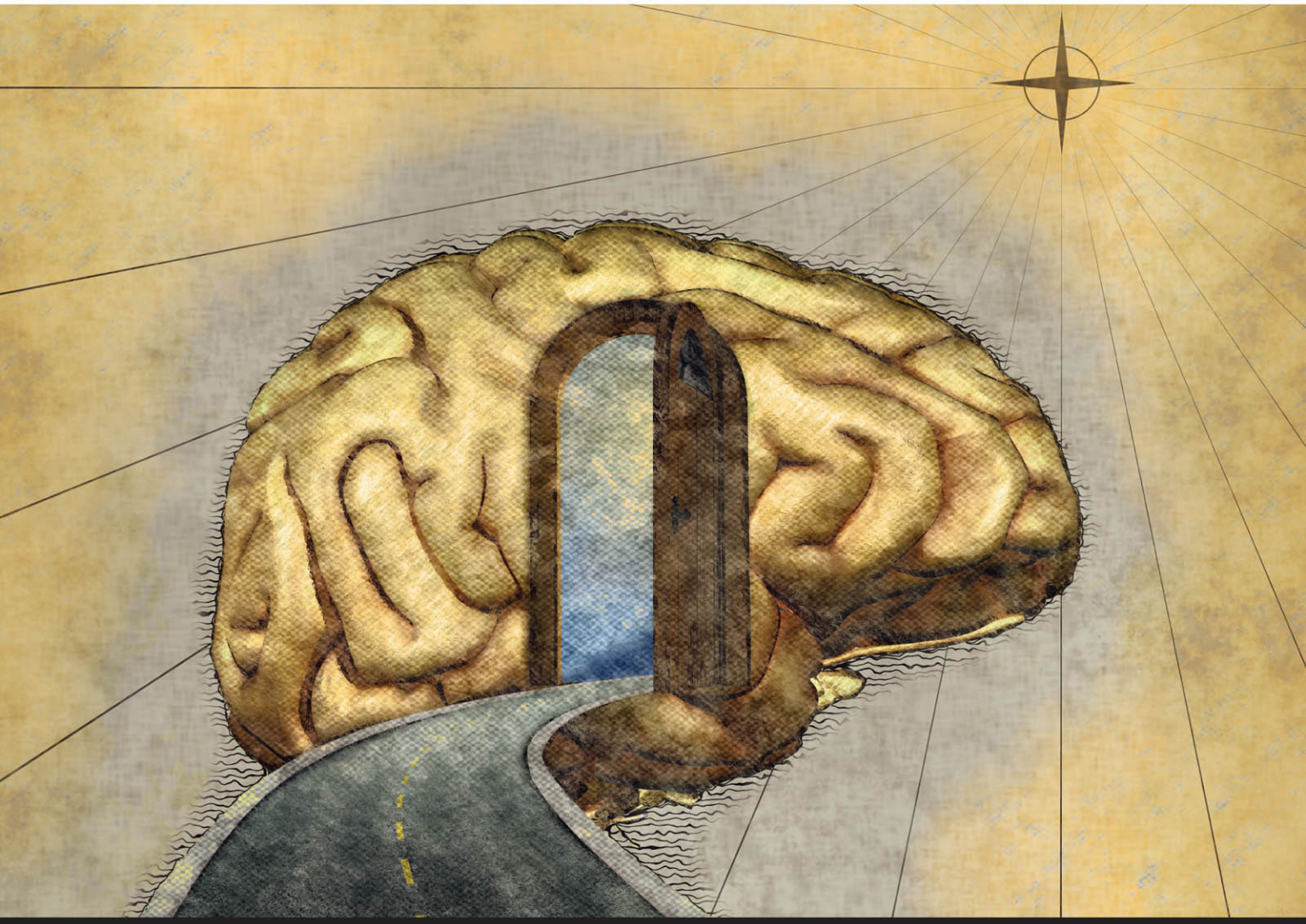
GLOBAL EDITION

Educational Research

Competencies for Analysis and Applications

ELEVENTH EDITION

Geoffrey E. Mills • Lorraine R. Gay



ALWAYS LEARNING

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EDUCATIONAL RESEARCH

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Preface

NEW TO THIS EDITION

Like the tenth edition, the eleventh 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. However, for the first time in many years, the Table of Contents reflects a new organization for the book. Part I, Foundational Concepts and Processes retains the same six chapters from the 10th edition, but Part II, Research Designs, includes all of the research design chapters that were previously separated into quantitative research designs and qualitative research designs. This reflects our decision to provide a comprehensive discussion of all the research designs before discussing data analysis and interpretation. Part III, Working with Quantitative and Qualitative Data brings together discussions of descriptive statistics, inferential statistics, and qualitative data collection and analysis. The intent of this new section is to provide a comprehensive section on both quantitative and qualitative data analysis and interpretation that reflects the increasing application of mixed methods designs in educational research. 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:

- All research articles have been annotated and now include descriptive annotations (what is the researcher doing) and reflective/evaluative annotations (how did the researcher's decisions support or challenge the chosen research design). These annotations will scaffold the readers' understanding of the content of the chapters to the sample journal articles.
- Chapter 1 (and subsequent chapters throughout the book) include a new "Write Like a Researcher" Feature that have been designed specifically with the purpose of encouraging new researchers to start writing early in the research process.
- Chapter 3 has undergone significant revision because of the way technology has affected the literature review process. Changes include a Digital Research Tools feature on Google Book and Google Scholar, step-by-step directions for an ERIC EBSCO search that maximizes the power of university library consortium agreements to identify fully online journal articles, a "Write Like a Researcher" feature that encourages new researchers to start their writing of the review of related literature very early in the research process.
- Chapter 8 on experimental research has been significantly updated to reflect 21st century discussions about validity, effect size, power, and quasi-experimental designs.
- Chapter 15 on mixed methods designs has been significantly updated to reflect the expansion of three basic and three advanced mixed methods designs currently being used in educational research settings.
- The chapters on Descriptive and Inferential Statistics (now Chapters 17 and 18 in Part III Working with Quantitative and Qualitative Data) have been updated to reflect new versions of SPSS and Excel.

In addition, we have added new tables and figures throughout the text. Every chapter has been edited and updated. References have been updated. Appendix A that historically contained tables related to random numbers, and so on, has been deleted and replaced with links throughout the book to online sources that provide the same information.

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 eleventh 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 and the ethical considerations that affect the conduct of any educational research (Chapter 1), identifies a research problem and formulates hypotheses (Chapter 2), conducts a review of the related literature (Chapter 3), develops a research plan (Chapter 4), selects and defines samples (Chapter 5), and evaluates and selects measuring instruments (Chapter 6). 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 three 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 11th 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.pearsonglobaleditions.com/mills**. 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 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.

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 eleventh edition: M.H. Clark, University of Central Florida; Anne Dahlman, Minnesota State University, Mankato; Dwight R. Gard, Texas Tech University; Jann W. MacInnes, University of Florida; Lauren Saenz, Boston College; and Rishi Sriram, Baylor University. These reviewers contributed greatly to the eleventh edition and their efforts are very much appreciated.

This edition benefited from the efforts of two editors: Kevin Davis and Gail Gottfried. A few words of thanks are in order here. For nearly 20 years I have been fortunate to work with Kevin Davis, Vice President and Publisher at Pearson. Kevin gave me my textbook start in 1997 when he offered me a contract to write *Action Research: A Guide for the Teacher Researcher* (now in its fifth 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. I have also been fortunate to work with my Developmental Editor, Gail Gottfried, for a number of years spanning both my action research and educational research books. My virtual relationship with Gail is remarkable. While we have never met face-to-face I trust and respect all the contributions she has made to my work over the years. I benefit greatly from Gail's creative thinking about how to make an educational research textbook meaningful and fun. Also at Pearson, Lauren Carlson ably shepherded the manuscript through development and production, responded to my cries for help, and kept me on track. 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 Gail 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 fourth 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. Ken Kempner (Emeritus Professor, Southern Oregon University) for his thoughtful work on revising the descriptive and inferential statistics chapters and feedback on other quantitative chapters in the text.

Finally, I want to thank my best friend and wife, Dr. Donna Mills (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 completes his undergraduate degree and contemplates work and graduate school, and Donna prepares for retirement after a very successful university career. I continue to suggest to Jonathan that one day he may want to take over my books. While it is safe to say that he is less than excited by the prospect—his undergraduate experiences in the Clark Honors College at the University of Oregon and his study abroad experiences at the University of Oxford have seen his interest in research increase dramatically!

Geoff Mills
Southern Oregon University

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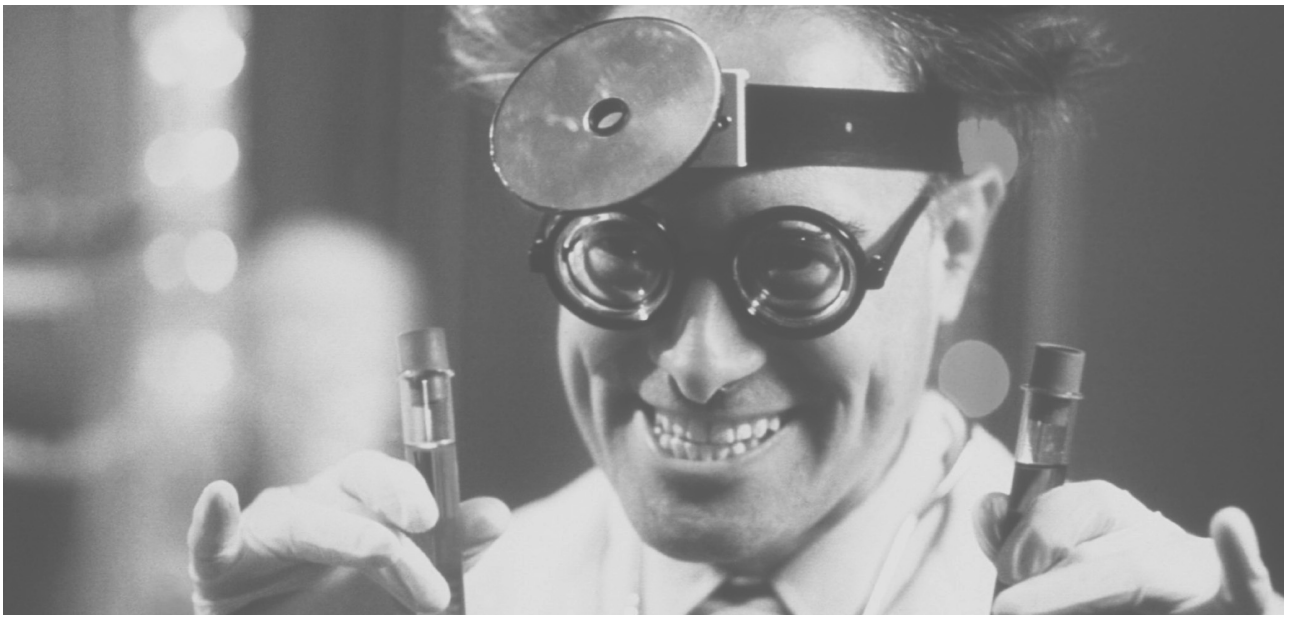
EDUCATIONAL RESEARCH

CHAPTER ONE

Educational Research: Method, Purpose, and Ethics



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, shapes, and sizes conduct educational research in a wide variety of settings." (p. 21)

LEARNING OUTCOMES

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

1. Briefly describe the reasoning involved in the scientific method.
2. Explain why researchers would use quantitative, qualitative, mixed methods, or action research designs to address a specific research problem.
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.
4. Explain the purposes of basic research, applied research, evaluation research, research and development (R&D), and action research.
5. Explain the ethical obligations that educational researchers have and describe the codes and procedures they must follow to ensure they adhere to them.

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
4. Ethical issues the authors experienced and how they were addressed

(See Performance Criteria, p. 51.)

TASK 1C

Classify given research studies based on their characteristics and purposes. (See Performance Criteria, p. 51.)

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. 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.

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 topics, 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] Creswell, J. W. (2013). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (3rd ed.). Thousand Oaks, CA: Sage.

underpinning a quantitative approach to research. A quantitative research approach 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 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 approaches are based on different beliefs and designed for different purposes than quantitative research approaches. 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 approaches 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' perspective 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 research. Some researchers and educators

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

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 approaches 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 approaches to understand a phenomenon more fully than is possible using either quantitative or qualitative approaches alone. Chapter 15 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).

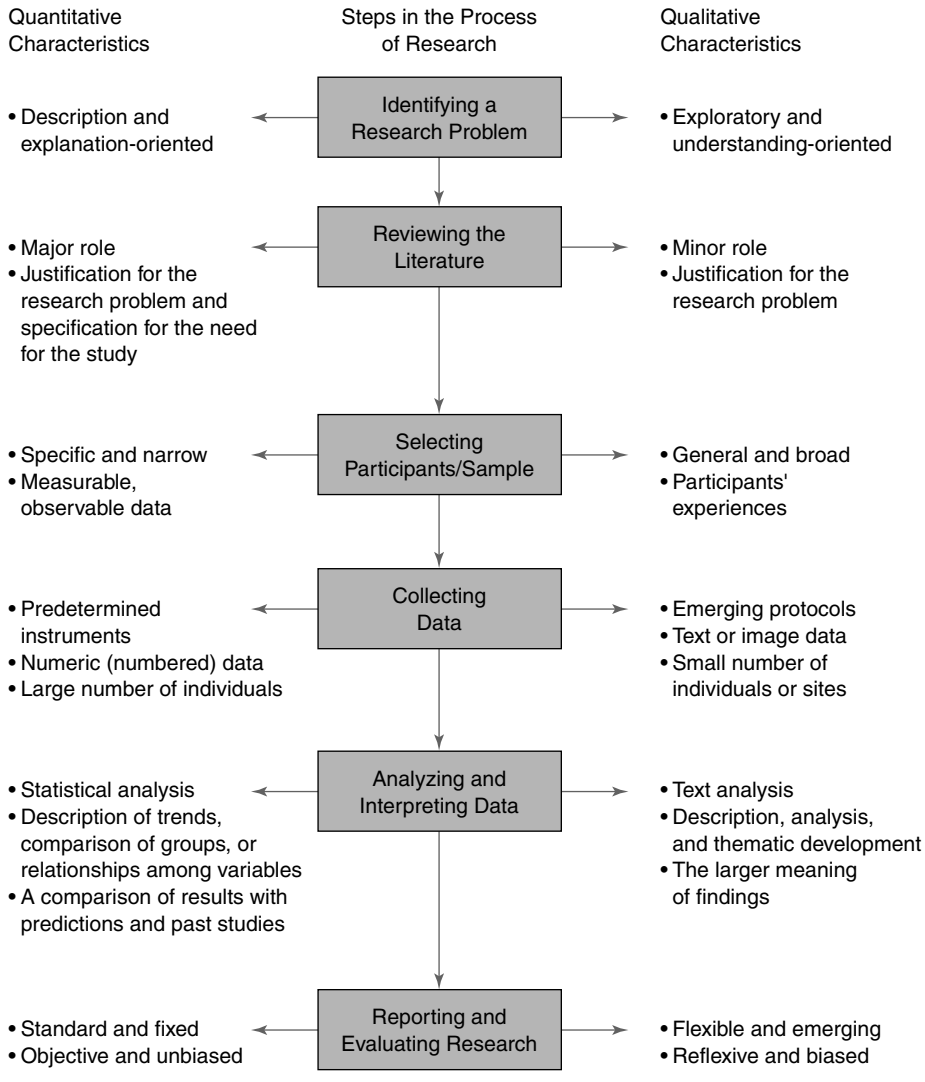
Characteristics of Quantitative and Qualitative Research Approaches

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.* Often the initial topic is narrowed to be more manageable.
2. *Reviewing the literature.* The researcher examines existing research to identify useful information and strategies for carrying out the study.
3. *Selecting participants.* Participants are purposefully selected (i.e., not randomly selected) and are usually fewer in number than in quantitative samples.
4. *Collecting data.* Qualitative data tend to be gathered from interviews, observations, and artifacts.
5. *Analyzing and interpreting data.* The researcher analyzes the themes and general tendencies and provides interpretations of the data.
6. *Reporting and evaluating the research.* The researcher summarizes and integrates the qualitative data in narrative and visual form.

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

FIGURE 1.1 • Characteristics of quantitative and qualitative research



Source: Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research (5th ed.), (pp. 20, 464, 504, 541), by Creswell, John W., © 2015. Reprinted by permission of Pearson Education, Inc., Upper Saddle River, NJ.

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.

TABLE 1.1 • Overview of qualitative and quantitative research characteristics

	Quantitative Research	Qualitative Research
Type of data collected	Numerical data	Non-numerical narrative and visual data
Research problem	Hypothesis and research procedures stated before beginning the study	Research problems and methods evolve as understanding of topic deepens
Manipulation of context	Yes	No
Sample size	Larger	Smaller
Research procedures	Relies on statistical procedures	Relies on categorizing and organizing data into patterns to produce a descriptive, narrative synthesis
Participant interaction	Little interaction	Extensive interaction
Underlying belief	We live in a stable and predictable world that we can measure, understand, and generalize about.	Meaning is situated in a particular perspective or context that is different for people and groups; therefore, the world has many meanings.

CLASSIFICATION OF RESEARCH BY DESIGN

A research design comprises the overall strategy followed in collecting and analyzing data. Although there is some overlap, most research studies follow a readily identifiable design. The largest distinction we can make in classifying research by design is the distinction between quantitative and qualitative approaches. Quantitative and qualitative research approaches, in turn, include several distinct types or designs with a focus on unique research problems.

Quantitative Approaches

Quantitative research approaches are applied to describe current conditions, investigate relations, and study cause–effect phenomena. Survey research is often designed to describe current conditions. Studies that investigate the relations between two or more variables are correlational research. Experimental studies and causal–comparative studies provide information about cause–effect outcomes. Studies that focus on the behavior change an individual exhibits as a result of some intervention fall under the heading of single-subject research.

Survey Research

Survey research determines and reports the way things are; it involves collecting numerical data to test hypotheses or answer questions about the current status of the subject of study. One common type of survey research involves assessing the preferences, attitudes, practices, concerns, or interests of a group of people. A pre-election political poll and a survey about community members' perception of the quality of the local schools are examples. Survey research data are mainly collected through questionnaires, interviews, and observations.

Although survey research sounds very simple, there is considerably more to it than just asking questions and reporting answers. Because researchers often ask questions that have not been asked before, they usually have to develop their own measuring instrument for each survey study. Constructing questions for the intended respondents requires clarity, consistency, and tact. Other

major challenges facing survey researchers are participants' failure to return questionnaires, their willingness to be surveyed over the phone, and their ability to attend scheduled interviews. If the response rate is low, then valid, trustworthy conclusions cannot be drawn. For example, suppose you are doing a study to determine the attitudes of principals toward research in their schools. You send a questionnaire to 100 principals and include the question "Do you usually cooperate if your school is asked to participate in a research study?" Forty principals respond, and they all answer "Yes." It's certainly a mistake to conclude that principals in general cooperate. Although all those who responded said yes, those 60 principals who did not respond may never cooperate with researchers. After all, they didn't cooperate with you! Without more responses, it is not possible to make generalizations about how principals feel about research in their schools.

Following are examples of questions that can be investigated in survey research studies, along with typical research designs:

- *How do second-grade teachers spend their teaching time?* Second-grade teachers are asked to fill out questionnaires, and results are presented as percentages (e.g., teachers spent 50% of their time lecturing, 20% asking or answering questions, 20% in discussion, and 10% providing individual student help).
- *How will citizens of Yourtown vote in the next school board election?* A sample of Yourtown citizens complete a questionnaire or interview, and results are presented as percentages (e.g., 70% said they will vote for Peter Pure, 20% named George Graft, and 10% are undecided). Survey research is described in more detail in Chapter 7.

Correlational Research

Correlational research involves collecting data to determine whether, and to what degree, a relation exists between two or more quantifiable variables. A **variable** is a placeholder that can assume any one of a range of values; for example, intelligence, height, and test score are variables. At a minimum, correlational research requires information about at least two variables obtained from a single group of participants.

The purpose of a correlational study may be to establish relations or use existing relations to make predictions. For example, a college admissions director may be interested in answering the question "How do the SAT scores of high school seniors correspond to the students' first-semester college grades?" If students' SAT scores are strongly related to their first-semester grades, SAT scores may be useful in predicting how students will perform in their first year of college. On the other hand, if there is little or no correlation between the two variables, SAT scores likely will not be useful as predictors.

Correlation refers to a quantitative measure of the degree of correspondence. The degree to which two variables are related is expressed as a **correlation coefficient**, which is a number between +1.00 and −1.00. Two variables that are not related have a correlation coefficient near 0.00. Two variables that are highly correlated will have a correlation coefficient near +1.00 or −1.00. A number near +1.00 indicates a positive correlation: As one variable increases, the other variable also increases (e.g., students with high SAT scores may also have high grade point averages [GPAs]). A number near −1.00 indicates a negative correlation: As one variable increases, the other variable decreases (e.g., a high GPA may correlate negatively with the likelihood of dropping out). Because very few pairs of variables are perfectly correlated, predictions based on them are rarely +1.0 or −1.0.

It is very important to note that the results of correlational studies do not suggest cause–effect relations among variables. Thus, a positive correlation between, for example, self-concept and achievement does not imply that self-concept causes achievement or that achievement causes self-concept. The correlation indicates only that students with higher self-concepts tend to have higher levels of achievement and that students with lower self-concepts tend to have lower levels of achievement. We cannot conclude that one variable is the cause of the other.

Following are examples of research questions tested with correlational studies:

- *What is the relation between intelligence and self-esteem?* Scores on an intelligence test and a measure of self-esteem are acquired