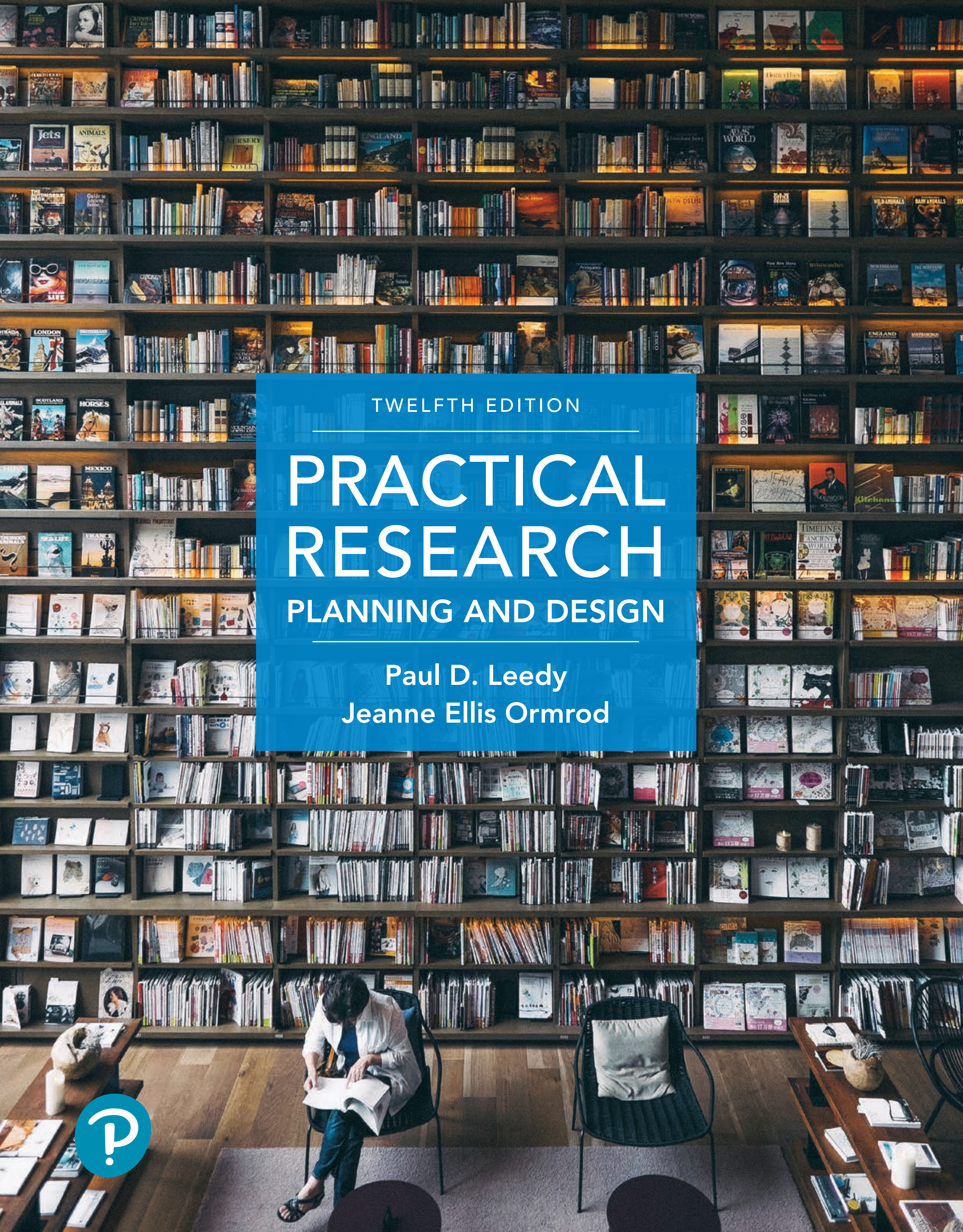
TWELFTH EDITION

PRACTICAL RESEARCH

PLANNING AND DESIGN

Paul D. Leedy
Jeanne Ellis Ormrod



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Preface

NEW TO THE TWELFTH EDITION

Every year brings new strategies for research design, data collection, and data analysis. Accordingly, this twelfth edition of the book has been revised in many ways. Discussions of some topics have been expanded—often with new, illustrative examples—and new topics have been added; meanwhile, sections that few of our readers were finding useful have been either reduced in length or eliminated altogether. Technology-based strategies have been updated to include new software options. And as always, every page has been revisited—every word, in fact—and many minor changes have been made to tighten the prose or enhance its clarity and readability.

Especially noteworthy changes in this edition are (a) a better balance between quantitative and qualitative methods than was true for the eleventh edition; (b) the addition of a new chapter on action research, with room for it being made by the elimination of the chapter on historical research (which reviewers have almost unanimously been telling us they don't assign in their classes); and (c) a reorganization of what were formerly Parts III, IV, and V (Chapters 6 through 12) into a new Part III ("Research Designs," with Chapters 6 through 10) and a new Part IV ("Data Analyses," with Chapters 11 and 12). The last of the changes just listed—the reorganization of chapters—was due in large part to the fact that researchers are increasingly drawing from both quantitative and qualitative traditions in their efforts to address important research problems and questions.

Other significant changes in this twelfth edition are the following:

- **Chapter 1.** Revised discussions of Step 1 and Step 4 in the research cycle, with Figure 1.1 also being revised accordingly; expansion of the section on philosophical assumptions to include *phenomenology* and *action-research* orientations; replacement of the key term *hypothesis* with *research hypothesis* to contrast it with the less formal hypotheses of everyday life; introduction of *purpose statement* as a key term; replacement of the key term *juried* with the term *peer-reviewed*, to reflect more popular terminology.
- **Chapter 2.** Discussion of research problems broadened to include research *questions* (the term more commonly used in qualitative research) and *purpose statements*; updated and expanded discussion of mind-mapping software, with new illustrative example (Figure 2.3); new section on identifying a *theoretical* or *conceptual framework* for a research study, along with (a) a new example and graphic illustrating the nature of a conceptual framework and (b) an additional suggestion to identify or create a theoretical/conceptual framework in the Practical Application feature "Writing the First Section of a Proposal."
- **Chapter 3.** Introduction of key term *open-access journal*; updated and expanded discussion of online databases; movement of what was formerly Table 13.1 ("Commonly Used Styles in Research Reports") to this chapter, where it is now Table 3.3; more specific recommendations for annotating sources during an in-house or online library search; new paragraph regarding the importance of writing an honest, nonbiased literature review; use of excerpts from a more current (2016) doctoral dissertation in the Dissertation Analysis feature.

- **Chapter 4.** Addition of the concept *unit of analysis* as a key term; explicit distinction between the key terms *assessment* and *measurement* (to create a better balance between qualitative and quantitative strategies in this and succeeding chapters); overhaul of the eleventh edition's section "Considering the Validity of Your Method" to give a better balance between qualitative and quantitative approaches, with the new heading "Enhancing the Credibility of Your Findings" (the in-depth discussion of *internal validity* in this section has been moved to Chapter 7); addition of follow-up studies as a strategy for enhancing the credibility of a research project; revision of the eleventh edition's section "External Validity" to offer a better balance between quantitative and qualitative methods, with a new heading "Enhancing the Generalizability of Your Findings"; renaming of the eleventh edition's section "Identifying Measurement Strategies" to "Choosing Appropriate Assessment Strategies," with a reorganization and many revisions to achieve a better quantitative/qualitative balance; new "Examples" column in Table 4.4 ("Contrasting the Four Types of Measurement Scales"); in many instances, replacement of the term *assessment instrument* with the more inclusive term *assessment strategy*; revision of the eleventh edition's section "Validity and Reliability in Measurement" (including revisions of glossary definitions of several key terms) to reflect a better balance between quantitative and qualitative approaches, with a heading change to "Validity and Reliability in Assessment."
- **Chapter 5.** Several minor changes in response to reviewers' concerns regarding (a) possible organizational structures for a research proposal, (b) the need for a reminder about not plagiarizing from other sources, and (c) the distinction between a reference list and a bibliography (in a new footnote).
- **Chapter 6.** Revision of the section on surveys to encompass qualitative as well as quantitative data collection; new section on *experience-sampling methods* (ESMs); in the section "Nonprobability Sampling," a new paragraph regarding the use of social media (e.g., Facebook) as a possible strategy for recruiting participants; significant revision of the eleventh edition's checklist "Analyzing Characteristics of the Population Being Studied" to include nonprobabilistic as well as probabilistic sampling, with the new title "Considering the Nature of the Population When Identifying Your Sampling Procedure"; addition of the *social desirability effect* as a bold-faced key term (with an accompanying hotlinked glossary definition) as a way of increasing its salience within the chapter.
- **Chapter 7.** Addition of a description of double-blind experiments and an in-depth discussion of internal validity (both discussions were previously in Chapter 4); relabeling of Designs 4 and 6 as *control-group pretest–posttest design* and *control-group posttest-only design,* respectively, to make them parallel to the labels for Designs 2 and 8; "down-grade" of term *repeated-measures design* from its previous key-term status (because the term *repeated measures* is increasingly being used in descriptive studies as well, especially in experience-sampling methods); switch from term *single-subject design* to the more contemporary and inclusive term *single-case intervention research,* with a new illustrative example that encompasses collection of data for both a single group and individual members of that group; addition of a reminder to *interpret* one's results regarding their relevance to one's initial research problem.
- **Chapter 8 (formerly Chapter 9).** Expansion of section on ethnographies to include *autoethnographies* and *reflective journals*; expansion of the section on phenomenological studies to include the *three-interview series* strategy for data collection; new section on *narrative inquiry*; expanded discussion of memos to include three types (reflective, methodological, and analytical memos); significant revision of the first Practical Application feature to include the key terms *credibility*, *transferability*, *dependability*, *confirmability*, *member checking*, and *audit trails*, along with the new title "Ensuring That Qualitative Data Collection Yields Credible, Trustworthy Data"; addition of the key terms *theoretical sampling*, *discriminant sampling*, *primary informants* (a.k.a.,

key informants), *extreme case sampling*, *convenience sampling*, and *snowball sampling* in the Practical Application feature "Selecting an Appropriate Sample for a Qualitative Study"; addition of *interview guide* as a key term in the guidelines for "Conducting a Productive Interview."

- **Chapter 9 (formerly Chapter 12).** New section on *longitudinal mixed-methods designs*; elimination of embedded designs as a category distinct from convergent designs (in line with Creswell's recent revisions of design categories); additional illustrative examples of mixed-methods research; expansion of Conceptual Analysis exercise "Identifying Mixed-Methods Research Designs" to include an example of a longitudinal mixed-methods design; movement of sections on "Analyzing and Interpreting Mixed-Methods Data" and "Systematic Reviews of Qualitative and Mixed-Methods Studies" to Chapter 12.
- **Chapter 10 (new chapter).** In-depth discussion of *action research* and *participatory designs*, which includes *teacher research*, *design-based research* (DBR), *participatory action research* (PAR), *youth participatory action research* (YPAR), and three distinct forms of *community-based research* (CBR); new Conceptual Analysis feature "Choosing an Action-Oriented Design"; new Practical Application feature "Deciding Whether to Use an Action Research and/or Participatory Design"; new sections "Data Collection and Analysis in Action Research" and "Disseminating the Findings of Action Research Projects"; new Practical Application feature "Using Community Forums as a Means of Disseminating the Results of Action Research and Participatory Research Projects"; new sample research report, with the usual side commentary.
- **Chapter 11 (formerly Chapter 8).** Simplification of Figure 11.10 (formerly Figure 8.10) to enhance its readability; addition of using a repeated-measures variable as a strategy for enhancing the power of statistical analyses; new paragraph regarding *data dredging* (a.k.a. *p-hacking*) as a generally inappropriate and potentially unethical practice; updated list of popular statistical software programs.
- **Chapter 12 (formerly Chapter 11).** Chapter title now "Analyzing Qualitative and Mixed-Methods Data"; substantially updated and expanded discussion of qualitative data analysis strategies; new example illustrating data analysis in an ethnographic study; addition and revision of sections "Analyzing and Interpreting Mixed-Methods Data," "Using Computer Software to Facilitate Mixed-Methods Data Analysis," and "Systematic Reviews of Qualitative and Mixed-Methods Studies" (all of which were previously in the chapter on mixed-methods research).
- **Chapter 13.** Movement of Table 13.1 (regarding style manuals) to Chapter 3 (where it is now Table 3.3); substantial revision of the checklist "Criteria for Critiquing a Research Report" so that it more even-handedly addresses important qualities of qualitative and mixed-methods research as well as those of quantitative research.
- **Appendix A.** Update that describes the use of Microsoft Excel 2016 for Macintosh (rather than the 2008 version used in the eleventh edition of the book); update of Figure A.1 to include more recent literature sources.

THE PURPOSE OF THIS BOOK

Practical Research: Planning and Design is a broad-spectrum, cross-disciplinary book suitable for a wide variety of courses in research methodology. Many basic concepts and strategies in research transcend the boundaries of specific academic areas, and such concepts and strategies are at the heart of this book. To some degree, certainly, research methods do vary from one subject area to another: A biologist might gather data by looking at specimens through a microscope, a psychologist by administering certain tests or systematically observing people's behavior, and an anthropologist by examining artifacts from a particular cultural group and perhaps from an earlier time period. Otherwise, the basic approach to research is the same. Regardless of the discipline, the researcher identifies a problem or question in need of a solution, collects data potentially relevant to the solution, analyzes and interprets the data, and draws conclusions that the data seem to warrant.

Students in the social sciences, the natural sciences, education, medicine, business administration, landscape architecture, and other academic disciplines have used this text as a guide to the successful completion of their research projects. *Practical Research* guides students from problem selection to completed research report with many concrete examples and practical, how-to suggestions. Students come to understand that research needs planning and design, and they discover how they can effectively and professionally conduct their own research projects. Essentially, this is a do-it-yourself, understand-it-yourself manual. From that standpoint, it can be a guide for students who are left largely to their own resources in carrying out their research projects. The book, supplemented by occasional counseling by an academic advisor, can guide the student to the completion of a successful research project.

LEARNING ABOUT THE RESEARCH PROCESS IS AN ESSENTIAL COMPONENT OF ACADEMIC TRAINING

All too often, students mistakenly believe that conducting research involves nothing more than amassing a large number of facts and incorporating them into a lengthy, footnoted paper. They reach the threshold of a master's thesis or doctoral dissertation only to learn that simply assembling previously known information is insufficient and unacceptable. Instead, they must do something radically different: They must try to answer a question that has never been answered before and, in the process, must discover something that no one else has ever discovered.

Research has one end: the discovery of some sort of "truth." Its purpose is to learn what has never before been known; to ask a significant question for which no conclusive answer has previously been found; and, by collecting and interpreting relevant data, to find an answer to that question.

Learning about and doing research are of value far beyond that of merely satisfying a program requirement. Research methods and their application to real-world problems are skills that will serve you for the rest of your life. The world is full of problems that beg for solutions; consequently, it is full of research activity! The media continually bring us news of previously unknown biological and physical phenomena, life-saving medical interventions, and ground-breaking technological innovations—all the outcomes of research. Research is not an academic banality; it is a vital and dynamic force that is indispensable to the health and well-being of planet Earth and its human and nonhuman inhabitants.

More immediate, however, is the need to apply research methodology to those lesser daily problems that nonetheless demand a thoughtful resolution. Those who have learned how to analyze problems systematically and dispassionately will live with greater confidence and success than those who have shortsightedly dismissed research as nothing more than a necessary hurdle on the way to a university degree.

Many students have found *Practical Research* quite helpful in their efforts both to understand the nature of the research process and to complete their research projects. Its simplification of research concepts and its readability make it especially suitable for those undergraduate and graduate students who are introduced, perhaps for the first time, to genuine research methodology.

We hope we have convinced you that a course on research methodology is not a temporary hurdle on the way to a degree but, instead, an unparalleled opportunity to learn how you might better tackle any problem for which you do not have a ready solution. In a few years you will undoubtedly look back on your research methods course as one of the most rewarding and practical courses in your entire educational experience.

Acknowledgments

Those who have had a part in the making of this book, known and unknown, friends and colleagues, gentle critics and able editors—all—are far too many to salute individually. But some individuals have especially stood out. First and foremost, I must thank Laura Ruth Johnson (Northern Illinois University), whose particular expertise in qualitative and mixed-methods research has enhanced the content of the two qualitative chapters (Chapters 8 and 12) in ways I could not possibly have done myself; Laura has also written most of the new chapter on action research (Chapter 10). Furthermore, Laura offered many helpful suggestions for how I might give a better quantitative-qualitative balance to Chapters 1 through 5.

Laura's contributions to this edition have been substantial enough that I have rightly credited her with a "with" status on the book's title page.

I must also thank Hadley Solomon (University of New Hampshire) both for the conceptual framework graphic used in Figure 2.3 and for her wise counsel and suggestions regarding the discussion of philosophical assumptions in Chapter 1.

In addition, those of you who have written in journals and textbooks about research methods and strategies, the generations of graduate and undergraduate students whom we authors have taught and who have also taught *us*, the kindly letters and e-mail messages that so many of you have written to suggest how we might improve on the book—to all of you, I extend my acknowledgment and appreciation wherever you may be. You have had the greater part in bringing this book through its previous 11 editions. I am especially grateful to reviewers of the 11th edition, who have offered many good suggestions for strengthening the book so that it can better assist novice researchers in the 21st century: Natasha V. Christie (University of North Florida), Rachel D. Goodman (George Mason University), Darren Liu (University of Nevada, Las Vegas), and Robert N. Ronau (University of Cincinnati).

I am also indebted to the students whose research proposals, doctoral dissertations, and master's theses have enabled me to illustrate some of the research and writing strategies described in the book. In particular, I extend my gratitude to Rosenna Bakari, Arthur Benton, Douglas Burtorff, Jennifer Chandler, Chelsie Hess, Dinah Jackson, Ginny Kinnick, Laura Lara-Brady, Christy Leung, Kimberly Mitchell, Luis Ramirez, Janie Shaklee, Nancy Thrailkill, and Debby Zambo. And I must certainly mention Hannah Wilson and Ernie Badger, who drew the maps used in Figure 12.3.

Equally important is to say "Thank you, thank you, thank you" to folks at Pearson Education and Cenveo Publisher Services who have been key players in bringing this book to fruition. In particular, I extend my deepest gratitude to Janelle Rogers, Pam Bennett, and Norine Strang, each of whom has expertly overseen execution of the many nitty-gritty details of the publishing process. Finally, I must thank our editor, Kevin Davis, for his guidance throughout this and preceding editions. Throughout its many editions, Kevin has shared Paul's and my vision for the book and struck the ever-so-important balance between providing substantive guidance.

Paul and I have had many hands guiding our pens plus many minds adding richness and depth to our thoughts. For that, I offer my humble and hearty thanks.

Jeanne Ellis Ormrod

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Chapter 1 The Nature and Tools of Research

In virtually every subject area, our collective knowledge about the world is incomplete: Certain questions remain unanswered, and certain problems remain unsolved. Systematic research provides many powerful tools—not only physical tools but also mental and social tools—that can help us discover possible answers and identify possible solutions.

Learning Outcomes

1.1 Distinguish between (a) common uses of the term *research* that reflect misconceptions about what research involves and (b) the true nature of research in academic settings.

1.2 Describe the iterative, cyclical nature of research, including the steps that a genuine research project involves.

1.3 Distinguish among positivism, postpositivism, constructivism, and pragmatism/realism as philosophical underpinnings of a research project.

1.4 Identify examples of how six general research tools can play significant roles in a research project: (a) the library and its resources, (b) computer technology, (c) measurement, (d) statistics, (e) language, and (f) the human mind.

1.5 Describe steps you might take to explore research in your field.

In everyday speech, the word *research* is often used loosely to refer to a variety of activities. In some situations the word connotes simply finding a piece of information or taking notes and then writing a so-called "research paper." In other situations it refers to the act of informing oneself about what one does not know, perhaps by rummaging through available sources to locate a few tidbits of information. Such uses of the term can create considerable confusion for university students, who must learn to use it in a narrower, more precise sense.

Yet when used in its true sense—as a systematic process that leads to new knowledge and understandings—the word *research* can suggest a mystical activity that is somehow removed from everyday life. Many people imagine researchers to be aloof individuals who seclude themselves in laboratories, scholarly libraries, or the ivory towers of large universities. In fact, research is often a practical enterprise that—given appropriate tools—*any* rational, conscientious individual can conduct. In this chapter we lay out the nature of true research and describe general tools that make it possible.

WHAT RESEARCH IS NOT

Following are three statements that describe what research is not. Accompanying each statement is an example that illustrates a common misconception about research.

1. ***Research is not merely gathering information.*** A sixth-grader comes home from school and tells her parents, "The teacher sent us to the library today to do research,

and I learned a lot about black holes." For this student, research means going to the library to find a few facts. This might be *information discovery,* or it might be learning *reference skills.* But it certainly is not, as the teacher labeled it, research.

2. ***Research is not merely rummaging around for hard-to-locate information.*** The house across the street is for sale. You consider buying it and call your realtor to find out how much someone else might pay you for your current home. "I'll have to do some research to determine the fair market value of your property," the realtor tells you. What the realtor calls doing "some research" means, of course, reviewing information about recent sales of properties comparable to yours; this information will help the realtor zero in on a reasonable asking price for your own home. Such an activity involves little more than searching through various files or websites to discover what the realtor previously did not know. Rummaging—whether through records in one's own office, at a library, or on the Internet—is not research. It is more accurately called an *exercise in self-enlightenment.*

3. ***Research is not merely transporting facts from one location to another.*** A college student reads several articles about the mysterious Dark Lady in William Shakespeare's sonnets and then writes a "research paper" describing various scholars' suggestions of who the lady might have been. Although the student does, indeed, go through certain activities associated with formal research—such as collecting information, organizing it in a certain way for presentation to others, supporting statements with documentation, and referencing statements properly—these activities do not add up to true research. The student has missed the essence of research: the *interpretation* of data. Nowhere in the paper does the student say, in effect, "These facts I have gathered seem to indicate such-and-such about the Dark Lady." Nowhere does the student interpret and draw conclusions from the facts. This student is approaching genuine research; however, the mere compilation of facts, presented with reference citations and arranged in a logical sequence—no matter how polished and appealing the format—misses genuine research by a hair. Such activity might more realistically be called *fact transcription, fact documentation, fact organization,* or *fact summarization.*

Going a little further, this student would have traveled from one world to another: from the world of mere transportation of facts to the world of interpretation of facts. The difference between the two worlds is the distinction between transference of information and genuine research—a distinction that is critical for novice researchers to understand.

WHAT RESEARCH IS

Research is a systematic process of collecting, analyzing, and interpreting information—*data*—in order to increase our understanding of a phenomenon about which we are interested or concerned.[1] People often use a systematic approach when they collect and interpret information to solve the small problems of daily living. Here, however, we focus on *formal*

[1]Some people in academia use the term *research* more broadly to include deriving new equations or abstract principles from existing equations or principles through a sequence of mathematically logical and valid steps. Such an activity can be quite intellectually challenging, of course, and is often at the heart of doctoral dissertations and scholarly journal articles in mathematics, physics, and related disciplines. In this book, however, we use the term *research* more narrowly to refer to *empirical* research—research that involves the collection and analysis of new data.

FIGURE 1.1 The Research Cycle

research, research in which we intentionally set out to enhance our understanding of a phenomenon and expect to communicate what we discover to the larger scientific community.

Although research projects vary in complexity and duration, research generally involves seven distinct steps, shown in Figure 1.1. We now look at each of these steps more closely.

1. ***The researcher begins with a problem—an unanswered question—related to a topic of interest and concern.*** The impetus for all good research is a desire to acquire new information that advances our collective understandings of physical, biological, social, or psychological phenomena. At a minimum, good researchers are *curious* researchers: They genuinely want to learn more about a particular topic. Many of them are also motivated to identify possible solutions to local, regional, or global problems—solutions that might either directly or indirectly enhance the well-being of humankind or of the physical, biological, and social environments in which we live.

As you think about your topic of interest, consider these questions: What is such-and-such a situation like? Why does such-and-such a phenomenon occur? Might such-and-such an intervention alter the current state of affairs? What does it all mean? With questions like these, research begins.

2. ***The researcher clearly and specifically articulates the goal of the research endeavor.*** A critical next step is to pin down the issue or question—which we will refer to as the **research problem**—that the researcher will address. The ultimate goal of the research must be set forth in a grammatically complete sentence that specifically and precisely identifies the question the researcher will try to answer. When you describe your objective in clear, concrete terms, you have a good idea of what you need to accomplish and can direct your efforts accordingly.

3. ***The researcher often divides the principal problem into more manageable subproblems.*** From a design standpoint, it is often helpful to break a main research problem into several subproblems that, when solved, can possibly resolve the main problem.

Breaking down principal problems into small, easily solvable subproblems is a strategy we use in everyday living. For example, suppose you want to drive from your hometown to a town many miles or kilometers away. Your principal goal is to get from one location to the other as expeditiously as possible. You soon realize, however, that the problem involves several subproblems:

Main problem:	How do I get from Town A to Town B?
Subproblems:	1. What route appears to be the most direct one?
	2. Is the most direct one also the quickest one? If not, what route might take the least amount of time?
	3. Which is more important to me: minimizing my travel time or minimizing my energy consumption?
	4. At what critical junctions in my chosen route must I turn right or left?

Thus, what initially appears to be a single question can be divided into several smaller questions that must be addressed before the principal question can be resolved.

So it is with most research problems. By closely inspecting the principal problem, the researcher often uncovers important subproblems. By addressing each of the subproblems, the researcher can more easily address the main problem. If a researcher doesn't take the time or trouble to isolate the lesser problems within the major problem, the overall research project can become cumbersome and difficult to manage.

Identifying and clearly articulating the problem and its subproblems are the essential starting points for formal research. Accordingly, we discuss these processes in depth in Chapter 2.

4. ***The researcher identifies general assumptions—and possibly also specific hypotheses—that underlie the research effort.*** An **assumption** is a condition that is taken for granted, without which the research project would be pointless. For example, imagine that your problem is to investigate whether students learn the unique grammatical structures of a language more quickly by studying only one foreign language at a time or by studying two foreign languages concurrently. What assumptions would underlie such a problem? At a minimum, you must assume that

- The teachers used in the study are competent to teach the language or languages in question and have mastered the grammatical structures of the language(s) they are teaching.
- The students taking part in the research are capable of mastering the unique grammatical structures of any language(s) they are studying.
- The languages selected for the study have sufficiently different grammatical structures that students might reasonably learn to distinguish between them.

Aside from such basic ideas as these, however, careful researchers state their assumptions, so that other people inspecting the research project can evaluate it in accordance with *their own* assumptions. For instance, a researcher might assume that

- Participants' responses in a paper-and-pencil questionnaire, face-to-face interview, or online survey are reasonably accurate indicators of their actual behaviors or opinions.
- Behaviors observed in an artificial laboratory environment can effectively reveal how people or other animal species are likely to behave in more natural, real-world settings.
- Certain assessment instruments (e.g., widely used intelligence tests, personality tests, and interest inventories) reflect relatively stable personal characteristics that are unlikely to change very much in the near future. (We examine this issue in detail in the discussion of *validity* of assessment instruments in Chapter 4.)

As you will discover in upcoming chapters, researchers can sometimes support such assumptions by citing past research findings or collecting certain kinds of data within their own research projects.

In addition to stating basic assumptions, many researchers form one or more hypotheses about what they might discover. A *hypothesis* is a logical supposition, a reasonable guess, an educated conjecture. In formal research, it might be more specifically called a **research hypothesis**, in that it provides a tentative explanation for a phenomenon under investigation. It may direct your thinking to possible sources of information that will aid in resolving one or more subproblems and, as a result, may also help you resolve the principal research problem. When one or more research hypotheses are proposed prior to any data collection, they are known as ***a priori*** **hypotheses**—a term whose Latin roots mean "from something before."

Hypotheses are certainly not unique to research. In your everyday life, if something happens, you immediately try to account for its cause by making some reasonable conjectures. For example, imagine that you come home after dark, open your front door, and reach inside for the switch that turns on a nearby table lamp. Your fingers find the switch. You flip it. No light. At this point, you identify several hypotheses regarding the lamp's failure:

Hypothesis 1: A recent storm has disrupted your access to electrical power.
Hypothesis 2: The bulb has burned out.
Hypothesis 3: The lamp isn't securely plugged into the wall outlet.
Hypothesis 4: The wire from the lamp to the wall outlet is defective.
Hypothesis 5: You forgot to pay your electric bill.

Each of these hypotheses hints at a strategy for acquiring information that may resolve the nonfunctioning-lamp problem. For instance, to test Hypothesis 1, you might look outside to see whether your neighbors have lights, and to test Hypothesis 2, you might replace the current light bulb with a new one.

Hypotheses in a research project are as tentative as those for a nonfunctioning table lamp. For example, a biologist might speculate that certain human-made chemical compounds increase the frequency of birth defects in frogs. A psychologist might speculate that certain personality traits lead people to show predominantly liberal or conservative voting patterns. A marketing researcher might speculate that humor in a television commercial will capture viewers' attention and thereby will increase the odds that viewers buy the advertised product. Notice the word *speculate* in all of these examples. Good researchers always begin a project with open minds about what they may—or may *not*—discover in their data.

Hypotheses—predictions—are an essential ingredient in certain kinds of research, especially experimental research (see Chapter 7). To a lesser degree, they might guide other forms of research as well, but they are intentionally *not* identified in the early stages of some kinds of qualitative research (e.g., see the discussion of grounded theory studies in Chapter 8).

5. ***The researcher develops a specific plan for addressing the problem and its subproblems.*** Research is not a blind excursion into the unknown, with the hope that

the data necessary to address the research problem will magically emerge. It is, instead, a carefully planned itinerary of the route you intend to take in order to reach your final destination—your research goal. Consider the title of this text: *Practical Research: Planning and Design.* The last three words—*Planning and Design*—are especially important ones. Researchers plan their overall research design and specific research methods in a purposeful way so that they can acquire data relevant to their research problem and subproblems. Depending on the research question, different designs and methods are more or less appropriate.

In the formative stages of a research project, much can be decided: Are any existing data directly relevant to the research problem? If so, where are they, and are you likely to have access to them? If the needed data *don't* currently exist, how might you generate them? And later, after you have acquired the data you need, what will you do with them? Such questions merely hint at the fact that planning and design cannot be postponed. Each of the questions just listed—and many more—must have an answer early in the research process. In Chapter 4, we discuss several general issues related to research planning. Then, beginning in Chapter 6, we describe strategies related to various research methodologies.

You should note here that we are using the word *data* as a plural noun; for instance, we ask "Where *are* the data?" rather than "Where *is* the data?" Contrary to popular usage of the term as a singular noun, *data* (which has its origins in Latin) refers to two or more pieces of information. A single piece of information is known as a *datum,* or sometimes as a *data point.*

6. ***The researcher collects, organizes, and analyzes data related to the problem and its subproblems.*** After a researcher has isolated the problem, divided it into appropriate subproblems, identified assumptions (and possibly also *a priori* hypotheses), and chosen a suitable design and methodology, the next step is to collect whatever data might be relevant to the problem and organize and analyze those data in meaningful ways.

The data collected in research studies take one or both of two general forms. **Quantitative research** involves looking at amounts, or *quantities,* of one or more variables of interest. A quantitative researcher tries to measure variables in some numerical way, perhaps by using commonly accepted measures of the physical world (e.g., rulers, thermometers, oscilloscopes) or carefully designed measures of psychological characteristics or behaviors (e.g., tests, questionnaires, rating scales).

In contrast, **qualitative research** involves looking at characteristics, or *qualities,* that cannot be entirely reduced to numerical values. A qualitative researcher typically aims to examine the many nuances and complexities of a particular phenomenon. You are most likely to see qualitative research in studies of complex human situations (e.g., people's in-depth perspectives about a particular issue, the behaviors and values of a particular cultural group) or complex human creations (e.g., television commercials, works of art). Qualitative research isn't limited to research problems involving human beings, however. For instance, some biologists study, in a distinctly qualitative manner, the complex social behaviors of other animal species; Dian Fossey's work with gorillas and Jane Goodall's studies of chimpanzees are two well-known examples (e.g., see Fossey, 1983; Goodall, 1986).

The two kinds of data—quantitative and qualitative—often require distinctly different research methods and data analysis strategies. Accordingly, three of the book's subsequent chapters focus predominantly on quantitative techniques (see Chapters 6, 7, and 11), and two others focus almost exclusively on qualitative techniques (see Chapters 8 and 12). Nevertheless, we urge you *not* to think of the quantitative–qualitative distinction as a mutually exclusive, *it-has-to-be-one-thing-or-the-other* dichotomy. Many researchers collect both quantitative and qualitative data in a single research project—an approach sometimes known as **mixed-methods research** (see Chapter 9). And in **action research**, one or more researchers—who are often practitioners in a particular helping profession (e.g., education, counseling, social work, medicine)—might use both quantitative and qualitative methods in an effort to improve current practices and desired outcomes (see Chapter 10). Good researchers tend to be *eclectic* researchers who draw from diverse methodologies and data sources in order to best address their research problems and questions (e.g., see Gorard, 2010; Lather, 2006; Onwuegbuzie & Leech, 2005).

7. ***The researcher interprets the meaning of the data as they relate to the problem and its subproblems.*** Quantitative and qualitative data are, in and of themselves, *only* data—nothing more. The significance of the data depends on how the researcher extracts *meaning* from them. In research, uninterpreted data are worthless: They can never help us answer the questions we have posed.

Yet researchers must recognize and come to terms with the subjective and dynamic nature of interpretation. Consider, for example, the many books written on the assassination of U.S. President John F. Kennedy. Different historians have studied the same events: One may interpret them one way, and another may arrive at a very different conclusion. Which one is right? Perhaps they both are; perhaps neither is. Both may have merely posed new problems for other historians to try to resolve. Different minds often find different meanings in the same set of facts.

Once we believed that clocks measured time and that yardsticks measured space. In one sense, they still do. We further assumed that time and space were two different entities. Then along came Einstein's theory of relativity, and time and space became locked into one concept: the time–space continuum. What's the difference between the old perspective and the new one? It's the way we think about, or interpret, the same information. The realities of time and space have not changed; the way we interpret them has.

Data demand interpretation. But no rule, formula, or algorithm can lead the researcher unerringly to a correct interpretation. Interpretation is inevitably a somewhat subjective process that depends on the researcher's assumptions, hypotheses, and logical reasoning processes.

Now think about how we began this chapter. We suggested that certain activities cannot accurately be called research. At this point you can understand why. None of those activities demands that the researcher draw any conclusions or make any interpretations of the data.

We must emphasize two important points related to the seven-step process just described. First, *the process is* ***iterative:*** A researcher sometimes needs to move back and forth between two or more steps along the way. For example, while developing a specific plan for a project (Step 5), a researcher might realize that a genuine resolution of the research problem requires addressing a subproblem not previously identified (Step 3). And while interpreting the collected data (Step 7), a researcher may decide that additional data are needed to fully resolve the problem (Step 6).

Second, *the process is* ***cyclical***. The final step in the process depicted in Figure 1.1—interpretation of the data—is not *really* the final step at all. Only rarely is a research project a one-shot effort that completely resolves a problem; more often, it is likely to unearth new questions related to the issue at hand. And if specific hypotheses have been put forth, either *a priori* or after data have been collected and analyzed, those hypotheses are rarely proved or disproved beyond a shadow of a doubt. Instead, they are either *supported* or *not supported* by the data. If the data are consistent with a particular hypothesis, the researcher can make a case that the hypothesis probably has some merit and should be taken seriously. In contrast, if the data run contrary to a hypothesis, the researcher *rejects* the hypothesis and might turn to other hypotheses as being more likely explanations of the phenomenon in question. In any of these situations, one or more additional, follow-up studies are called for.

Ultimately, then, most research studies don't bring total closure to a research problem. There is no obvious end point—no point at which a researcher can say "*Voila!* I've completely answered the question about which I'm concerned." Instead, research typically involves a cycle—or more accurately, a *helix* (spiral)—in which one study spawns additional, follow-up studies. In exploring a topic, one comes across additional problems that need resolving, and so the process must begin anew. Research begets more research.

To view research in this way is to invest it with a dynamic quality that is its true nature—a far cry from the conventional view, which sees research as a one-time undertaking that is static, self-contained, an end in itself. Here we see another difference between true research and the nonexamples of research presented earlier in the chapter. Every researcher soon learns that genuine research is likely to yield as many problems as it resolves. Such is the nature of the acquisition of knowledge.

PHILOSOPHICAL ASSUMPTIONS UNDERLYING RESEARCH METHODOLOGIES

Let's return to Step 4 in the research process: *The researcher identifies assumptions—and possibly also hypotheses—that underlie the research effort.* The assumptions underlying a research project are sometimes so seemingly self-evident that a researcher may think it unnecessary to mention them. In fact, the researcher may not even be consciously aware of them. For example, two general assumptions underlie many research studies:

- The phenomenon under investigation is somewhat lawful and predictable; it is *not* comprised of completely random events.
- Cause-and-effect relationships can account for certain patterns observed in the phenomenon.

But are such assumptions justified? Is the world a lawful place, with some things definitely causing or influencing others? Or are definitive laws and cause-and-effect relationships nothing more than figments of our fertile human imaginations?

As we consider such questions, it is helpful to distinguish among different philosophical orientations that point researchers in somewhat different directions in their quests to make sense of our physical, biological, social, and psychological worlds.[2] Historically, a good deal of research in the natural sciences has been driven by a perspective known as **positivism**. Positivists believe that, with appropriate measurement tools, scientists can objectively uncover absolute, undeniable *truths* about cause-and-effect relationships within the physical world and human experience.

In the social sciences, many researchers are—and most others *should* be—less self-assured and more tentative about their assumptions. Some social scientists take a perspective known as **postpositivism**, believing that true objectivity in seeking absolute truths can be an elusive goal. Although researchers might strive for objectivity in their collection and interpretation of data, they inevitably bring certain *biases* to their investigations—perhaps biases regarding the best ways to measure certain variables or the most logical inferences to draw from patterns within the data. From a postpositivist perspective, progress toward genuine understandings of physical, social, and psychological phenomena tends to be gradual and probabilistic. For example, recall the earlier discussion of hypotheses being either *supported* or *not supported* by data. Postpositivists don't say, "I've just proven such-and-such." Rather, they're more likely to say, "This increases the probability that such-and-such is true."

[2]Some writers use terms such as *worldviews, epistemologies,* or *paradigms* instead of the term *philosophical orientations.*

Other researchers have abandoned any idea that absolute truths are somewhere "out there" in the world, waiting to be discovered. In this perspective, known as **constructivism**, the "realities" researchers identify are nothing more than human *creations* that can be helpful in finding subjective meanings within the data collected.[3] Constructivists not only acknowledge that they bring certain biases to their research endeavors but also try to be as up-front as possible about these biases. The emphasis on subjectivity and bias—rather than objectivity—applies to the phenomena that constructivist researchers study as well. By and large, constructivists focus their inquiries on people's *perceptions* and *interpretations* of various phenomena, including individuals' behaviors, group processes, and cultural practices.

In yet another perspective, known as **phenomenology**, the focus is entirely on how human beings *experience* themselves and their world as they go through life. Researchers with this orientation typically ask the question, "What is it like to experience such-and-such?" For example, they might ask, "What is it like . . . to have attention-deficit disorder?" ". . . to run for political office?" ". . . to undergo chemotherapy?" ". . . to immigrate to an English-speaking country without any knowledge of English?" In our view, a phenomenological orientation is also a constructivist orientation, in that people's constructed realities are essential components of their lived experiences. However, some scholars argue that the two perspectives are distinctly different entities.

Many of the quantitative methodologies described in this book have postpositivist, probabilistic underpinnings—a fact that becomes especially evident in the discussion of statistics in Chapter 11. In contrast, some qualitative methodologies have a distinctly constructivist or phenomenological bent, with a focus on ascertaining people's beliefs, perceptions, and experiences, rather than trying to pin down absolute, objective truths that might not exist at all.

But once again we urge you *not* to think of quantitative research and qualitative research as reflecting a mutually exclusive, *either-this-or-that* dichotomy. For instance, some quantitative researchers approach a research problem from a constructivist framework, and some qualitative researchers tend to think in a postpositivist manner. Many researchers acknowledge *both* that (a) absolute truths regarding various phenomena may actually exist—even if they are exceedingly difficult to discover—and (b) human beings' self-constructed beliefs and experiences are legitimate objects of study in their own right. You might see such labels as **pragmatism** and **realism** used in reference to this orientation (e.g., see R. B. Johnson & Onwuegbuzie, 2004; Maxwell & Mittapalli, 2010).

Presumably, most researchers hope that their findings will either directly or indirectly be useful to humankind as a whole. But some researchers focus almost exclusively on how human actions can lead to beneficial outcomes. In an orientation that goes by various names, including *action research, praxis,* and *social action,* a researcher places a particular human action or intervention front and center in an investigation—perhaps studying a particular approach to physical therapy, reading instruction, protection of an endangered species, or rainforest preservation—with the ultimate goal being to enhance the well-being of our planet or some of its inhabitants (e.g., see Gergen, Josselson, & Freeman, 2015). The researcher determines whether the intervention has a desired effect and then, after some analysis and reflection, may modify the intervention to further enhance its effectiveness. Clearly, these practically oriented researchers assume that some cause-and-effect relationships do exist in our world and that, more specifically, we human beings can have a beneficial impact on our physical, biological, social, or psychological environments.

[3] In some fields (e.g., in business), this perspective is often called *interpretivism.*

TOOLS OF RESEARCH

Every professional needs specialized tools in order to work effectively. Without hammer and saw, the carpenter is out of business; without scalpel or forceps, the surgeon cannot practice. Researchers, likewise, have their own set of tools to carry out their plans. The tools that researchers use to achieve their research goals can vary considerably depending on the discipline. A microbiologist needs a microscope and culture media; an attorney needs a library of legal decisions and statute law. By and large, we don't discuss such discipline-specific tools in this book. Rather, our concern here is with general tools of research that the great majority of researchers of all disciplines need in order to collect data and derive meaningful conclusions.

We should be careful not to equate the *tools* of research with the *methodology* of research. A **research tool** is a specific mechanism or strategy the researcher uses to collect, manipulate, or interpret data. The **research methodology** is the general approach the researcher takes in carrying out the research project; to some extent, this approach dictates the particular tools the researcher selects.

Confusion between the tool and the research method is immediately recognizable. Such phrases as "library research" and "statistical research" are telltale signs and largely meaningless terms. They suggest a failure to understand the nature of formal research, as well as a failure to differentiate between tool and method. The library is merely a place for locating certain information that will be analyzed and interpreted at some point in the research process. Likewise, statistics merely provide ways to analyze and summarize data, thereby allowing us to see patterns within the data more clearly.

In the following sections, we look more closely at six general tools of research:

1. The library and its resources
2. Computer technology
3. Measurement
4. Statistics
5. Language
6. The human mind

The Library and Its Resources

Historically, many literate human societies used libraries to assemble and store their collective knowledge. For example, in the seventh century B.C., the ancient Assyrians' Library of Nineveh contained 20,000 to 30,000 tablets, and in the second century A.D., the Romans' Library of Celsus at Ephesus housed more than 12,000 papyrus scrolls and, in later years, many parchment books as well.[4]

Until the past few decades, libraries were primarily repositories of concrete, physical representations of knowledge—clay tablets, scrolls, manuscripts, books, journals, films, and the like. For the most part, any society's collective knowledge expanded rather slowly and could seemingly be contained within masonry walls. But by the latter half of the 20th century, people's knowledge about their physical and social worlds began to increase many times over, and at the present time, it continues to increase at an astounding rate. In response, libraries have evolved in important ways. First, they have made use of many emerging technologies (e.g., microforms, CDs, DVDs, online databases) to store information in more compact forms. Second, they have provided increasingly fast and efficient means of locating and

[4] Many academic scholars would instead say "seventh century BCE" and "second century CE" in this sentence, referring to the more religion-neutral terms *Before Common Era* and *Common Era.* However, we suspect that some of our readers are unfamiliar with these terms, hence our use of the more traditional ones.

accessing information on virtually any topic. And third, many of them have made catalogs of their holdings available on the Internet. The libraries of today—especially university libraries—extend far beyond their local, physical boundaries.

We explore efficient use of a library and its resources in depth in Chapter 3. For now, we simply want to stress that the library is—and must be—one of the most valuable tools in any researcher's toolbox.

Computer Technology

As research tools, personal computers—whether they take the form of desktops, laptops, tablets, or smartphones—are now commonplace. In addition, computer software packages and applications have become increasingly user-friendly, such that novice researchers can easily take advantage of them. But like any tool—no matter how powerful—computer technology has its limitations. Yes, computers can certainly calculate, compare, search, retrieve, sort, and organize data more efficiently and accurately than you can. But in their present stage of development, they depend largely on people to give them directions about what to do.

A computer is not a miracle worker—it can't do your thinking for you. It can, however, be a fast and faithful assistant. When told exactly what to do, it is one of the researcher's best friends. Table 1.1 offers suggestions for how you might use computer technology as a research tool.

Measurement

Especially when conducting quantitative research, a researcher needs a systematic way of *measuring* the phenomena under investigation. Some common, everyday measurement instruments—rulers, scales, stopwatches—can occasionally be helpful for measuring easily observable variables, such as length, weight, or time. But in most cases, a researcher needs one or more specialized instruments. For example, an astronomer might need a high-powered telescope to detect patterns of light in the night sky, and a neurophysiologist might need a magnetic resonance imaging (MRI) machine to detect and measure neural activity in the brain.

In quantitative research, social and psychological phenomena require measurement as well, even though they have no concrete, easily observable basis in the physical world. For example, an economist might use the Dow-Jones Industrial Average or NASDAQ index to track economic growth over time, a sociologist might use a questionnaire to assess people's attitudes about marriage and divorce, and an educational researcher might use an achievement test to measure the extent to which schoolchildren have acquired knowledge and skills related to a particular topic. Finding or developing appropriate measurement instruments for social and psychological phenomena can sometimes be quite a challenge. Thus, we explore measurement strategies in some depth when we discuss the research planning process in Chapter 4.

Statistics

As you might guess, statistics are most helpful in quantitative research, although they occasionally come in handy in qualitative research as well. Statistics also tend to be more useful in some academic disciplines than in others. For instance, researchers use them quite often in such fields as psychology, medicine, and business; they use statistics less frequently in such fields as history, musicology, and literature.

Statistics have two principal functions: to help a researcher (a) describe quantitative data and (b) draw inferences from these data. **Descriptive statistics** help the researcher capture the general nature of the data obtained—for instance, how certain measured characteristics appear to be "on average," how much variability exists within a data set, and how closely two

TABLE 1.1 The Computer As a Research Tool

Part of the Study	*Relevant Technological Support Tools*
Planning the study	• Brainstorming assistance—software used to help generate and organize ideas related to the research problem, research strategies, or both. • Outlining assistance—software used to help structure various aspects of the study and focus work efforts. • Project management assistance—software used to schedule and coordinate varied tasks that must occur in a timely manner. • Budget assistance—spreadsheet software used to help in outlining, estimating, and monitoring the potential costs involved in the research effort.
Literature review	• Literature identification assistance—online databases used to help identify relevant research studies to be considered during the formative stages of the research endeavor. • Communication assistance—computer technology used to communicate with other researchers who are pursuing similar topics (e.g., e-mail, Skype, electronic bulletin boards, list servers). • Writing assistance—software used to facilitate the writing, editing, formatting, and citation management of the literature review.
Study implementation and data gathering	• Materials production assistance—software used to develop instructional materials, visual displays, simulations, or other stimuli to be used in experimental interventions. • Experimental control assistance—software used to physically control the effects of specific variables and to minimize the influence of potentially confounding variables. • Survey distribution assistance—databases and word-processing software used in combination to send specific communications to a targeted population. • Online data collection assistance—websites used to conduct surveys and certain other types of studies on the Internet. • Field based data collection assistance—software used to take field notes or to monitor specific types of responses given by participants in a study.
Analysis and interpretation	• Organization and transcription assistance—software used to assemble, categorize, code, integrate, and search potentially huge data sets (such as qualitative interview data or open-ended responses to survey questions). • Conceptual assistance—software used to write and store ongoing reflections about data or to construct theories that integrate research findings. • Statistical assistance—statistical and spreadsheet software packages used to categorize and analyze various types of data sets. • Graphic production assistance—software used to depict data in graphic form to facilitate interpretation.
Reporting	• Communication assistance—telecommunication software used to distribute and discuss research findings and initial interpretations with colleagues and to receive their comments and feedback. • Writing and editing assistance—word-processing software used to write and edit successive drafts of the final report. • Dissemination assistance—desktop publishing software and poster-creation software used to produce professional-looking documents and posters that can be displayed or distributed at conferences and elsewhere. • Presentation graphics assistance—presentation software used to create static and animated slides for conference presentations. • Networking assistance—blogs, social networking sites, and other Internet-based mechanisms used to communicate one's findings to a wider audience and to generate discussion for follow-up studies by others in the field.

or more characteristics are associated with one another. In contrast, **inferential statistics** help the researcher make decisions about the data. For example, they might help a researcher decide whether the differences observed between two experimental groups are large enough to be attributed to the differing experimental interventions rather than to a once-in-a-blue-moon fluke. Both of these functions of statistics ultimately involve summarizing the data in some way.

In the process of summarizing data, statistical analyses often create entities that have no counterpart in reality. Let's take a simple example: Four students have part-time jobs on campus. One student works 24 hours a week in the library, a second works 22 hours a week in the campus bookstore, a third works 12 hours a week in the parking lot, and the fourth works 16 hours a week in the cafeteria. One way of summarizing the students' work hours is to calculate the arithmetic mean.[5] By doing so, we find that, "on average," the students work 18.5 hours a week. Although we have learned something about these four students and their working hours, to some extent we have learned a myth: None of these students has worked exactly 18.5 hours a week. That figure represents absolutely no fact in the real world.

If statistics offer only an unreality, then why use them? Why create myth out of hard, demonstrable data? The answer lies in the nature of the human mind. Human beings can cognitively think about only a very limited amount of information at any single point in time.[6] Statistics help condense an overwhelming body of data into an amount of information that the mind can more readily comprehend and deal with. In the process, they can help a researcher detect patterns and relationships in the data that might otherwise go unnoticed. More generally, statistics *help the human mind comprehend disparate data as an organized whole.*

Any researcher who uses statistics must remember that calculating statistical values is not—and must not be—the final step in a research endeavor. The ultimate question in research is, *What do the data indicate?* Statistics yield *information* about data, but conscientious researchers are not satisfied until they determine the *meaning* of this information.

Although a book such as this one can't provide all of the nitty-gritty details of statistical analysis, we give you an overview of potentially useful statistical techniques in Chapter 11.

Language

One of humankind's greatest achievements is language. Not only does it allow us to communicate with one another, but it also enables us to think more effectively. People can often think more clearly and efficiently about a topic when they can represent their thoughts in their heads with specific words and phrases.

For example, imagine that you're driving along a country road. In a field to your left, you see an object with the following characteristics:

- Black and white in color, in a splotchy pattern
- Covered with a short, bristly substance
- Appended at one end by something similar in appearance to a paintbrush
- Appended at the other end by a lumpy thing with four smaller things coming out of its top (two soft and floppy; two hard, curved, and pointed)
- Held up from the ground by four spindly sticks, two at each end

Unless you have spent most of your life living under a rock, you would almost certainly identify this object as a *cow.*

Words—even those as simple as *cow*—and the concepts that the words represent enhance our thinking in several ways (J. E. Ormrod, 2016; also see Jaccard & Jacoby, 2010):

1. ***Words reduce the world's complexity.*** Classifying similar objects and events into categories and assigning specific words to those categories can make our experiences easier to make sense of. For instance, it's much easier to think to yourself, "I see a herd of cows," than to think, "There is a brown object, covered with bristly stuff, appended by a paintbrush and a lumpy thing, and held up by four sticks. Ah, yes, and I also see a black-and-white spotted

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[5]When the word *arithmetic* is used as an adjective, as it is here, it is pronounced with emphasis on the third syllable ("ar-ith-MET-ic").

[6]If you have some background in human memory and cognition, you may realize that we are talking about the limited capacity of *working memory* here (e.g., see Cowan, 2010; J. E. Ormrod, 2016).

object, covered with bristly stuff, appended by a paintbrush and a lumpy thing, and held up by four sticks. And over there is a brown-and-white object. . . .”

2. ***Words allow abstraction of the environment.*** An object that has bristly stuff, a paintbrush at one end, a lumpy thing at the other, and four spindly sticks on its underside is a concrete entity. The concept *cow,* however, is more abstract: It connotes such characteristics as *female, supplier of milk,* and, to the farmer, *economic asset.* Concepts and the labels associated with them allow us to think about our experiences without necessarily having to consider all of their discrete, concrete characteristics.

3. ***Words enhance the power of thought.*** When you are thinking about an object covered with bristly stuff, appended by a paintbrush and a lumpy thing, held up by four sticks, and so on, you can think of little else (as mentioned earlier, human beings can think about only a very limited amount of information at any one time). In contrast, when you simply think *cow,* you can easily think about other ideas at the same time (e.g., *farmer, milk, pasteurization*) and perhaps form connections and interrelationships among them in ways you hadn’t previously considered.

4. ***Words facilitate generalization and inference drawing in new situations.*** When we learn a new concept, we associate certain characteristics with it. Then, when we encounter a new instance of the concept, we can draw on our knowledge of associated characteristics to make assumptions and inferences about the new instance. For instance, if you see a herd of cattle as you drive through the countryside, you can infer that you are passing through either dairy or beef country, depending on whether you see large udders hanging down between two of the spindly sticks.

Just as *cow* helps us categorize certain experiences into a single idea, so, too, does the terminology of your discipline help you interpret and understand your observations. The words *tempo, timbre,* and *perfect pitch* are useful to the musicologist. Such terms as *central business district, folded mountain,* and *distance to k* have special meaning for the geographer. The terms *learning outcome, classroom climate,* and *student at risk* communicate a great deal to the educator. Learning the specialized terminology of your field is indispensable to conducting a research study, grounding it in prior theories and research, and communicating your results to others.

Two outward manifestations of language usage are also helpful to the researcher: (a) knowing two or more languages and (b) writing one’s thoughts either on paper or in electronic form.

The Benefits of Knowing Two or More Languages

It should go without saying that not all important research is reported in a researcher’s native tongue. Accordingly, some doctoral programs require that students demonstrate reading competency in one or two foreign languages in addition to their own language. The choice of these languages is usually linked to the area of proposed research.

The language requirement is a reasonable one. Research is and always has been a worldwide endeavor. For example, researchers in Japan have made gigantic strides in electronics and robotics. And two of the most influential theorists in child development today—Jean Piaget and Lev Vygotsky—wrote in French and Russian, respectively. Many new discoveries are first reported in a researcher’s native language.

Knowing two or more languages has a second benefit as well: Words in a second language may capture the *meaning* of certain phenomenon in ways that one’s native tongue may not. For example, the German word *Gestalt*—which roughly means “organized whole”—has no direct equivalent in English. Thus, many English-speaking psychologists use this word when describing the nature of human perception, enabling them to communicate the idea that people often perceive organized patterns and structures in visual data that, in the objective physical world, are *not* organized. Likewise, the Zulu word *ubuntu* defies an easy translation into English. This word—which reflects the belief that people become fully human largely through regularly caring for others and contributing to the common good—can help anthropologists and other social scientists capture a cultural worldview quite different from the more self-centered perspective so prevalent in mainstream Western culture.

The importance of writing To be generally accessible to the larger scientific community and ultimately to society as a whole, all research must eventually be presented as a written document—a *research report*—either on paper or in electronic form. A basic requirement for writing such a report is the ability to use language in a clear, coherent manner.

Although a good deal of conventional wisdom tells us that clear thinking *precedes* clear writing, writing can in fact be a productive form of thinking in and of itself. When you write your ideas down on paper, you do several things:

- You must identify the specific things you do and don't know about your topic.
- You must clarify and organize your thoughts sufficiently to communicate them to your readers.
- You may detect gaps and logical flaws in your thinking.

Perhaps it isn't surprising, then, that writing about a topic actually enhances the writer's understanding of the topic (e.g., Kellogg, 1994; Mueller & Oppenheimer, 2014; Shanahan, 2004).

If you wait until all your thoughts are clear before you start writing, you may never begin. Thus we recommend that you start writing parts of your research proposal or report as soon as possible. Begin with a title and a **purpose statement**—one or more sentences that clearly describe the primary goal(s) you hope to achieve by conducting your study. Commit your title to paper; keep it in plain sight as you focus your ideas. Although you may very well change the title later as your research proceeds, creating a working title in the early stages can provide both focus and direction. And when you can draft a clear and concise statement that begins, "The purpose of this study is to . . . ," you are well on your way to planning a focused research study.

PRACTICAL APPLICATION Communicating Effectively Through Writing

In our own experiences, we authors have found that most students have a great deal to learn about what good writing entails. Yet we also know that with effort, practice, mentoring, and regular feedback, students *can* learn to write more effectively. Subsequent chapters present specific strategies for writing literature reviews (Chapter 3), research proposals (Chapter 5), and research reports (Chapter 13). Here we offer general strategies for writing in ways that can help you clearly communicate your ideas and reasoning to others. We also offer suggestions for making the best use of word-processing software.

GUIDELINES Writing to Communicate

The following guidelines are based on techniques often seen in effective writing. Furthermore, such techniques have consistently been shown to facilitate readers' comprehension of what people have written (e.g., see J. E. Ormrod, 2016).

1. ***Be specific and precise.*** Precision is of utmost importance in all aspects of a research endeavor, including writing. Choose your words and phrases carefully so that you communicate your *exact* meaning, not some vague approximation. Many books and online resources offer suggestions for writing clear, concise sentences and combining them into unified and coherent paragraphs (e.g., see the sources in the "For Further Reading" list at the end of the chapter).

2. ***Continually keep in mind your primary objective in writing your paper, and focus your discussion accordingly.*** All too often, novice researchers try to include everything they have learned—both from their literature review and from their data analysis—in their research reports. But ultimately, everything you say should relate either directly or indirectly to your research problem. If you can't think of how something relates, leave it out! You will undoubtedly have enough things to write about as it is.

3. ***Provide an overview of what you will be talking about in upcoming pages.*** Your readers can more effectively read your work when they know what to expect as they read. Providing an overview of what topics you will discuss and in what order—and possibly also showing how the various topics interrelate—is known as an **advance organizer**. As an example, Dinah Jackson, a doctoral student in educational psychology, was interested in the possible effects of *self-questioning*—asking oneself questions about the material one is studying—on college students' note taking. Jackson began her dissertation's "Review of the Literature" with the following advance organizer:

> The first part of this review will examine the theories, frameworks, and experimental research behind the research on adjunct questioning. Part two will investigate the transition of adjunct questioning to self-generated questioning. Specific models of self-generated questioning will be explored, starting with the historical research on question position (and progressing) to the more contemporary research on individual differences in self-questioning. Part three will explore some basic research on note taking and tie note taking theory with the research on self-generated questioning. (Jackson, 1996, p. 17)

4. ***Organize your ideas into general and more specific categories, and use headings and subheadings to guide your readers through your discussion of these categories.*** We authors have read many student research reports that seem to wander aimlessly and unpredictably from one thought to another, without any obvious organizational structure directing the flow of ideas. Using headings and subheadings is one simple way to provide an organizational structure for your writing *and* make that structure crystal clear to others.

5. ***Use concrete examples to make abstract ideas more understandable.*** There's a fine line between being abstract and being vague. Even as scholars who have worked in our respective academic disciplines for many years, we authors still find that we can more easily understand something when the writer gives us a concrete example to illustrate an abstract idea. As an example, we return to Jackson's dissertation on self-questioning and class note taking. Jackson made the point that how a researcher evaluates, or *codes,* the content of students' class notes will affect what the researcher discovers about those notes. More specifically, she argued that only a superficial coding scheme (e.g., counting the number of main ideas included in notes) would fail to capture the true quality of the notes. She clarified her point with a concrete example:

> For example, while listening to the same lecture, Student A may record only an outline of the lecture, whereas Student B may record an outline, examples, definitions, and mnemonics. If a researcher only considered the number of main ideas that students included in their notes, then both sets of notes might be considered equivalent, despite the fact that the two sets differ considerably in the *type* of material recorded. (Jackson, 1996, p. 9)

6. ***Use figures and tables to help you more effectively present or organize your ideas and findings.*** Although the bulk of your research proposal or report will almost certainly be prose, in many cases it might be helpful to present some information in figure or table form. For example, as you read this book, look at the variety of mechanisms we use to accompany our prose, including art, diagrams, graphs, and summarizing tables. We hope you will agree that these mechanisms help you understand and organize some of the ideas we present.

7. ***At the conclusion of a chapter or major section, summarize what you have said.*** You will probably be presenting a great deal of information in any research proposal

or report that you write. Summarizing what you have said in preceding paragraphs or pages helps your readers identify the things that are, in your mind, the most important things for them to remember. For example, in a dissertation that examined children's beliefs about the mental processes involved in reading, Debby Zambo summarized a lengthy discussion about the children's understanding of what it means to pay attention:

> In sum, the students understand attention to be a mental process. They know their attention is inconsistent and affected by emotions and interest. They also realize that the right level of material, amount of information, and length of time helps their attention. The stillness of reading is difficult for some of the students but calming for others, and they appear to know this, and to know when reading will be difficult and when it will be calming. This idea is contrary to what has been written in the literature about struggling readers. (Zambo, 2003, p. 68)

8. ***Anticipate that you will almost certainly have to write multiple drafts.*** All too often, we authors have had students submit research proposals, theses, or dissertations with the assumption that they have finished their task. Such students have invariably been disappointed—sometimes even outraged—when we have asked them to revise their work, usually several times. The need to write multiple drafts applies not only to novice researchers but to experienced scholars as well. For instance, we would hate to count the number of times this book has undergone revision—certainly far more often than the label "12th edition" indicates! Multiple revisions enable you to reflect on and critically evaluate your own writing, revise and refocus awkward passages, get feedback from peers and advisors who can point out where a manuscript has gaps or lacks clarity, and in other ways ensure that the final version is as clear and precise as possible.

9. ***Fastidiously check to be sure that your final draft uses appropriate grammar and punctuation, and check your spelling.*** Appropriate grammar, punctuation, and spelling are not just bothersome formalities. On the contrary, they help you better communicate your meanings. For example, a colon announces that what follows it explains the immediately preceding statement; a semicolon communicates that a sentence includes two independent clauses (as the semicolon in this sentence does!).

Correct grammar, punctuation, and spelling are important for another reason as well: They communicate to others that you are a careful and disciplined scholar whose thoughts and work are worth reading about. If, instead, you mispel menny of yur werds—as we our doing in this sentance—your reeders may quikly discredit you as a sloppy resercher who shuldn't be taken seriusly!

Many style manuals, such as those in the "For Further Reading" list at the end of this chapter, have sections dealing with correct punctuation and grammar. In addition, dictionaries and word-processing spell-check functions can obviously assist you in your spelling.

GUIDELINES Using the Tools in Word-Processing Software

Most of our readers know the basics of using word-processing software—for instance, how to "copy," "paste," and "save"; how to choose a particular font and font size; and how to format text as *italicized,* <u>underlined</u>, or **boldface**. Following are specific features and tools that you may not have routinely used in previous writing projects but that can be quite useful in writing research reports:

- ***Outlining.*** An "outlining" feature lets you create bullets and subbullets to organize your thoughts.
- ***Setting headers and footers.*** A "header" is a line or two at the top of the page that appears on every page; a "footer" appears at the bottom of each page. For example,

using the "insert date" function, you might create a header that includes the specific date on which you are writing a particular draft. And using an "insert page number" function will add appropriate numbers to the tops or bottoms of successive pages.

- ***Creating tables.*** Using a "table" feature, you can create a table with the number of rows and columns you need. You can easily adjust the widths of various columns, format the text within each table cell, add new rows or tables, and merge two or more cells into a single, larger cell. Usually, an "autoformat" option will give you many possible table formats from which to choose.
- ***Inserting graphics.*** You are likely to find a variety of options under an "Insert" pull-down menu. Some of these options enable you to insert diagrams, photographs, charts, and other visuals you have created elsewhere.
- ***Creating footnotes.*** Footnotes are easy to create using an "insert footnote" feature. Typically, you can choose the symbols to be used in designating footnotes—perhaps *1, 2, 3, . . . , a, b, c, . . .* , or special symbols such as * and †.
- ***Using international alphabets and characters.*** Computers and computer software sold in English-speaking countries have the English alphabet as the default alphabet, but often either your word-processing software or your "system preferences" on your computer's operating system will let you choose a different alphabet (e.g., Turkish, as in the surname Kağitçibaşi) or certain characters (e.g., in Chinese or Japanese) for particular words or sections of text.
- ***Tracking changes.*** A "track changes" feature enables you to keep a running record of specific edits you have made to a document; you can later go back and either "accept" or "reject" each change. This feature is especially useful when two or more researchers are coauthoring a report: It keeps track of who made which changes and the date on which each change was made.

We offer three general recommendations for using a word processor effectively.

1. ***Save and back up your document frequently.*** We authors can recall a number of personal horror stories we have heard (and in some cases experienced ourselves) about losing data, research materials, and other valuable information. Every computer user eventually encounters some type of glitch that causes problems in information retrieval. Whether the electricity goes out before you can save a file, a misguided keystroke leads to a system error, or your personal computer inexplicably crashes, things you have written sometimes get lost. It's imperative that you get in the habit of regularly saving your work. Save multiple copies so that if something goes awry in one place, you will always have a backup in a safe location. Here are a few things to think about:

- Save your work-in-progress frequently, perhaps every 5 to 10 minutes. Many software programs will do this for you automatically if you give them instructions about whether and how often to do it.
- Save at least two copies of important files, and save them in different places—perhaps one file at home and another at the office, at a relative's home, or somewhere in cyberspace. One option is to save documents on a flash drive or external hard drive. Another is to copy them to an electronic dropbox, iCloud (for Macintosh), or other Internet-based storage mechanism. One of us authors uses a flash drive to back up much of her past work (including several book manuscripts) and any in-progress work; she keeps this flash drive in her purse and takes it everywhere she goes. Also, she occasionally sends herself in-progress documents as attachments to self-addressed e-mail messages—giving her an almost-current backup version of the documents in the event that an unintended keystroke somehow wreaks havoc on what she has written.
- Save various versions of your work with distinct labels that help you identify each version—for instance, by including the date on which you completed each file.

- If your computer completely dies—seemingly beyond resuscitation—some software programs (e.g., Norton Utilities) may be able to fix the damage and retrieve some or all of the lost material. And service departments at computer retailers can often retrieve documents from the hard drives of otherwise "dead" machines.

2. ***Use such features as the spell checker and grammar checker to look for errors, but do NOT rely on them exclusively.*** Although computers are marvelous machines, their "thinking" capabilities have not yet begun to approach those of the human mind. For instance, although a computer can detect spelling errors, it does so by comparing each word against its internal "dictionary" of correctly spelled words. Not every word in the English language will be included in the dictionary; for instance, proper nouns (e.g., surnames such as Leedy and Ormrod) will *not* be. Furthermore, it may assume that *abut* is spelled correctly when the word you really had in mind was *about,* and it may very well not know that *there* should actually be *their* or *they're.*

3. ***Print out a paper copy for final proofreading and editing.*** One of us authors once had a student who turned in a dissertation draft chock-full of spelling and grammatical errors—and this from a student who was, ironically, teaching a college-level English composition course at the time. A critical and chastising e-mail message to the student made her irate; she had checked her document quite thoroughly before submitting it, she replied, and was convinced that it was virtually error-free. When her paper draft was returned to her almost bloodshot with spelling and grammatical corrections in red ink, she was quite contrite. "I don't know how I missed them all!" she said. When asked if she had ever edited a printed copy of the draft, she replied that she had not, figuring that she could read her work just as easily on her computer monitor and thereby save a tree or two. But in our own experience, it is *always* a good idea to read a printed version of what you have written. For some reason, reading a paper copy often alerts us to errors we have previously overlooked on the computer screen.

The Human Mind

The research tools discussed so far—the library, computer technology, measurement, statistics, and language—are effective only to the extent that another critical tool also comes into play. The human mind is undoubtedly the most important tool in the researcher's toolbox. Nothing equals its powers of comprehension, integrative reasoning, and insight.

Over the past few millennia, human beings have developed a number of general strategies through which they can more effectively reason about and better understand worldly phenomena. Key among these strategies are critical thinking, deductive logic, inductive reasoning, scientific methods, theory building, and collaboration with other minds.

Critical Thinking

Before beginning a research project, good researchers typically look at research reports and theoretical discussions related to their topic of interest. But they don't just accept research findings and theories at face value; instead, they scrutinize those findings and theories for faulty assumptions, questionable logic, weaknesses in methodologies, and unwarranted conclusions. And, of course, good researchers scrutinize their *own* work for the same kinds of flaws. In other words, good researchers engage in critical thinking.

In general, **critical thinking** involves evaluating the accuracy, credibility, and worth of information and lines of reasoning. Critical thinking is reflective, logical, and evidence-based. It also has a purposeful quality to it—that is, the researcher thinks critically in order to achieve a particular goal.

Critical thinking can take a variety of forms, depending on the context. For instance, it may involve any one or more of the following (Halpern, 1998, 2008; Mercier, Boudry, Paglieri, & Trouche, 2017; Nussbaum, 2008):

- ***Verbal reasoning.*** Understanding and evaluating persuasive techniques found in oral and written language.
- ***Argument analysis.*** Discriminating between reasons that do and do not support a particular conclusion.
- ***Probabilistic reasoning.*** Determining the likelihood and uncertainties associated with various events.
- ***Decision making.*** Identifying and evaluating several alternatives and selecting the alternative most likely to lead to a successful outcome.
- ***Hypothesis testing.*** Judging the value of data and research results in terms of the methods used to obtain them and their potential relevance to certain conclusions. When hypothesis testing includes critical thinking, it involves considering questions such as these:
    - Was an appropriate method used to measure a particular outcome?
    - Are the data and results derived from a relatively large number of people, objects, or events?
    - Have other possible explanations or conclusions been eliminated?
    - Can the results obtained in one situation be reasonably generalized to other situations?

To some degree, different fields of study require different kinds of critical thinking. In history, critical thinking might involve scrutinizing various historical documents and looking for clues as to whether things *definitely* happened a particular way or only *maybe* happened that way. In psychology, it might involve critically evaluating the way in which a particular psychological characteristic (e.g., intelligence, personality) is being measured. In anthropology, it might involve observing people's behaviors over an extended period of time and speculating about what those behaviors indicate about the cultural group being studied.

Deductive Logic

Deductive logic begins with one or more *premises.* These premises are statements or assumptions that the researcher initially takes to be true. Reasoning then proceeds logically from the premises toward conclusions that—if the premises are indeed true—must *also* be true. For example,

> If all tulips are plants, (Premise 1)
>
> And if all plants produce energy through photosynthesis, (Premise 2)
>
> Then all tulips must produce energy through photosynthesis. (Conclusion)

To the extent that the premises are false, the conclusions may also be false. For example,

> If all tulips are platypuses, (Premise 1)
>
> And if all platypuses produce energy through spontaneous combustion, (Premise 2)
>
> Then all tulips must produce energy through spontaneous combustion. (Conclusion)

The if-this-then-that logic is the same in both examples. We reach an erroneous conclusion in the second example—we conclude that tulips are apt to burst into flames at unpredictable times—only because both of our premises are erroneous.

Let's look back more than 500 years to Christopher Columbus's first voyage to the New World. At the time, people held many beliefs about the world that, to them, were irrefutable facts: People are mortal; the Earth is flat; the universe is finite and relatively small. The terror that gripped Columbus's sailors as they crossed the Atlantic was a fear supported by deductive logic. If the Earth is flat (premise), and the universe finite and small (premise), the

Earth's flat surface must stop at some point. Therefore, a ship that continues to travel into uncharted territory must eventually come to the Earth's edge and fall off, and its passengers (who are mortal—another premise) will meet their deaths. The logic was sound; the conclusions were valid. Where the reasoning fell short was in two faulty premises: that the Earth is flat and also relatively small.

Deductive logic provides the basis for mathematical proofs in mathematics, physics, and related disciplines. It is also extremely valuable for generating research hypotheses and testing theories. As an example, let's look one more time at doctoral student Dinah Jackson's dissertation project about the possible effects of self-questioning during studying. Jackson knew from well-established theories about human learning that forming mental associations among two or more pieces of information results in more effective learning than does trying to learn each piece of information separately from the others. She also found a body of research literature indicating that the kinds of questions students ask themselves (mentally) and try to answer as they listen to a lecture or read a textbook influence both what they learn and how effectively they remember it. (For instance, a student who is trying to answer the question, "What do I need to remember for the test?" might learn very differently from the student who is considering the question, "How might I apply this information to my own life?") From such findings, Jackson generated several key premises and drew a logical conclusion from them:

> If learning information in an associative, integrative manner is more effective than learning information in a fact-by-fact, piecemeal manner, (Premise 1)
>
> If the kinds of questions students ask themselves during a learning activity influence how they learn, (Premise 2)
>
> If training in self-questioning techniques influences the kinds of questions that students ask themselves, (Premise 3)
>
> And if learning is reflected in the kinds of notes that students take during class, (Premise 4)
>
> Then teaching students to ask themselves integrative questions as they study class material should lead to better-integrated class notes and higher-quality learning. (Conclusion)

Such reasoning led Jackson to form and test several hypotheses, including this one:

> Students who have formal training in integrative self-questioning will take more integrative notes than students who have not had any formal training. (Jackson, 1996, p. 12)

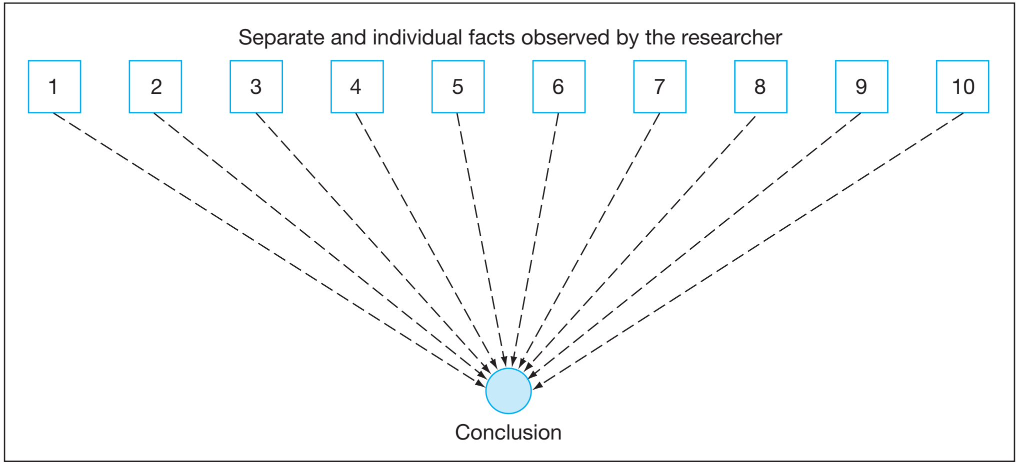
Happily for Jackson, the data she collected in her dissertation research supported this hypothesis.

Inductive Reasoning

Inductive reasoning begins not with a preestablished truth or assumption but instead with an observation. For example, as a baby in a high chair many years ago, you may have observed that if you held a cracker in front of you and then let go of it, it fell to the floor. "Hmmm," you may have thought, "what happens if I do that again?" So you grabbed another cracker, held it out, and released it. It, too, fell to the floor. You followed the same procedure with several more crackers, and the result was always the same: The cracker traveled in a downward direction. Eventually, you may have performed the same actions on other things—blocks, rattles, peas, milk—and invariably observed the same result. Eventually, you drew the conclusion that all things fall when dropped—your first inkling about a force called *gravity.* (You may also have concluded that dropping things from your high chair greatly annoyed your parents, but that is another matter.)

In **inductive reasoning**, people use specific instances or occurrences to draw conclusions about entire classes of objects or events. In other words, they observe a *sample* and then draw conclusions about the larger *population* from which the sample has been

FIGURE 1.2 The Inductive Process



taken. For instance, an anthropologist might draw conclusions about a certain culture after studying a certain community within that culture. A professor of special education might use a few case studies in which a particular instructional approach is effective with students who have dyslexia to recommend that teachers use the instructional approach with other students with dyslexia. A sociologist might (a) conduct three surveys (one each in 1995, 2005, and 2015) asking 1,000 people to describe their beliefs about AIDS and then (b) draw conclusions about how society's attitudes toward AIDS have changed over the 20-year period.

Figure 1.2 graphically depicts the nature of inductive reasoning. Let's look at an example of how this representation applies to an actual research project. Neurologists Silverman, Masland, Saunders, and Schwab (1970) sought the answer to a problem in medicine: How long can a person have a flat electroencephalogram (EEG) (i.e., an absence of measurable electrical activity in the brain, typically indicative of cerebral death) and still recover? Silverman and his colleagues observed 2,650 actual cases. They noted that, in all cases in which the flat EEG persisted for 24 hours or more, not a single recovery occurred. All of the data pointed to the same conclusion: *People who exhibit flat EEGs for 24 hours or longer will not recover.* We cannot, of course, rule out the unexplored cases, but *from the data observed,* the conclusion reached was that recovery is impossible. The EEG line from *every* case led to that *one* conclusion.

Scientific Method

During the Renaissance, people found that when they systematically collected and analyzed data, new insights and understandings might emerge. Thus was the scientific method born; the words literally mean "the method that searches for knowledge" (*scientia* is Latin for "knowledge" and derives from *scire,* "to know"). The scientific method gained momentum during the 16th century with such men as Paracelsus, Copernicus, Vesalius, and Galileo.

Traditionally, the term scientific method has referred to an approach in which a researcher (a) identifies a problem that defines the goal of one's quest; (b) posits a hypothesis that, if confirmed, resolves the problem; (c) gathers data relevant to the hypothesis; and (d) analyzes and interprets the data to see whether they support the hypothesis and resolve the question that instigated the research. In recent years, however, the term has been a controversial one because not all researchers follow the steps just listed in a rigid, lockstep manner; in fact, as noted earlier, some researchers shy away from forming any hypotheses about what they might find. Some of the controversy revolves around which article to use in front of the term—more specifically, whether to say "*the* scientific method" or "*a* scientific method." If we are speaking generally about the importance of collecting and analyzing data systematically rather than haphazardly, then saying "*the* scientific method" makes sense. If, instead, we are speaking about a specific methodology—say, experimental research or ethnographic research (described in Chapter 7 and Chapter 8, respectively), it is probably better to say "*a* scientific method." In any event, we are talking about a somewhat flexible—although certainly also rigorous—process.

As you may already have realized, application of a scientific method usually involves both deductive logic and inductive reasoning. Researchers might develop a hypothesis either from a theory (deductive logic) or from observations of specific events (inductive reasoning). Using deductive logic, they might make predictions about the patterns they are likely to see in their data *if* a hypothesis is true, and even researchers who have not formulated hypotheses in advance must eventually draw logical conclusions from the data they obtain. Finally, researchers often use inductive reasoning to generalize about a large population from which they have drawn a small sample.

Theory Building

Psychologists are increasingly realizing that the human mind is a very *constructive* mind. People don't just passively absorb and remember a large body of unorganized facts about the world. Instead, they pull together the things they see and hear to form well-organized and integrated understandings about a wide variety of physical and social events. Human beings, then, seem to have a natural tendency to develop *theories* about the world around them (e.g., see Bransford, Brown, & Cocking, 2000; J. E. Ormrod, 2016).

In general, a **theory** is an organized body of concepts and principles intended to explain a particular phenomenon. Even as young children, human beings are inclined to form their own personal theories about various physical and social phenomena—for instance, why the sun "goes down" at night, where babies come from, and why certain individuals behave in particular ways. People's everyday, informal theories about the world aren't always accurate. For example, imagine that an airplane drops a large metal ball as it travels forward through the air. What kind of path will the ball take as it falls downward? The answer, of course, is that it will fall downward at an increasingly fast rate (thanks to gravity) but will also continue to travel forward (thanks to inertia). Thus, its path will have the shape of a parabolic arc. Yet many college students erroneously believe that the ball (a) will fall straight down, (b) will take a straight diagonal path downward, or (c) will actually move *backward* from the airplane as it falls down (Cook & Breedin, 1994; McCloskey, 1983).

What characterizes the theory building of a good researcher is the fact that it is supported by well-documented findings—rather than by naive beliefs and subjective impressions of the world—and by logically defensible reasoning. Thus, the theory-building process involves thinking *actively* and *intentionally* about a phenomenon under investigation. Beginning with the facts known about the phenomenon, the researcher brainstorms ideas about plausible and, ideally, *best* explanations—a process that is sometimes called **abduction** (e.g., Jaccard & Jacoby, 2010; Walton, 2003). Such explanations are apt to involve an interrelated set of concepts and propositions that, taken together, can reasonably account for the phenomenon being studied.

After one or more researchers have developed a theory to explain a phenomenon of interest, the theory is apt to drive further research, in part by posing new questions that require answers and in part by suggesting hypotheses about the likely outcomes of particular investigations. For example, one common way of testing a theory is to use deductive reasoning to make a prediction (hypothesis) about what should occur *if the theory is a viable explanation of the phenomenon being examined.* As an example, let's consider Albert Einstein's theory of relativity, first proposed in 1915. Within the context of his theory, Einstein hypothesized that light passes through space as photons—tiny masses of spectral energy. If light has mass, Einstein reasoned, it should be subject to the pull of a gravitational field. A year later, Karl Schwarzschild predicted that, based on Einstein's reasoning, the gravitational field of the sun should bend light rays considerably more than Isaac Newton had predicted many years earlier. In 1919 a group of English astronomers traveled to Brazil and North Africa to observe how the sun's gravity distorted the light of a distant star now visible due to a solar eclipse. After the data were analyzed and interpreted, the results clearly supported the Einstein–Schwarzschild hypothesis—and therefore also supported Einstein's theory of relativity.

As new data emerge, a researcher may continue to revise a theory, reworking parts to better account for research findings, filling in gaps with additional concepts or propositions, extending the theory to apply to additional situations, and relating the theory to other theories regarding overlapping phenomena (Steiner, 1988; K. R. Thompson, 2006). Occasionally, when an existing theory cannot adequately account for a growing body of evidence, a good researcher casts it aside and begins to formulate an alternative theory that better explains the data.

Theory building tends to be a relatively slow process, with any particular theory continuing to evolve over a period of years, decades, or centuries. Often, many researchers contribute to the theory-building effort, testing hypotheses that the theory suggests, suggesting additional concepts and propositions to include in the theory, and conducting additional investigations to test one or more aspects of the theory in its current state. This last point brings us to yet another strategy for effectively using the human mind: collaborating with *other* minds.

Collaboration with Other Minds

As an old saying goes, two heads are better than one. Three or more heads can be even better. Any single researcher is apt to have certain perspectives, assumptions, and theoretical biases—not to mention gaps in knowledge about the subject matter—that will limit how the researcher approaches a research project. By bringing one or more professional colleagues into a project—ideally, colleagues who have perspectives, backgrounds, and areas of expertise somewhat different from the researcher's own—the researcher brings many more cognitive resources to bear on how to tackle the research problem and how to find meaning in the data obtained.

Sometimes these colleagues enter the picture as equal partners. At other times they may simply offer suggestions and advice. For example, when a graduate student conducts research for a master's thesis or doctoral dissertation, the student is, of course, the key player in the endeavor. Yet the student typically has considerable guidance from an advisor and, especially in the case of a doctoral dissertation, from a faculty committee. The prudent student selects an advisor and committee members who have the expertise to help shape the research project into a form that will truly address the research question and—more importantly—will make a genuine contribution to the student's topic of study.

Many productive researchers keep in regular communication with others who conduct research on the same or similar topics, perhaps exchanging ideas, critiquing one another's work, and directing one another to potentially helpful resources. Such ongoing communication is also a form of collaboration—albeit a less systematic one—in that everyone can benefit from and build on what other people are thinking and finding. Increasingly, computer technology is playing a central role in this cross-communication and cross-fertilization. For example, many researchers subscribe to topic-specific **electronic discussion groups**—you may also see such terms as *list servers, online discussion forums, bulletin boards,* and *message boards*—in which any message sent to or posted on them is available and possibly sent to all subscribers. In addition, some researchers maintain professional websites that describe their research programs and include links to relevant research reports; often you can find these web pages by going to the websites of the researchers' universities or other home institutions.

As the preceding sections should make clear, we human beings are—or at least have the potential to be—*logical, reasoning* beings. But despite our incredible intellectual capabilities—which almost certainly surpass those of all other species on the planet—we don't always reason as logically or objectively as we might. For example, sometimes we "discover" what we *expect* to discover, to the point where we don't look objectively at the data we collect. And sometimes we are so emotionally attached to particular perspectives or theories about a phenomenon that we can't abandon them when mountains of evidence indicate that we should. Figure 1.3 describes

We human beings often fall short of the reasoning capacities with which Mother Nature has endowed us. Following are seven common pitfalls to watch for in your own thinking as a researcher.

1. ***Confusing what must logically be true with what seems to be true in the world as we know it—a potential pitfall in deductive reasoning.*** Our usual downfall in deductive reasoning is failing to separate logic from everyday experience. For example, consider Isaac Newton's second law of motion: Force equals mass times acceleration ($F = ma$). According to this basic principle of Newtonian physics, any force applied to an object results in acceleration of the object. Using simple algebra—deductive reasoning at its finest—we can conclude that $a = F \div m$ and therefore that if there is no acceleration ($a = 0$), then there is no force ($F = 0$). This deduction makes no sense to anyone who has ever tried to push a heavy object across the floor: The object may not move at all, let alone accelerate. What explains the object's stubbornness, of course, is that other forces, especially friction with and resistance from the floor, are counteracting any force that the pusher may be applying.
2. ***Making generalizations about members of a category after having encountered only a restricted subset of that category—a potential pitfall in inductive reasoning.*** The main weakness of inductive reasoning is that even if all of our specific observations about a particular set of objects or events are correct, our generalizations about the category as a whole may *not* be correct. For example, if the only tulips we ever see are red ones, we may erroneously conclude that tulips can *only* be red. And if we conduct research about the political or religious beliefs of people who live in a particular location—say, people who live in Chicago—we may draw conclusions that don't necessarily apply to the human race as a whole. Inductive reasoning, then, is most likely to fall short when we gather data from only a small, limited sample and want to make *generalizations* about a larger group.
3. ***Looking only for evidence that supports our hypotheses, without also looking for evidence that would disconfirm our hypotheses.*** We humans seem to be predisposed to look for confirming evidence rather than disconfirming evidence—a phenomenon known as **confirmation bias**. For many everyday practical matters, this approach serves us well. For example, if we flip a light switch and fail to get any light, we might immediately think, "The light bulb has probably burned out." We unscrew the existing light bulb and replace it with a new one—and *voila!* We now have light. Hypothesis confirmed, problem solved, case closed. However, truly objective researchers don't just look for evidence that confirms what they believe to be true. They also look for evidence that might *disprove* their hypotheses. They secretly hope that they don't find such evidence, of course, but they open-mindedly look for it nonetheless.
4. ***Confirming expectations even in the face of contradictory evidence.*** Another aspect of our confirmation bias is that we tend to ignore or discredit any contradictory evidence that comes our way. For example, consider the topic of global climate change. Convincing evidence continues to mount to support the ideas that (a) the Earth's average temperature is gradually rising and (b) this temperature rise is at least partly the result of carbon emissions and other human activities. Yet some folks have great difficulty looking at the evidence objectively—perhaps the researchers incorrectly analyzed the data, they say, or perhaps the scientific community has a hidden agenda and so isn't giving us the straight scoop.
5. ***Mistaking dogma for fact.*** Although we might be inclined to view some sources of information with a skeptical, critical eye, we might accept others without question. For example, many of us willingly accept whatever an esteemed researcher, scholarly book, or other authority source says to be true. In general, we may uncritically accept anything said or written by individuals or groups we hold in high esteem. Not all authority figures and works of literature are reliable sources of information and guidance, however, and blind, unquestioning acceptance of them can be worrisome.
6. ***Letting emotion override logic and objectivity.*** We humans are emotional beings, and our emotions often infiltrate our efforts to reason and think critically. We're apt to think quite rationally and objectively when dealing with topics we don't feel strongly about and yet think in decidedly irrational ways about emotionally charged issues—issues we find upsetting, infuriating, or personally threatening.
7. ***Mistaking correlation for causation.*** In our efforts to make sense of our world, we human beings are often eager to figure out what causes what. But in our eagerness to identify cause-and-effect relationships, we sometimes "see" them when all we really have is two events that just happen to occur at the same time and place. Even when the two events are *consistently* observed together—in other words, when they are *correlated*—one of them doesn't necessarily cause the other. An ability to distinguish between causation and correlation is critical in any research effort, as you will discover in Chapter 6.

FIGURE 1.3 Common Pitfalls in Human Reasoning

List of pitfalls based on Chapter 8, "Common Sense Isn't Always Sensible: Reasoning and Critical Thinking" in *Our Minds, Our Memories* by J. E. Ormrod, 2011, pp. 151–183.

some common pitfalls in human reasoning—pitfalls we urge you to be on the lookout for and try to overcome. Good researchers are *reflective* researchers who regularly and critically examine not only their research designs and data but also their own thinking processes.

REFLECTIONS ON NOTEWORTHY RESEARCH

The time: February 13, 1929. The place: St. Mary's Hospital, London. The occasion: the reading of a paper before the Medical Research Club. The speaker: a member of the hospital staff in the Department of Microbiology. Such was the setting for the presentation of one of the most significant research reports of the early 20th century. The report was about a discovery that has transformed the practice of medicine. Dr. Alexander Fleming presented to his colleagues his research on penicillin. The group was apathetic. No one showed any enthusiasm for Fleming's paper. Great research has frequently been presented to those who are imaginatively both blind and deaf.

Despite the lukewarm reception, Fleming knew the value of what he had done. The first public announcement of the discovery of penicillin appeared in the *British Journal of Experimental Pathology* in 1929. It is a readable report—one that André Maurois (1959) called "a triumph of clarity, sobriety, and precision." Get it; read it. You will be reliving one of the great moments in 20th-century medical research.

Soon after Fleming's presentation of his paper, two other names became associated with the development of penicillin: Ernst B. Chain and Howard W. Florey (Chain et al., 1940; also see Abraham et al., 1941). Together they developed a pure strain of penicillin. Florey was especially instrumental in initiating its mass production and its use as an antibiotic for wounded soldiers in World War II (Coghill, 1944; also see Coghill & Koch, 1945). Reading these reports takes you back to the days when the medical urgency of dying people called for a massive research effort to make a newly discovered antibiotic available for immediate use.

On October 25, 1945, the Nobel Prize in medicine was awarded to Fleming, Chain, and Florey.

If you want to learn more about the discovery of penicillin, read André Maurois's *The Life of Sir Alexander Fleming* (1959), the definitive biography done at the behest of Fleming's widow. The book will give you an insight into the way great research comes into being.

The procedures used in groundbreaking research are identical to those every student follows in completing a dissertation, thesis, or other research project. Triggered by curiosity, all research begins with an observation, a question, a problem. Assumptions are made. Hypotheses might be formulated. Data are gathered. Conclusions are reached. What *you* do in a research project is the same as what many others have done before you, including those who have pushed back the barriers of ignorance and made discoveries that have greatly benefited humankind.

EXPLORING RESEARCH IN YOUR FIELD

Early in the chapter we mentioned that academic research is popularly seen as an activity far removed from everyday living. Even graduate students working on theses or dissertations may consider their tasks to be meaningless busywork that have little or no relevance to the world beyond the university campus. This "busywork" conception of an academic program's research requirement is simply not accurate. Conducting the research required to write an acceptable thesis or dissertation is one of the most valuable educational experiences a person can have. Even if you plan to become a practitioner rather than a researcher—say, a nurse, social worker, or school principal—knowledge of strong research methodologies and legitimate ways to collect and analyze data is essential for keeping up with advances in your field. The alternative—*not* being well versed in sound research practices—can lead you to base important professional decisions on faulty data, inappropriate interpretations and conclusions, or unsubstantiated personal intuitions. Truly competent and effective practitioners base their day-to-day decisions and long-term priorities on solid research findings in their field.

As a way of getting your feet wet in the world of research, take some time to read articles in research journals in your academic discipline. You can do so by spending an hour or two in the *periodicals* section of your local college or university library or, alternatively, making use of your library website's online databases to download and read a number of articles at home.

Your professors should have suggestions about journals that are especially relevant to your discipline. Reference librarians can be helpful as well. If you are shy about asking other people for advice, you can get insights about important journals by scanning the reference lists in some of your textbooks.

Keep in mind that the quality of research you find in your explorations may vary considerably. One rough indicator of the quality of a research study is whether the research report has gained the approval of designated peers. A **peer-reviewed** research report—you may also see the terms *juried* and *refereed*—has been judged by respected colleagues in one's field and deemed to be of sufficient quality and importance to warrant publication. For instance, the editors of many academic journals send submitted manuscripts to one or more reviewers who pass judgment on the manuscripts, and only manuscripts that meet certain criteria are published in the journal. A **non-peer-reviewed** report (a.k.a., a *nonjuried* or *nonrefereed* one) is a report that appears in a journal or on the Internet without first being screened by one or more experts. Some non-peer-reviewed reports are excellent, but others may not be.

PRACTICAL APPLICATION Identifying Important Tools in Your Discipline

We have introduced several key research tools in the preceding pages, and we describe many more specific ones in subsequent chapters. Some of the tools you learn about in this book may be somewhat new to you. How will you learn when, how, and why you should use them? One effective means of learning about important tools in your discipline is to work closely with an expert researcher in your field.

Take the time to find a person who has completed a few research projects—perhaps someone who teaches a research methods class, someone who has published in prestigious journals, someone who has successfully obtained research grants, or even someone who has recently finished a dissertation. Ideally, this individual should be someone in your own field of study. Ask the questions listed in the following checklist and, if possible, observe the person as he or she goes about research work. If you can't locate anyone locally, it may be possible to recruit one or more willing individuals through e-mail.

CHECKLIST

Interviewing an Expert Researcher

_____ 1. How do you start a research project?

_____ 2. What specific tools do you use (e.g., library resources, computer software, forms of measurement, statistics)?

_____ 3. How did you gain your expertise with the various tools you use?

_____ 4. What are some important experiences you suggest for a novice researcher?

_____ 5. If I wanted to learn how to become a competent researcher, what specific tools would you suggest I work with?

FOR FURTHER READING

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Chapter 2

The Problem: The Heart of the Research Process

The main research problem or question is the axis around which the whole research effort revolves. It clarifies the goals of the research project and can keep the researcher from wandering in tangential, unproductive directions.

Learning Outcomes

2.1. Identify strategies for choosing and refining an overall research problem or question.

2.2. Subdivide a main research problem or question into useful subproblems (or subquestions).

2.3. Pin down a proposed research study by (a) identifying a relevant theoretical or conceptual framework; (b) if appropriate, stating one or more *a priori* hypotheses; (c) identifying the general concepts or more-specific variables to be examined; (d) defining terms; (e) stating assumptions; (f) if applicable, identifying delimitations and limitations; and (g) explaining the study's potential importance or significance.

The heart of every research project—the axis around which the entire research endeavor revolves—is the problem or question the researcher wants to address. The first step in the research process, then, is to identify this problem or question with clarity and precision.

FINDING RESEARCH PROJECTS

Issues in need of research are everywhere. Some research projects can enhance our general knowledge about our physical, biological, social, or psychological world or shed light on historical, cultural, or aesthetic phenomena. For example, an ornithologist might study the mating habits of a particular bird species, an anthropologist might examine the moral beliefs and behaviors of a particular cultural group, and a psychologist might study the nature of people's logical reasoning processes (as one of us authors did in her doctoral dissertation). Such projects, which can advance theoretical conceptualizations about a particular topic, are known as **basic research**.

Other research projects address issues that have immediate relevance to current procedures, practices, and policies. For example, an agronomist might study the effects of various fertilizers on the growth of sunflowers, a nursing educator might compare the effectiveness of different instructional techniques for training future nurses, and a political scientist might determine what kinds of campaign strategies influence one or more demographic groups' voting patterns. Such projects, which can inform human decision making about practical problems, are known as **applied research**.

Keep in mind, however, that the line between basic research and applied research is a blurry one. Answering questions about basic theoretical issues can often inform current practices in the everyday world; for example, by studying the mating habits of an endangered bird species, an ornithologist might lead the way in saving the species from extinction. Similarly, answering questions about practical problems may enhance theoretical understandings of particular phenomena; for example, the nursing educator who finds that one approach to training nurses is more effective than another may enhance psychologists' understanding of how, in general, people acquire new knowledge and skills.

To get an online sample of recently published research studies in your area of interest, go to Google Scholar at scholar.google.com; type a topic in the search box, and then click on some of the titles that pique your curiosity. As you scan the results of your Google search, especially look for items identified as being in **pdf** form, referring to **portable document format**; these items are often electronic photocopies of articles that have appeared in academic journals and similar sources.

You might also want to look at typical research projects for doctoral dissertations. For example, your university library probably has a section that houses the completed dissertations of students who have gone before you. Alternatively, you might go to the electronic databases in your library's catalog. Among those databases you are likely to find ProQuest Dissertations & Theses Global, which includes abstracts—and in many cases, the complete texts—for millions of dissertations and theses from around the world.

Regardless of whether you conduct basic or applied research, a research project is likely to take a significant amount of your time and energy, so whatever problem you study should be *worth* your time and energy. As you begin the process of identifying a suitable research problem to tackle, keep two criteria in mind. First, your problem should address an important question, such that the answer can actually *make a difference* in some way. And second, it should advance the frontiers of knowledge, perhaps by leading to new ways of thinking, suggesting possible applications, or paving the way for further research in the field. To accomplish both of these ends, your research project must involve not only the collection of data but also the *interpretation* of those data.

Some problems aren't suitable for research because they lack the interpretation-of-data component; they don't require the researcher to go beyond the data themselves and reveal their meaning. Following are four situations to avoid when considering a problem for research purposes.

1. ***A research project should not be simply a ruse for achieving self-enlightenment.*** All of us have large gaps in our knowledge that we may want to fill. But mere self-enlightenment should not be the primary purpose of a research project (see Chapter 1). Gathering information to know more about a certain topic is entirely different from looking at a body of data to discern how it contributes to the solution of a problem or to address a currently unanswered question.

A student once submitted the following statement of a research problem:

> The problem of this research is to learn more about the way in which the Panama Canal was built.

For this student, the information-finding effort would provide the satisfaction of having gained more knowledge about a particular topic, but it would *not* have led to *new* knowledge.

2. ***A project whose sole purpose is to compare two sets of data does not qualify as a suitable research endeavor.*** Take this proposed problem for research:

> This research project will compare the increase in the number of women employed over 100 years—from 1870 to 1970—with the employment of men over the same time span.

A simple table completes the project:

	1870	*1970*
Women employed	13,970,000	72,744,000
Men employed	12,506,000	85,903,000

The "research" project involves nothing more than a quick trip to a government website to reveal what is already known.

3. ***Simply calculating a correlation coefficient between two related sets of data is not acceptable as a problem for research.*** Why? Because a key ingredient in true research—*making sense* of the data—is missing. A correlation coefficient is nothing more than a statistic that expresses how closely two characteristics or other variables are associated with each other. It tells us nothing about *why* the association might exist.

Some novice researchers think that after they have collected data and performed a simple statistical procedure, their work is done. In fact, their work is *not* done at this point; it has only begun. For example, many researchers have found a correlation between the IQ scores of children and those of their parents. In and of itself, this fact is of little use. It does, however, suggest questions that a research project might address: What is the underlying *cause* of the correlation between children's and parents' intelligence test scores? Is it genetic? Is it environmental? Does it reflect some combination of genetic heritage and environment?

4. ***A problem that results only in a yes-or-no answer is not a sufficient problem for a research study.*** Why? For the same reason that merely calculating a correlation coefficient is unsatisfactory. Both situations simply skim the surface of the phenomenon under investigation, without exploring the mechanisms underlying it.

"Is homework beneficial to children?" That is no problem for research, at least not in the form in which it's stated. The researchable issue is not whether homework is beneficial, but wherein the benefit of homework—if there is one—lies. Which components of homework are beneficial? Which ones, if any, might be counterproductive? If we knew the answers to these questions, then teachers could better structure homework assignments to enhance students' learning and classroom achievement.

There is so much to learn—there are so many important questions unanswered—that we should look for significant problems and issues and not dwell on those that will make little or no contribution. Good research, then, begins with identifying a good question to ask—ideally, a question that no one has ever thought to ask before. Researchers who contribute the most to our understanding of our physical, biological, psychological, and social worlds are those who pose questions that lead us into entirely new lines of inquiry. To illustrate, let's return to that correlation between the IQ scores of children and those of their parents. For many years, psychologists bickered about the relative influences of heredity and environment on intelligence and other human characteristics. They now know not only that heredity and environment *both* influence virtually every aspect of human functioning but also that they *influence each other's influences* (for a good, down-to-earth discussion of this point, see Lippa, 2002). Rather than ask the question "How much do heredity and environment each influence human behavior?" a more fruitful question is "How do heredity and environment *interact* in their influences on behavior?"

PRACTICAL APPLICATION Identifying and Presenting the Research Problem or Question

How can a beginning researcher formulate an important and useful research problem or question? Here we offer guidelines both for choosing an appropriate problem or question and for pinning it down sufficiently to focus the research effort.

GUIDELINES Choosing an Appropriate Problem or Question

Choosing a good research problem or question requires genuine curiosity about unanswered questions. But it also requires enough knowledge about a topic to identify the kinds of investigations that are likely to make important contributions to one's field. Here we offer several strategies that are often helpful for novice researchers.

1. ***Look around you.*** In many disciplines, questions that need answers—phenomena that need explanation—are everywhere. For example, let's look back to the early 17th century, when Galileo was trying to make sense of a variety of earthly and celestial phenomena. Why did large bodies of water (but not small ones) rise and fall in the form of tides twice a day? Why did sunspots consistently move across the sun's surface from right to left, gradually disappear, and then, about 2 weeks later, reappear on the right edge? Furthermore, why did sunspots usually move in an upward or downward path as they traversed the sun's surface, while only occasionally moving in a direct, horizontal fashion? Galileo correctly deduced that the various "paths" of sunspots could be explained by the facts that both the Earth and sun were spinning on tilted axes and that—contrary to popular opinion at the time—the Earth revolved around the sun, rather than vice versa. Galileo was less successful in explaining tides, mistakenly attributing them to natural "sloshing" as a result of the Earth's movement through space, rather than to the moon's gravitational pull.

We do not mean to suggest that novice researchers should take on such monumental questions as the nature of the solar system or oceanic tides. But smaller problems suitable for research exist everywhere. Perhaps you might see them in your professional practice or in everyday events. Continually ask yourself questions about what you see, hear, and read: Why does such-and-such happen? What makes such-and-such tick? What are people thinking when they do such-and-such?

2. ***Read the existing research literature about a topic.*** One essential strategy is to find out what things are already known and believed about your topic of interest—a topic we address in more detail in Chapter 3. Little can be gained by reinventing the wheel. In addition to telling you what is already known, the existing literature about a topic is likely to tell you what is *not* known in the area—in other words, what still needs to be done. For instance, your research project might

- Address the suggestions for future research that another researcher has identified
- Replicate a research project in a different setting or with a different population
- Consider how various subpopulations might behave differently in the same situation
- Apply an existing perspective or theory to a new situation
- Explore unexpected or contradictory findings in previous studies
- Challenge research findings that seem to contradict what you personally know or believe to be true (Neuman, 2011)

Reading relevant literature has other advantages as well. It can give you a conceptual or theoretical framework on which you can build a rationale for your study; we talk more about such frameworks later in the chapter. Reading the literature can also offer potential research designs and data-collection strategies. And it can help you interpret your results and relate them to previous research findings in your field.

As you read about other people's research related to your topic, *take time to consider how you can improve your own work because of it.* Ask yourself: What have I learned that I would (or would not) want to incorporate into my own research? Perhaps it is a certain way of writing, a specific method of data collection, or a particular approach to data analysis. You should constantly question and reflect on what you read.

We also urge you to *keep a running record of helpful journal articles and other sources.* Include enough information that you will be able to track each source down again—perhaps including the author's name, the title and year of the journal or book, key words and phrases that capture the focus of the work, and (if applicable) the appropriate library call number or Internet address. You may think you will always be able to recall where you found a helpful source and what you learned from it. However, our own experiences tell us that you probably *will* forget a good deal of what you read unless you keep a record of it.

3. ***Seek the advice of experts.*** Another simple yet highly effective strategy for identifying a research problem or question is to ask an expert: What needs to be done? What burning

questions are still out there? What previous research findings don't seem to make sense? Your professors will almost certainly be able to answer each of these questions, as will other scholars you might contact through e-mail or meet on campus and elsewhere.

Some beginning researchers—including many students—are reluctant to approach well-known scholars for fear that these scholars don't have the time or patience to talk with novices. Quite the opposite is true: Most experienced researchers are happy to talk with people who are just starting out. In fact, they may feel flattered that you're familiar with their work and would like to extend or apply it in some way.

4. ***Attend professional conferences.*** Many researchers have great success finding new research projects at national or regional conferences in their discipline. By scanning the conference program and attending sessions of interest, they can learn "what's hot and what's not" in their field. Furthermore, conferences are places where novice researchers can make contacts with more experienced individuals in their field—where they can ask questions, share ideas, and exchange e-mail addresses that enable follow-up communication.

5. ***Choose a topic that intrigues and motivates you.*** As you read the professional literature, attend conferences, and talk with experts, you will uncover a number of potential research problems or questions. At some point you need to pick just *one* of them, and your selection should be based on what you personally want to learn more about. Remember, the project you are about to undertake will take you many months, quite possibly a couple of years or even longer. So it should be something you believe is worth your time and effort—even better, one you're truly passionate about. Peter Leavenworth, at the time a doctoral student in history, explained the importance of choosing an interesting dissertation topic this way: "You're going to be married to it for a while, so you might as well enjoy it."

6. ***Choose a topic that other individuals will find interesting and worthy of attention.*** Ideally, your work should not end simply with a thesis, dissertation, or other unpublished research report. If your research adds an important piece to what the human race knows and understands about the world, then you will, we hope, want to share your findings with a larger audience. In other words, you will want to present what you have done at a regional or national conference, publish an article in a professional journal, or both (we talk more about doing such things in Chapter 13). Conference coordinators and journal editors are often quite selective about the research reports they accept for presentation or publication, and they are most likely to choose those reports that will have broad appeal.

Future employers may also make judgments about you, at least in part, based on the topic you have chosen for a thesis or dissertation. Your résumé or curriculum vitae will be more apt to attract their attention if, in your research, you're pursuing an issue of broad scientific or social concern—especially one that is currently a hot topic in your field.

7. ***Be realistic about what you can accomplish.*** Although it's important to address a problem or question that legitimately needs addressing, it's equally important that your research project be a *manageable* one. For example, how much time will it take you to collect the necessary data? Will you need to travel great distances to acquire the data? Will you need expensive equipment? Will the project require knowledge and skills far beyond those you currently have? Asking yourself and then answering such questions can help you keep your project within reasonable, accomplishable bounds.

GUIDELINES Writing a Purpose Statement

Remember, the heart of any research project is your problem or question, along with the goal or goals you intend to pursue in your efforts to address the problem or question. At every step in the process, successful researchers ask themselves: What am I doing? For what