Preface

Why This Book

The second edition of *Research Methods for Education* was developed to preserve the accessible, conversational tone and learning-centered philosophy of the first edition while incorporating the most current developments in educational research. The authors updated all example studies to reflect work published since 2019 and emphasized real-world educational applications to help students engage with research that feels relevant and authentic. Major updates include expanded content on experimental and single-case designs, integration of current standards in measurement validity and reliability, and revisions aligned with APA style and contemporary classroom needs. This edition supports instructors through clearly defined learning objectives and built-in learning checks, while helping students build research skills step by step. It stands apart from other texts through its refined organization and emphasis on scholarly rigor delivered in a practical, education-focused format.

Approach

Research Methods for Education uses a problem-focused, decision-oriented approach that guides students through the full research process—from identifying a question to choosing an analysis and sharing findings. The book introduces foundational topics such as ethics, measurement, literature reviews, and participant selection before progressing through various research designs, including nonexperimental, quasi-experimental, single-case, experimental, qualitative, and mixed methods. Each chapter is structured to show how to align research design with research questions and how to select appropriate analytical techniques. By integrating methodology with a strong emphasis on educational contexts, the book helps students not only understand how research works but also how to apply it meaningfully within the field of education.

New to This Edition

All chapters have been edited for APA 7th edition style and contain updated examples of educational research published since 2019, along with updated tables, figures, and references. Here are some brief highlights of new or updated material you will find in each chapter:

Chapter 1 combines Chapters 1 and 2 from the first edition. New educational research examples were added, and outdated content and figures were removed. Tables were updated with recent data and studies.

Chapter 2 includes minor revisions for clarity and style. Outdated tables were deleted, and references were updated to reflect newer research on ethics and research integrity.

Chapter 3 merges and refines the content of Chapters 4 and 5 in the first edition. Major updates include a new section on validity based on national standards, updated tables with 2024 data, and deletion of outdated measurement concepts.

Chapter 4 updates the previous version on sampling, with new examples and revised figures to reflect new content and examples from recent research.

Chapter 5 includes recognition of qualitative research as a fourth design category. Updated examples and figures were incorporated, including new references and discussion of COVID-19 as a historical effect.

Chapter 6 provides updated tables and references to include newer examples of archival, content analysis, and meta-analysis research.

Chapter 7 includes a new table summarizing correlation interpretation, and figures and citations were updated with newer studies on survey and correlation.

Chapter 8 incorporates updated researcher role examples, and references were added to illustrate sampling strategies and researcher-participant relationships.

Chapter 9 integrates new figures and updated citations to illustrate qualitative designs like phenomenology, ethnography, and grounded theory using recent studies.

Chapter 10 was updated with some reorganization of sections, deletion of two redundant tables, and newer examples of narrative research and critical theory.

Chapter 11 is a new chapter developed from splitting quasi-experimental content from Chapter 13 in the previous edition. Figures and references were updated to align with reorganized and expanded content.

Chapter 12 is also a new chapter focused solely on single-case designs, formed from the split Chapter 13 in the first edition. It adds new sections on evidence standards and statistical analysis, includes new figures, and incorporates recent studies and guidelines.

Chapter 13 was reorganized to highlight experimental design content by design type, with a new section on factorial designs. Figures and tables were revised, and recent examples were added.

Chapter 14 represents a clarification of mixed methods designs reorganized by design complexity, and updated citations to reflect recent educational studies.

Chapter 15 focuses on action research designs, which were updated with recent example studies.

Chapter 16 presents updated evaluation models and standards. A new figure replaced an outdated model, and references were revised to reflect current polling and evaluation practices.

Chapter 17 includes edits to clarify descriptive statistics concepts. Several figures were updated to align better with examples and improve data display accuracy.

Chapter 18 features content reorganized to group all parametric statistics together. Figures and citations were revised to support updated statistical concepts and practices.

Chapter 19 contains minor updates including revised software names and updated references addressing prolonged engagement and member checking in qualitative research.

Chapter 20 includes revised references and examples related to APA style to reflect 7th edition standards. Figures and references were updated, including a new citation on authorship agreements.

Appendix A contains minor updates made for APA style, particularly on pronoun usage and formatting of the sample manuscript.

Appendix B needed no changes, as the instructions for randomizing and counterbalancing remain current.

Pedagogy

The following are unique features in this book to facilitate student learning, with revised content or approaches in the second edition noted:

- **Strengthened organization of research design:**
  - **Follows a problem-focused organization.** This second edition is organized into 20 chapters (versus 21 in the first edition), with each building on the previous one to give a full picture of the scientific process as applied in the field of educational research. In Chapters 1 and 2, students are introduced to the process and ethics of engaging in the scientific method in education. In Chapters 3 through 5, students are shown how to define and measure scientific variables, and methods used to select samples and choose an appropriate research design are described. Chapters 6 through 17 fully introduce each type of research design with all new examples, from nonexperimental (Chapters 6–7) and qualitative research designs (Chapters 8–10) to quasi-experimental, single-case, experimental, and mixed methods research designs (Chapters 11–14). The dedicated chapter on single-case experimental designs is new to this edition, with attention to the most recent research on statistical analysis for these designs. Chapters 15 and 16 introduce students to applied research designs, specifically action research (Chapter 15) and program evaluation (Chapter 16), which engage in systematic inquiry to evaluate instructional changes and their implementation within a specific context. In Chapters 17–20, the focus is on analyzing, interpreting, and communicating research data, and students are shown how to summarize and describe outcomes (using American Psychological Association [APA] 7th edition style) for both quantitative and qualitative studies. Also included is a full chapter that introduces how to use APA style to write manuscripts and tips on creating posters and giving research talks. The organization of this book is "problem focused" in that it introduces the scientific process as it would be applied from setting up a study, to conducting a study, to communicating the outcomes observed in that study—all while applying the decision tree to engage further the critical thinking skills of students.
  - **Ethics in Focus sections across chapters.** Ethical considerations are often specific to a particular research design or methodology, or even the research topic. For this reason, the theme of ethics is not only covered in Chapter 2 but also in an Ethics in Focus section in most chapters. These sections review important ethical issues related to the topics in the chapter. This allows instructors the flexibility to teach ethics as a separate section and integrate discussions of ethics throughout the semester. This level of organization for ethics is simply absent from most comparable research methods textbooks.
  - **Introduces four broad categories of research design.** In truth, research design is complex. Many designs are hybrids that cannot be neatly fit into a single type of category or research design. This is especially true for education where research designs are often dynamic depending on the educational environment being studied. Further, we acknowledge that qualitative research should be recognized as a category of design versus simply being classified as nonexperimental. For this reason, we have updated our classification of research designs in the second edition into nonexperimental, qualitative, quasi-experimental, and experimental categories, and we identify the strengths and limitations of these designs for education in the corresponding chapters.

- **Reduced bias in language across research designs:**
  - **Research design is introduced without bias.** Research designs are introduced as means to answer different types of questions. Our emphasis throughout this

book that the ability to demonstrate cause does not make a design superior to other designs; it simply allows researchers to answer different types of questions (i.e., research questions pertaining to cause).

- **The qualitative research design and perspective is given fair coverage.** While many textbooks focus on quantitative methods often used in the education sciences, many omit or even are dismissive of qualitative methodology. This bias can mislead students into thinking that all research is quantitative. This second edition includes a fair balance of qualitative methods throughout the book, in addition to quantitative methods, with recent examples from the literature to demonstrate their use. All of these methods contribute to the peer-reviewed literature, and educational researchers frequently use many robust qualitative methodologies.

- **Engages student learning and interest:**
  - **Conversational writing style.** In this second edition, we retain a conversational tone that speaks to the reader as if they are the researcher. It empowers students to view research methods as something they are capable of understanding and applying. It is a positive psychology approach to writing that involves students in the process and decisions made using the scientific process. The goal is to motivate and excite students by making the book easy to read and follow without dumbing down the information they need to be successful.
  - **Written with student learning in mind.** There are many features in this book to help students succeed. Several updated figures and tables are provided in each chapter to facilitate student learning and break up the readings to make the material less intimidating. In this new edition, key terms are bolded in the text and then restated in a list and defined in a glossary at the end of each chapter to make it easier for students to search for key terms while studying. In addition, review questions and classroom activities are included at the end of each chapter to test learning and give students an opportunity to apply the knowledge they have learned.
  - **Learning objectives and learning objective summaries.** Revised learning objectives are stated in each chapter to get students focused and thinking about the material they will learn, as well as to organize each chapter and to allow students to review content by focusing on those learning objectives they struggle with the most. In addition, a chapter summary organized by learning objective is provided at the end of each chapter. In this summary, each learning objective is stated and answered. Hence, not only are learning objectives identified in each chapter, but they are also answered at the end of each chapter.
  - **Connecting to the Classroom** boxes take an idea from the chapter and illustrate how it can be applied to educational research. These boxes, included in most chapters in the book, are aimed at helping students see how the ideas from the book can be used to study and evaluate common classroom educational practices. We intend for the inclusion of classroom examples to make research more approachable and understandable to students in education.
  - **Learning Checks** are inserted throughout each chapter for students to review what they learn, as they learn it. Many research methods textbooks give learning check questions, with no answer. How can students "check" their learning without the answers? Instead, in this book, all learning checks have questions with answer keys to allow students to actually check their learning before continuing their reading of the chapter.

- **Making Sense** boxes support critical and difficult material. A research methods course can have many areas where students can struggle, and the Making Sense boxes are included to break down the most difficult concepts and material in the book—to make sense of them. These boxes, included in most chapters in the book, are aimed at easing student stress and making research methods more approachable to students. Again, this book was written with student learning in mind.
- **APA Appendices** support student learning of APA style, updated for the 7th edition (2020) of the publication manual. The appendices include an essential APA writing guide (A.1); a guide to grammar, punctuation, and spelling (A.2); a full-sample APA-style manuscript from a study that was published in a peer-reviewed scientific journal (A.3); and instructions for creating posters using Microsoft PowerPoint, including a sample poster and poster template (A.4). Also included are instructions for using randomization (B.1) and constructing a Latin square (B.2). Hence, this book provides the necessary support for students who are asked to complete a research project and an APA-style paper, poster, or talk. Few books provide this level of comprehensive supportive materials.

In addition, there is one more overarching feature that we refer to as *teachability.* Although this book is comprehensive and a great reference for any undergraduate or master's level student, it sometimes can be challenging for instructors to cover every topic in this book. For this reason, the chapters are organized into sections, each of which can largely stand alone, to assist instructors in more easily managing course content—instructors can assign students particular sections in each chapter when they cannot teach all topics covered in a chapter. Further, in this revised edition, each section is aligned to a specific learning objective and learning check questions. Hence, this book was written with both the student and the instructor in mind.

Additional Teaching Resources

Visit **collegepublishing.sagepub.com** and navigate to the Resources tab on your book's page to find the teaching materials designed to accompany this textbook. On this site you will find an array of materials that will save you time and help you keep students engaged, including:

- **Learning management system** cartridges that easily integrate with your course management system so student test results and graded assignments seamlessly flow into your gradebook;
- **Test banks**, aligned to Bloom's Taxonomy, that provide a diverse range test items, including multiple choice, true/false, and essay questions;
- The **instructor's manual**, which offers a wide range of customizable teaching and learning content for all chapters, including:
  - Learning objectives
  - A detailed chapter outline
  - Lecture suggestions
- **PowerPoint® slides** that offer a flexible, accessible, and customizable solution for creating multimedia lectures;
- **Tables and Figures from the book** are available to support lecture preparation and class discussions.

Acknowledgments

We would like to acknowledge our families, friends, students, colleagues, mentors, and the team at Sage for their support in bringing this second edition to life. We extend special thanks to Kyle Cox, associate professor of educational research, measurement, and evaluation at UNC Charlotte, who has used the first edition of this book extensively in his teaching since its release in 2019. His thoughtful feedback and practical insights—as both an instructor and colleague—were instrumental in shaping revisions to Chapters 1 and 3.

Sandra would also like to honor the memory of Kusum Singh, whose mentorship, insight, and steadfast support during her doctoral studies and early career were instrumental in shaping her path as an educational researcher and educator. Singh's intellectual generosity and deep commitment to equity continue to inform Sandra's teaching, scholarly work, and mentoring practices.

Importantly, we'd like to thank the thousands of educational research methodology students and instructors across the country who will use this book; thank you! It is your pursuit of education that has inspired this contribution. Our hope is that you take away as much from reading this book as we have from writing it.

Last, but certainly not least, we would also like to thank the reviewers who provided feedback during the development process:

Stefani Boutelier, Aquinas College
Mary Dereshiwsky, Northern Arizona University
Scott Drabenstot, Southern Nazarene University
Amber Gonzalez, California State University, Sacramento
Maria Gray, Northeastern State University
Jagdish Khubchandani, New Mexico State University
Stephanie Lezotte, Rowan University
Abbot Packard, University of West Georgia
Amanda Blakewood Pascale, University of North Florida
Amira Proweller, DePaul University
Erin M. Ramirez, California State University Monterey Bay
Jeff Savage, Cornerstone and Liberty University
Chia-Lin Tsai, University of Northern Colorado
Dunja Trunk, Bloomfield College
Tracy M. Walker, Virginia State University

About the Authors

Source: University of North Carolina at Charlotte

Sandra L. Dika is a professor of educational research at the University of North Carolina at Charlotte, where she has taught graduate-level research methods courses since 2010 and served as PhD program director from 2018 to 2025. A first-generation college graduate, she earned her B.Ed. and M.Sc. from the University of Alberta and her PhD in educational research and evaluation from Virginia Tech. Prior to UNC Charlotte, she held positions at the University of Puerto Rico–Mayagüez, Virginia Tech, and Brown University.

Sandra's research focuses on college access, student success, and equity for historically underserved and minoritized populations. She has published more than 75 peer-reviewed articles, book chapters, and proceedings papers, and she has led research funded by the Spencer Foundation, National Science Foundation, and the John M. Belk Endowment. She also serves as an external evaluator for STEM education initiatives.

Her teaching and mentorship have earned her the UNC Charlotte College of Education's Excellence in Teaching and Excellence in Research Awards, and she was named a Catalyst Research Fellow in 2018. She has chaired or served on over 40 dissertation committees and has mentored more than 20 student coauthors, with two of her dissertation advisees receiving dissertation of the year awards. She also contributes to graduate curriculum development in research methodology.

Outside of academia, Sandra enjoys hiking, traveling, cheering on her children's sports and hobbies, and connecting with friends and family over coffee or a shared meal.

Source: Florence Martin

Lynn Ahlgrim-Delzell (1957–2025) was an associate professor emerita of education research at the University of North Carolina at Charlotte with over 25 years of experience conducting research on issues pertinent to individuals with moderate to severe developmental disability. She earned her BS in psychology and MS in school psychology from Illinois State University in Normal, Illinois. She earned her PhD in educational research methodology at the University of North Carolina at Greensboro. She taught master's and doctoral-level courses on research methods and statistics and directed the graduate certificate in quantitative analyses prior to her retirement in 2018. She published more than 40 peer-reviewed articles and book chapters on literacy instruction and assessment and access to academic content for individuals with moderate to severe developmental disability. She served as an external consultant on U.S. Department of Education–funded research grants on reading

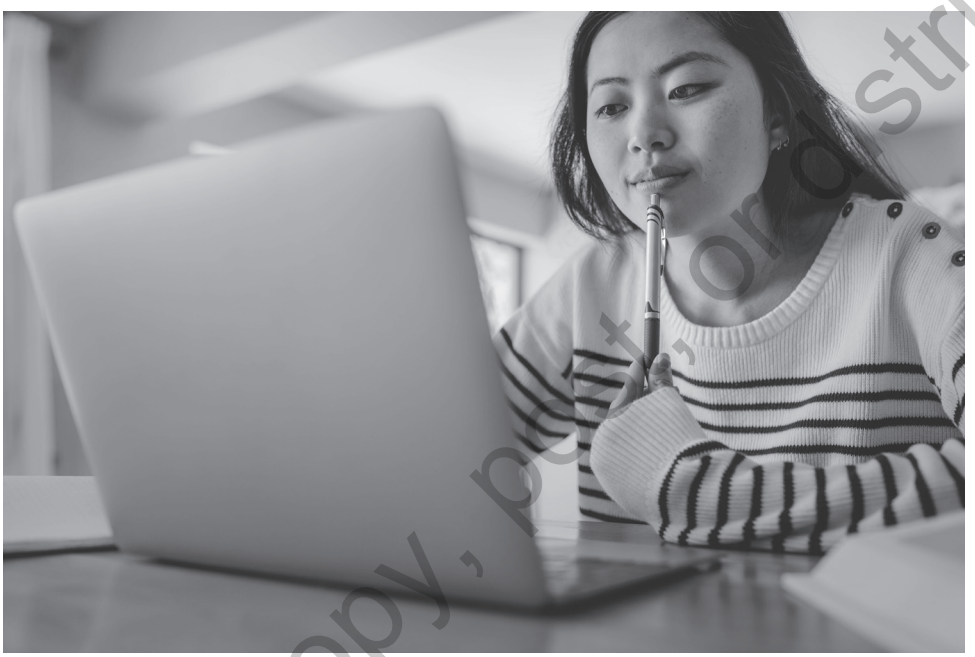
instruction for this population and was most proud of her work as coauthor of the Early Literacy Skills Builder (ELSB), the Early Reading Skills Builder (ERSB), and the Nonverbal Literacy Assessment (NVLA). She was awarded Fellow status by the American Association on Intellectual and Developmental Disabilities and received the 2017 Excellence in Research Award from the College of Education at the University of North Carolina at Charlotte. Her "best day ever" was every Saturday spent at home, cooking, playing, and laughing with her husband, daughters, sons-in-law, and grandchildren.

Source: St. Bonaventure University

Gregory J. Privitera is a three-time national-award-winning author and a professor of psychology at St. Bonaventure University where he is a recipient of its highest teaching honor, The Award for Professional Excellence in Teaching, and its highest honor for scholarship, The Award for Professional Excellence in Research and Publication. Privitera received his PhD in behavioral neuroscience in the field of psychology at the State University of New York at Buffalo and continued with his postdoctoral research at Arizona State University. His texts span diverse topics in psychology and the behavioral sciences and include an introductory psychology text, three statistics texts, two research methods texts, and multiple other texts bridging knowledge creation across health, health care, and analytics. In addition, He has authored more than three dozen peer-reviewed papers aimed at advancing our understanding of health, health literacy, and informing policy in health care. His research has earned recognition by the American Psychological Association and in media to include *O, the Oprah Magazine*, *Time*, and *The Wall Street Journal*. He mentors a variety of undergraduate research projects at St. Bonaventure University, where dozens of students, many of whom have gone on to earn graduate and doctoral degrees at various institutions, have coauthored and presented research work. In addition to his teaching, research, and advisement, Privitera is a veteran of the U.S. Marine Corps, is an identical twin, and is married with two daughters, Grace Ann and Charlotte Jane, and two sons, Aiden Andrew and Luca James.

Chapter 1

Introduction to Scientific Thinking and the Science of Education



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Learning Objectives

1.1 Define science and the scientific method, including six steps for engaging in the scientific method.

1.2 Distinguish between basic and applied research, as well as quantitative and qualitative research.

1.3 Differentiate between a hypothesis and a theory, and between induction and deduction.

1.4 Delineate the process and strategies of performing a literature review.

1.5 Discriminate between a confirmational and a disconfirmational strategy.

Introduction

Are you curious about the world around you? Do you think that seeing is believing? When something seems too good to be true, are you critical of the claims? If you answered yes to any of these questions, the next step in your quest for knowledge is to learn about the methods people use to understand events and behaviors—specifically, the methods scientists use. Much of what you think you know is based on the methods scientists use to answer questions.

For example, on a typical morning, you may eat breakfast because it is "the most important meal of the day." If you drive to school, you may put away your cellphone because "it is unsafe to use cellphones while driving." At school, you may attend an exam review session because "students are twice as likely to do well if they attend the session." In your downtime, you may watch videos or read articles that make sensational claims such as "scientifically tested" and "clinically proven." At night, you may try to get your "recommended 8 hours of sleep" so that you have the energy you need to start a new day. All these decisions and experiences are related in one way or another to the science of human behavior.

Teaching is also a scientific endeavor. Have you ever wondered if collaborative student groups, graphic organizers, or project-based teaching strategies can improve student learning? Have you tried to use incentives to encourage students to complete homework assignments, increase student engagement, or decrease inappropriate behavior during class? Are you curious about the prevalence of bullying in your school? Teachers frequently ask these types of questions. The practice of teaching is also based on decisions and experiences that are related to the science of human behavior. This book reveals the scientific process, which will allow you to be a more critical consumer of knowledge because you will be able to critically review the methods that lead to the claims you read and hear each day. Understanding the various strengths and limitations of using science can empower you to make educated decisions and confidently negotiate widely accepted facts and principles. The idea is that you do not need to be a scientist to appreciate what you learn in this book. *Science* is all around you—for this reason, being a critical consumer of everyday information is useful and necessary across professions.

1.1 The Scientific Method and Its Relevance in Educational Research

LO 1.1	Define science and the scientific method, including six steps for engaging in the scientific method.

This book is a formal introduction to the scientific method. **Science** is one way of knowing about the world. The word *science* comes from the Latin *scientia*, meaning knowledge. From a broad view, science is a systematic method of acquiring knowledge. From a stricter view, science refers specifically to the acquisition of knowledge using the **scientific method**, also known as the **research method**.

Using the scientific method, we make observations that can be measured. An observation can be direct or indirect. For example, we can directly observe how well a student performs on a test by counting the number of correct answers on the test. However, learning cannot be directly observed. Instead, we can indirectly observe learning by defining how we measure it—for example, administering tests of knowledge before and after instruction or by recording the number of

correct responses when applying knowledge to a new situation. In both cases, we infer that more correct responses are associated with greater learning. Hence, we can make direct or indirect observations of behavior by defining how we exactly measure that behavior.

The scientific method requires the use of systematic techniques, many of which are introduced and discussed in this book. Each method or design comes with a specific set of assumptions and rules that make it *scientific*. Think of this as a game, such as a card game or sport, that only makes sense if players follow the rules. The scientific method is very much the same. It is defined by rules that scientists must follow, and this book is largely written to identify those rules for engaging in science. To engage in the scientific method, we need to organize the process we use to acquire knowledge. The scientific method is composed of six general steps, which are shown in Figure 1.1. The steps are as follows:

The Six Steps of the Scientific Method

1. Identify a problem
2. Develop a research plan
3. Conduct the study
4. Analyze and evaluate the data
5. Communicate the results
6. Generate more new ideas

Step 1: Identify a Problem

The research process begins when you identify the problem to be investigated or a problem that can be resolved in some way by making observations. For example, Pennington (2010) found that computer assisted instruction (CAI) was effective for teaching reading to students with autism, but there were limited rigorous experimental studies to evaluate these programs. From this study, Grindle et al. (2021) identified a problem to be investigated—whether a phonics-based CAI program would improve the reading skills of students with severe intellectual disabilities. This could be resolved by observing how well participants read words before and after the CAI instruction compared to those who did not receive the instruction.

In Step 1, we determine what to observe in a way that will allow us to answer questions about the problem we are investigating. In the education sciences, we often investigate problems related to human learning (e.g., instructional practices): processes and mechanisms of learning (e.g., cognition, memory, motivation) or other factors that influence learning (e.g., mental health, socioeconomic, school structure, resources). Step 1 is discussed in greater detail later in this chapter.

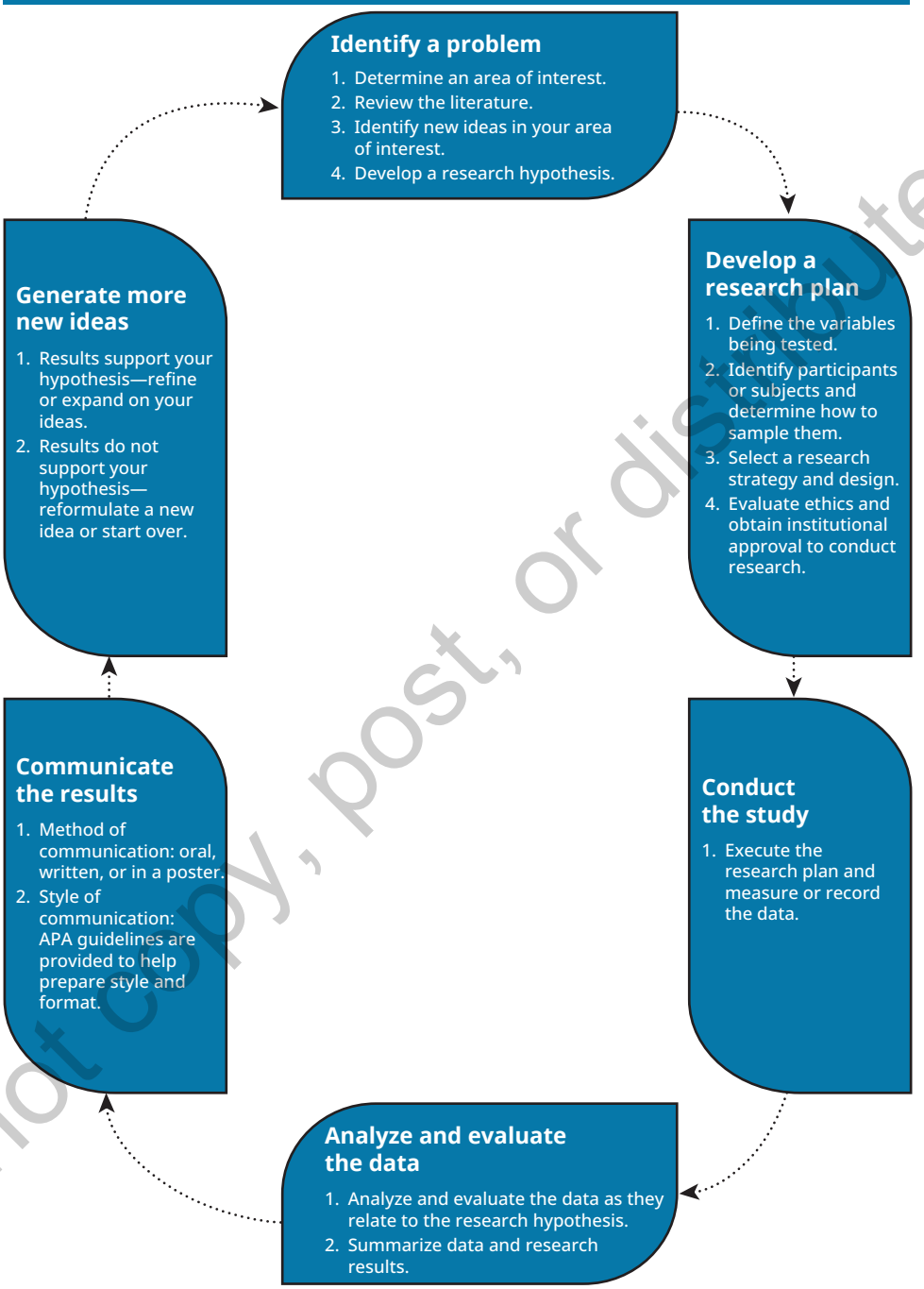
(1) Determine an area of interest.

The scientific process can take anywhere from a few days to a few years to complete, so it is important to select topics of research that interest you.

(2) Review the literature.

The literature refers to the full database of scientific articles, most of which are accessible using online search engines. Reviewing the scientific literature is important because it allows you to identify what is known and what can still be learned about an educational issue that interests you.

Figure 1.1 ▪ The Six Steps of the Scientific Method



(3) Identify new ideas in your area of interest.

Reviewing the literature allows you to identify new ideas that can be tested using the scientific method. The new ideas can then be restated as predictions or expectations based on what is known. For example, below are two outcomes identified in a literature review. From these

outcomes, we then identify a new (or *novel*) idea that is given as a statement of prediction, called a **research hypothesis**:

Scientific Outcome 1: Individualized instruction improves literacy processing.

Scientific Outcome 2: Literacy programs with initial learning in the students' native language result in greater long-term academic gains.

Research hypothesis: Participation in a one-on-one Spanish-language reading intervention will improve literacy outcomes of Spanish-speaking first grade students.

(4) Develop a research hypothesis.

The research hypothesis is a specific, testable claim or prediction about what you expect to observe given a set of circumstances. We identified the research hypothesis that a one-on-one native language literacy instruction will improve literacy, similar to a hypothesis tested by Borman et al. (2020)—we will revisit this study at the end of this section. Note also that we used the literature review to develop our research hypothesis, which is why we must review the literature before stating a research hypothesis.

Step 2: Develop a Research Plan

Once a research hypothesis is stated, we need a plan to test that hypothesis. To complete the scientific process, we need to develop a *research plan*, or a strategy for testing a research hypothesis.

(1) Define the variables being tested.

A **variable**, or any value that can change or vary across observations, is typically measured as a number in science. The initial task in developing a research plan is to define or *operationalize* each variable stated in the research hypothesis in terms of how each variable is measured. The resulting definition is called an **operational definition**. For example, we can define the variable identified in the research hypothesis we developed: Participation in a Spanish-language tutoring intervention will improve literacy outcomes of Spanish-speaking first grade students.

In our research hypothesis, we state that literacy will increase if Spanish-speaking students participate in a native-language tutoring intervention. We need to measure literacy both numerically and in such a way that others could also observe or measure it in the same way; this will be our operational definition. The following are two ways we could measure or operationalize literacy:

Operational Definition 1: The score on a Spanish literacy assessment.

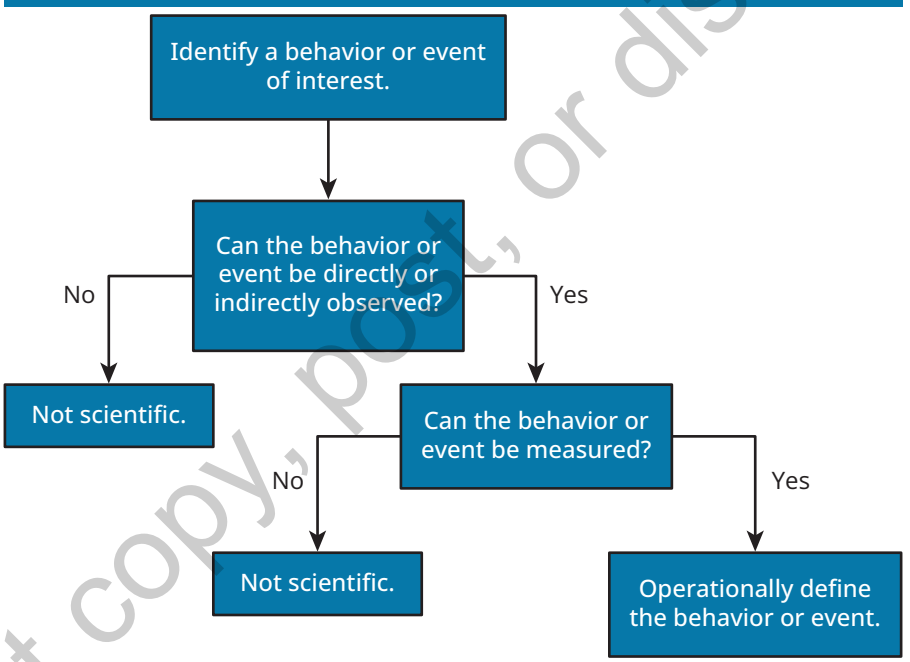
Operational Definition 2: The difference in Spanish literacy assessment scores before versus after the tutoring intervention.

Each operational definition clearly identifies how *literacy* will be measured—either as a **score** (i.e., number of items correct) or as a difference (in items correct with versus without tutoring intervention). Both operational definitions make *literacy* a suitable variable for scientific study because we have identified how it will be objectively measured. We typically need to choose one operational definition, which can be influenced by the type of study we conduct.

Making Sense—Observation as a Criterion for "Scientific"

In science, only observable behaviors and events can be tested using the scientific method. Figure 1.2 shows the steps to determine whether a phenomenon can be tested using the scientific method. Notice in the figure that we must be able to observe and measure behaviors and events. Behaviors and events of interest (such as identifying letters) must be observable because we must make observations to conduct the study (Step 3). Behaviors and events must be measurable because we must analyze the observations we make in a study (Step 4), and to analyze observations we must have defined the specific way we measured those observations.

Figure 1.2 ▪ A Decision Tree for Identifying Scientific Variables



Note: A behavior or event must be observable and measurable to be tested using the scientific method.

(2) Identify participants or subjects and determine how to sample them.

Next we need to consider the **population** of interest, which is the group that is the subject of our hypothesis. In our research hypothesis, we identify how Spanish-speaking students gain literacy skills (i.e., participating in tutoring). The population of interest to us, then, is Spanish-speaking students. We need to define this population further so that we can define the exact group of students of interest to us. For example, we could define this group by a grade level. In this case, we can define the population as Spanish-speaking students in first grade.

Of course, we cannot readily observe every Spanish-speaking first grader. For this reason, we need to identify a sample of first grade Spanish-speaking students that we will actually observe

in our study. A **sample** is a subset or portion of individuals selected from the larger group of interest. It is more realistic for scientists to observe samples instead of entire populations. It also requires less time, money, and resources than observing entire populations. Indeed, most scientific research is conducted with samples and not populations. There are many strategies used for appropriately selecting samples, which will be introduced in Chapter 4.

(3) Select a research strategy and design.

After defining the variables and determining the type of sample for the research study, we need a plan to test the research hypothesis. The plan we use will largely depend on how we defined the variable being measured. For example, Figure 1.3 illustrates two research plans—one using Operational Definition 1 and a second using Operational Definition 2. Using Operational Definition 1, we predict that students in the tutoring intervention group will have greater literacy skills than those in the nonintervention (control) group. To test this prediction, we set up a two-group design to compare the literacy scores between the two groups.

Figure 1.3 ▪ Two Research Plans to Test the Same Hypothesis

	Research Plan 1 (Two-Group Study)		
Groups	*Tutoring Group:* Spanish-speaking students receive Spanish-language tutoring intervention.	vs.	*Non-Tutoring (Control) Group:* Spanish-speaking students receive typical classroom instruction.
Measurements	Operational Definition 1: Score on a Spanish literacy assessment.		
Prediction from research hypothesis	Spanish-speaking students in the tutoring intervention group will have greater Spanish literacy skills than those in the nonintervention group.		
	Research Plan 2 (One-Group Study)		
Groups	*Tutoring Group:* Spanish-speaking students receive Spanish-language tutoring intervention.		
Measurements	Operational Definition 2: The difference in Spanish literacy scores before and after the intervention.		
Prediction from research hypothesis	Spanish-speaking students will have higher Spanish literacy scores after participating in the tutoring intervention.		

Note: These are two ways that scientists could design a study to test the same research hypothesis. The type of design we implement influences how the dependent variable will be defined and measured.

Using Operational Definition 2, we predict that students will have higher literacy scores after participating in the tutoring intervention. To test this prediction, we set up a one-group design in which we take the difference in the literacy scores before and after the intervention. Selecting an appropriate research strategy and design is important, and Chapters 4 to 14 in this book are devoted to describing this step.

(4) Evaluate ethics and obtain institutional approval to conduct research.

While a research design can be used to test a hypothesis, it is always important to consider how you plan to treat participants in a research study. It is not acceptable to use unethical procedures to test a hypothesis. Hence, participation in a study must be voluntary. Because the ethical treatment of participants can often be difficult to assess, research institutions have created ethics

committees to which a researcher submits a proposal that describes how participants will be treated in a study. Upon approval from such a committee, a researcher can then conduct their study. Because ethics is so important to the research process, this topic is addressed in each chapter, and it is also specifically described in detail in Chapter 2.

Step 3: Conduct the Study

The goal of Step 3 is to execute the research plan. In Step 2, we developed a plan (Figure 1.3) that led to two ways we could conduct a study to test our hypothesis. Let us execute Research Plan 1 as an example. Using this plan, we would select a sample of Spanish-speaking first grade students, provide the tutoring intervention to a subset, administer the literacy posttest, and record the difference in the scores based on receipt of the intervention. By doing so, we have conducted the study.

Step 4: Analyze and Evaluate the Data

Once we have collected data aligned to our research hypothesis, the goal of Step 4 is to conduct data analysis and report the results.

(1) Analyze and evaluate the data as they relate to the research hypothesis.

Data are typically analyzed in numeric units, such as the scores we analyzed for Research Plan 1 (i.e., the difference in the literacy scores based on receiving tutoring intervention). In Step 4, we analyze the data to specifically determine if the pattern of data we observed in our study shows support for the research hypothesis. In Research Plan 1, we start by assuming that there will be 0 difference in literacy scores between the two groups if the Spanish-language tutoring does not increase literacy, and then we test this assumption. To make this test, we use *statistics*, which will be introduced throughout this book to provide a more complete understanding of how researchers make decisions using the scientific method.

(2) Summarize data and report the research results.

Once the data are evaluated and analyzed, we need to concisely report the data. Data are often reported in tables graphically as shown in Figure 1.4 later in this chapter. Also, statistical outcomes are reported by specifically using guidelines identified by the American Psychological Association (APA). The exposition of data and the reporting of statistical analyses are described throughout the book beginning in Chapter 3 and also specifically reviewed in Chapters 17 and 18.

Step 5: Communicate the Results

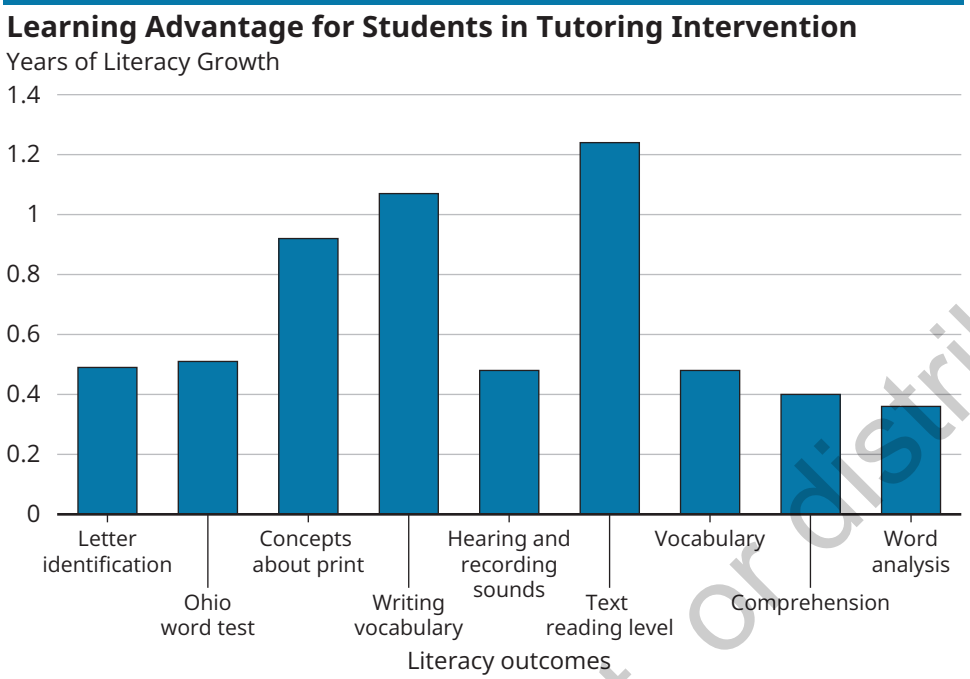
To share the results of a study, we must decide how to make our work available to others as identified by the APA.

(1) Method of communication.

Communicating your work allows other professionals to review your work to learn about what you did, test whether they can replicate your results, or use your study to generate their own new ideas and hypotheses. The most typical ways of sharing the results of a study are orally, in written form, or as a poster.

Oral and poster presentations are often given at professional conferences, such as national conferences held by the American Educational Research Association (AERA), the National

Figure 1.4 ▪ A Portion of the Results Reported by Borman et al. (2020)



Note: Spanish-speaking first grade students in the tutoring intervention outperformed the control students on nine different literacy outcome measures. The effect sizes (equivalent to school years of achievement growth) ranged from 0.40 to 1.24.

Source: Adapted from those reported by Borman et al. (2020).

Council of Teachers of English (NCTE), the National Council of Teachers of Mathematics (NCTM), the University Council for Educational Administration (UCEA), and the Council for Exceptional Children (CEC). The strongest method for communication, however, is through publication in a peer-reviewed journal. To publish in these journals, researchers describe their studies in a manuscript and have it reviewed by their peers (i.e., other professionals in their field of study). Only after their peers agree that their study reflects high-quality scientific research can they publish their manuscript in the journal. Chapter 20 provides guidelines for writing manuscripts using APA style, as well as for writing posters and giving talks. Several examples of posters and an APA manuscript that has been published are given in Appendix A.

(2) Style of communication.

Written research reports often must conform to the style and formatting guidelines provided in the *Publication Manual of the American Psychological Association* (APA, 2020), also called the *Publication Manual.* The *Publication Manual* is a comprehensive guide for using ethics and reducing bias, writing manuscripts and research reports, and understanding the publication process. It is essential that you refer to this manual when choosing a method of communication. After all, most educational researchers across the education sciences follow these guidelines.

For our research hypothesis, we chose Research Plan 1. Borman et al. (2020) also used a plan similar to Research Plan 1 except that the students in the control group in their study received a delayed treatment after the experiment was complete. These researchers published their results

in the peer-reviewed journal *American Educational Research Journal*. Their results, a portion of which is shown in Figure 1.4, show support for the hypothesis—first grade Spanish-speaking students who received the native-language tutoring showed greater literacy skills than those who did not. The researchers note that this is the first experimental study of the Spanish-language version of the Reading Recovery program and shows very promising results for a supplemental intervention that spans only 12 to 20 weeks.

Step 6: Generate More New Ideas

When your study is complete, you can publish your work and allow other researchers the opportunity to review and evaluate your findings. You have also learned something from your work. If you found support for your research hypothesis, you can use it to refine and expand on existing knowledge. If the results do not support your research hypothesis, then you propose a new idea and begin again.

Steps 1 to 6 of the scientific process are cyclic, not linear, meaning that even when a study answers a question, this usually leads to more questions and more testing. For this reason, Step 6 typically leads back to Step 1, and we begin again. More important, the scientific process allows other researchers to ask, "If your claim is correct, then we should also observe this," or "If your claim is correct, then this should not be observed." A subsequent study would then allow other researchers to determine how confident we can be about what we think we know of that particular behavior or event of interest.

Learning Check 1.1

1. What tasks should a researcher perform before stating a research hypothesis?
   - **a.** determine an area of interest
   - **b.** review the literature
   - **c.** identify new ideas in an area of interest
   - **d.** all of the above
2. Fill in the blanks using A = attention, and T = time (in seconds): A researcher studying attention measured the time (in seconds) that students spent working continuously on a task. Longer times indicated greater attention. In this study, _____ is the variable being measured, and _____ is the operational definition for the variable.

1.2 Approaches in Acquiring Knowledge

LO 1.2 Distinguish between basic and applied research, as well as quantitative and qualitative research.

Many approaches lead to different levels of understanding of the behaviors and events we study using the scientific method. In this section, we introduce research that is basic or applied and research that is qualitative or quantitative.

Basic and Applied Research

Basic research is an approach where researchers aim to understand the nature of behavior. Basic research is used to answer fundamental questions that address theoretical issues, typically regarding the mechanisms and processes of behavior. Whether there are practical applications

for the outcomes in basic research is not as important as whether the research builds upon existing theory. Basic research is used to study many aspects of behavior, such as the influence of biology, cognition, learning, memory, consciousness, and development on behavior.

Applied research, on the other hand, is an approach in which researchers aim to answer questions concerning practical problems that require practical solutions. In educational research, applied research seeks to answer questions about educational practice that can be generalized to varied educational settings. Examples of educational applied research include implementing varied instructional strategies, character development, parental involvement, and classroom management. Researchers who conduct applied research focus on problems with immediate practical implications to apply their findings to problems that have the potential for immediate action.

While basic and applied research are very different in terms of the focus of study, we can use what is learned in theory (basic research) and apply it to practical situations (applied research), or we can test how practical solutions to a problem (applied research) fit with the theories we use to explain that problem (basic research). As an example, basic research looking at brain activity found that learners who were asked to focus on letter-sound relationships versus memorizing words had higher activity in the left hemisphere, a brain pattern that supports word recognition (Yoncheva et al., 2015). A confirming result was shown in an applied research study in which researchers found that first-grade children who were taught to decode consonant-vowel syllables by sounding out and blending them learned to read and write a greater number of words than those who were taught to decode whole syllable units (Sargiani et al., 2021). The applied research study in 2021, which was developed from earlier basic research studies, proposed immediate solutions that could be applied to beginning reading instruction.

Qualitative and Quantitative Research

Quantitative research uses the scientific method to record observations as numeric data. Most scientific research in the social sciences is quantitative because the data are numeric, allowing for a more objective analysis of the observations made in a study. Researchers, for example, may define *mastery* as the time (in seconds) it takes to complete a presumably difficult task. By defining mastery in seconds (a numeric value), the analysis is more objective—other researchers can readily measure mastery in the same way. Numeric values can also be readily entered into statistical formulas, from which researchers can obtain measurable results. Statistical analysis is not possible without numeric data.

Qualitative research is different from quantitative research in that qualitative research does not include the measurement of numeric data. Instead, observations are made, from which conclusions are drawn. The goal in qualitative research is to describe, interpret, and explain the behaviors or events being studied. As an example, a qualitative researcher studying motivation may interview a small group of participants about their experiences with motivation, then use their descriptions to interpret and explain what motivation is. Whereas in quantitative research, the researcher defines the variable of interest (e.g., motivation) and then makes observations to measure that variable. In qualitative research, the participants describe the variable of interest, from which researchers interpret and explain that variable.

Quantitative and qualitative research can be effectively used to study the same behaviors, so both types of research have value. For example, quantitative research can be used to determine how often and for how long (in minutes, on average) students study for an exam, whereas qualitative research can be used to characterize their study habits in terms of what they study, why they study it, and how they study. Each observation gives the researcher a bigger picture of how to characterize studying among students. In this way, both types of research can be effectively used to gauge a better understanding of the behaviors and events we observe.

Learning Check 1.2

1. True or false: Basic research is used to study practical problems to create the potential for immediate action.
2. State whether each of the following is an example of quantitative (A) or qualitative (B) research.
   a. A researcher interviews a group of teachers and asks them to explain how they feel about the Common Core State Standards. Each teacher is allowed to respond in their own words.
   b. A school administrator examines student attendance records after implementing a later school start time.
   c. A school psychologist interested in attention records the number of out-of-seat behavior of students.
   d. A witness to a bullying incident describes the incident to the school principal.

1.3 Generating and Converting Ideas to Hypotheses and Theories

LO 1.3 Differentiate between a hypothesis and a theory, and between induction and deduction.

It was the German-born American physicist Albert Einstein who once said, "I am neither especially clever nor especially gifted. I am only very, very curious." While it is more likely that Einstein was clever, gifted, and curious, his insight marks an important feature in science: Knowledge is only possible through inquiry. One characteristic of all good scientists is that they ask good questions. Einstein, for example, asked, "Are time and space the same thing?" His research was to answer this question, which led to his theory of relativity (Einstein, 1915)—a mathematical proof that the answer to his question is yes. For all the complexities of the theory of relativity, imagine that this research was inspired by such a simple question.

The object of research is to extend human knowledge beyond what is already known. Once a research study is complete, researchers will try to publish the results in a scientific journal known as a **peer-reviewed journal**. After all, the scientific community will not know about a research study that is not published. To publish your work, you should be considerate of the aims of peer-reviewed scientific journals as you develop your ideas. Two criteria of importance to publishing a work can be met by answering the following two important questions regarding your idea:

Is my idea interesting? An interesting idea can potentially benefit society, test a prediction, or develop areas of research where little is known. Peer-reviewed journals have a readership, and your idea must appeal to those who read that journal if you are to publish your ideas. In other words, journals prefer to publish papers that are going to be widely read and useful to their readers. The websites for most peer-reviewed journals have an *aims and scope* section that you should read before deciding to submit your work to a particular journal. Not meeting the aims and scope of a journal can be grounds alone for rejection of a work.

Is my idea novel? A novel idea is one that is original or new. You must be able to show how your idea adds to or builds upon the scientific literature. If you can demonstrate what we

learn from your idea, then it is novel. It is valuable to replicate or repeat the results of other works; however, replication alone, without appreciable advancement of a fundamental new understanding or knowledge in an area, is often not sufficient to publish a work. Instead, the editors at peer-reviewed journals will prefer scientific reports of "original and significant" findings that extend, not simply repeat, scientific understanding or knowledge.

For any idea you have, the answer to both of these questions should be yes. Ultimately, it is your peers (i.e., other researchers in a field related to your idea) who will review your work before it can be published in a scientific journal. By answering yes to both questions, you should be able to effectively communicate the value of your idea to a broad scientific audience. Table 1.1 gives three examples of how the authors of a peer-reviewed article studying the use of iPads in elementary school classrooms communicated what made their ideas interesting and novel.

Table 1.1 ▪ Three Articles Concerning the Use of iPads in Elementary School

Reference	Description	Is the Idea Interesting?	Is the Idea Novel?
Cary et al. (2021)	Researchers conducted an experiment to study the effects of an iPad-based math program on math achievement of kindergarten students.	"Educators, researchers, and leaders of educational associations recognize technology's potential to motivate and engage students in math, assess students' math knowledge, and simultaneously provide instruction at different levels and paces to different students." (p. 322)	"...many technology-based early elementary math programs do not incorporate evidence-based instructional design principles, tend to favor basic facts and procedures over conceptual knowledge, and vary in whether—and the degree to which—they offer differentiated learning experiences." (p. 322)
Lauricella & Jacobson (2022)	Researchers used interviews with teachers and classroom observations to understand first-grade teachers' intentions and use of iPads in the classroom.	"The relatively sudden increase in access and availability of developmentally appropriate technology as well as federal- and district-level support for technology use in early elementary classrooms may be informing teachers' pedagogical intentions for technology use with students and their actual practices of using the technology for educational purposes in their classrooms." (p.1)	"...rarely do researchers collect observational data to supplement teacher reports of use to provide a clear picture of the realities of technology use, particularly in early elementary school years." (p. 1)
Torrington & Bower (2021)	Researchers examined the effects of teacher-created video instruction using iPads on elementary student learning, behavior, and attitudes.	Researchers noted that "...specific, personalized teacher-made instructional videos are an effective method to afford differentiation in a diverse mainstream classroom." (p. 1109)	"...research on the use of customized, teacher-created video in the elementary classroom and its effect on student learning, behaviour and perceptions, as well as the impact on teachers, has not been investigated." (pp. 1107-1108)

Note: The citation for where the authors of each article explicitly state what makes their research interesting and novel is given.

Converting Ideas to Hypotheses and Theories

In many ways, science may appear to be the search for new information. However, the information itself is of little value without organization. Imagine, for example, trying to find a book in a library that places books on shelves in a random order. The information is in the library; however, it will be difficult to find the information you seek. Moreover, we must do

more than just catalog the information we obtain; we must also understand it. In other words, we identify the relevance or usefulness of information. Specifically, we identify the relevance of information by identifying how information can broaden our understanding of the phenomena we study.

The process of organizing information in science is similar to working on a puzzle. You begin with scattered pieces and guessing where pieces fit. Once you have enough puzzle pieces in place, you can begin to organize other puzzle pieces based on what you know about the pieces in place. Some regions of the puzzle have a similar color and some have a similar design, and this organization can help you ultimately organize the remaining pieces until they all fit the puzzle. The pieces of the puzzle are like the observations we make. And the strategies we use to complete the puzzle are like the hypotheses and theories that researchers state.

A **hypothesis** is a specific, testable claim or prediction about what you expect to observe given a set of circumstances. For example, we tested the hypothesis that Spanish-language tutoring will increase literacy of Spanish-speaking students. The hypothesis we stated was a prediction that specifically identified the outcome we expect to observe (increased literacy scores) given a specified set of circumstances (students receive Spanish-language tutoring). Using the puzzle analogy, each attempt to place puzzle pieces together is like an attempt to test a hypothesis. As we start to "put the pieces together," a theory can then develop.

A **theory**, however, is a broad statement used to account for or explain an existing body of knowledge and provide unique predictions to advance that body of knowledge. A theory essentially organizes evidence that has been rigorously tested and supported by scientific observations. If the findings of research studies point to a collective explanation for the observations made, then a theory develops. Returning to the puzzle analogy, imagine that we put together a puzzle without knowing what the image is that we are constructing. As we group pieces by colors and patterns, we will start to see an image appear in a similar way as we gain evidence and begin to "see" the nature of the phenomena we study. From that information, we can theorize what the puzzle image is. As we continue to fit pieces of the puzzle together, we can then modify and refine our theory for what is in the image, similar to how we modify and refine theories of natural or behavioral phenomena as we gather more evidence about these phenomena.

While not exhaustive, there are three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific:

Testable/falsifiable. A good theory or hypothesis must be stated in a way that makes it possible to reject it (i.e., it must be falsifiable). For example, we can state the theory that a belief in God or a higher power can mitigate depression among African American adolescents who live in stressful environments (Lee & Neblett, 2019). This theory does lead to falsifiable predictions that researchers can readily test. However, we cannot state the theory that God exists because the existence of God cannot be falsified and therefore cannot be accepted as a good theory. That is not to say science says God does not exist; that is to say that such a claim cannot be tested using the scientific process.

Replicable/precise. The mechanisms (i.e., presumed causes) and outcomes in a hypothesis or theory should be clearly defined and precise. For example, consider the theory that a growth mindset promotes willingness to tackle challenges and results in greater learning (see Dweck, 1999; 2012). This theory is scientific if growth mindset (the mechanism) and what constitutes learning (the outcome) are specifically defined, such that other researchers could

also readily observe, measure, and repeat the procedures used to test this theory. Growth mindset may be measured using rating scales or perhaps by recording time spent working on a challenging problem, for example. It should also be explicitly defined how to evaluate learning (e.g., grades, attainment). This needs to be clearly defined and precise so that other researchers could readily set up similar measures and procedures to see if they get similar results.

Parsimonious. **Parsimony** is a canon of science where simpler explanations should be preferred to more complex ones. For example, one poor theory popularized by television is the ancient alien theory, which posits that aliens have visited Earth in the past and influenced human civilizations. The theory, among other flaws, is unnecessarily complex. A simpler explanation is simply that humans influenced their civilization. Evidence such as pyramid building and cultural norms such as burial practices can be explained without the need to appeal to ancient aliens visiting Earth and interacting with humans. Thus, one reason it is a poor theory for science is that simpler explanations can just as readily explain the evidence purported to support the theory itself.

An advantage of a theory is that it not only states unique predictions but can also explain an existing body of research. Figure 1.5 shows the general pattern of developing hypotheses and theories. Notice in the figure that a theory is just as open to testing as a hypothesis. Specifically, a theory is often tested in one of two ways:

The predictions made by a theory can be tested. For example, the mindset theory (Dweck & Leggett, 1988; Dweck & Yeager, 2019) states that students' beliefs about their intelligence affect their persistence and effort, which ultimately impact academic achievement. We can test a "healthy" prediction of the theory to see if mindset interventions increase motivation and achievement in mathematics.

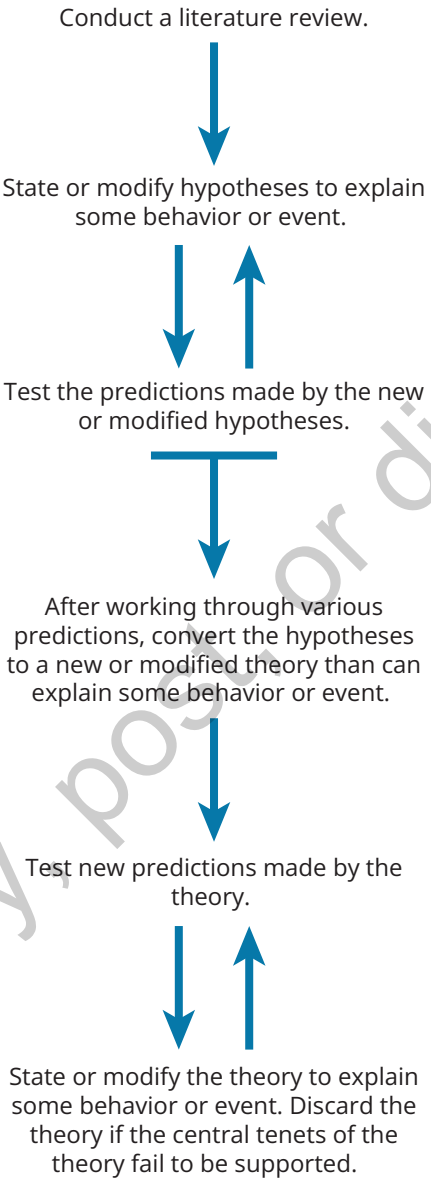
The limitations of a theory can be tested. For example, the mindset theory focuses on individual effort and neglects innate ability and external factors such as socioeconomic status. Thus, one limitation of the theory is lack of context. We could test this limitation by testing if students with lower abilities or lower socioeconomic status experience similar effects of growth mindset on outcomes as more advantaged students.

Hypotheses and theories allow researchers to organize a large body of research in a way that explains an understanding for evidence, as it is understood, and also provide predictions to organize the expectations for what we should observe. From this platform, we can state hypotheses to test our ideas, and we can also revise and develop our theories to better explain our observations—all with the hope of one day completing the puzzle of understanding human behavior.

Developing Your Idea: Deduction and Induction

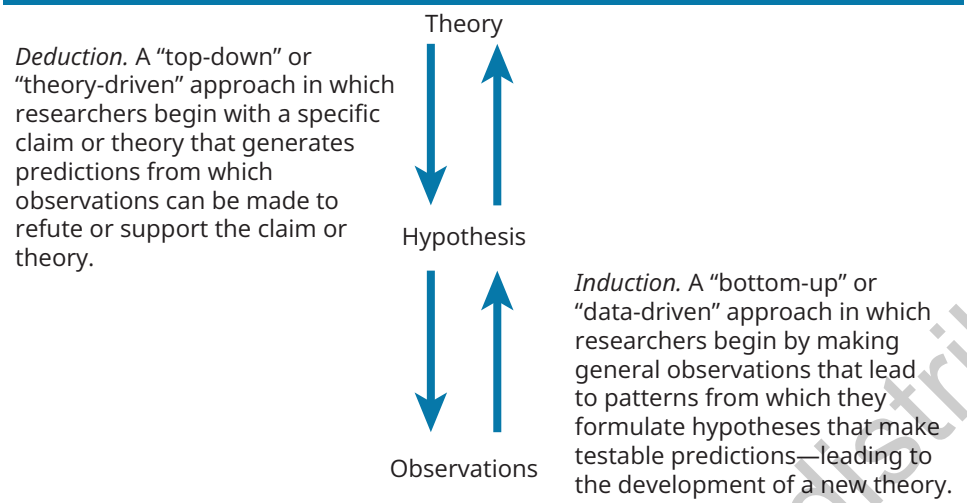
The reasoning that scientists often use to develop their ideas is to begin with a theory or to begin with an observation, referred to as deductive and inductive reasoning, respectively. To some extent, many scientists use a combination of both types of reasoning to develop their ideas. Each type of reasoning is introduced here and illustrated in Figure 1.6.

Figure 1.5 ▪ A General Pattern of Developing Hypotheses and Theories to Explain Behaviors and Events



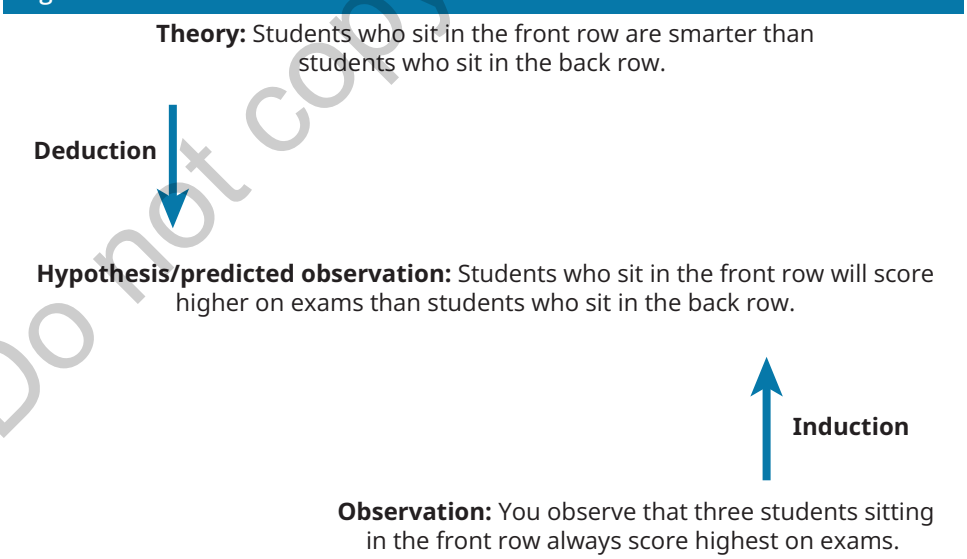
Many scientific reports will explicitly state theories that have been developed to explain a body of knowledge. A useful theory is one that leads to logical predictions of what we should and should not observe if the theory is correct. The reasoning we use to develop ideas to test those predictions is called **deductive reasoning**. Using deductive reasoning, you begin with a hypothesis or theory, then use that claim to deduce what you believe should occur, or not occur, if the claim is correct. The prediction you deduce will be used to refute or support the claim. Hence, using deductive reasoning, you start with an idea (the hypothesis or theory) to generate your ideas (predictions made by the hypothesis or theory). Using deductive reasoning, the hypothesis or theory guides the ideas you generate and observations you make.

Figure 1.6 ▪ A Comparison of Deductive and Inductive Reasoning



To illustrate deductive reasoning, imagine that, based on a literature review, you state the following theory, which you call the "front row theory": Students who sit in the front row are smarter than students who sit in the back row. From this starting point, you deduce predictions of what will be observed if your theory is correct. One prediction, for example, is that students who sit in the front row will score higher on an exam than students who sit in the back row. You can test this prediction by recording the grades of students and recording where they sat in class. In this way, your theory guides what you choose to observe. Figure 1.7 illustrates the "front row theory" example using deductive reasoning.

Figure 1.7 ▪ The Process of Deduction and Induction for the Same Problem



Note: In this example, both types of reasoning led to the same hypothesis.

Sometimes, you may find that your initial ideas are developed by your own data or observations. The type of reasoning you use to generate ideas from observations is called **inductive reasoning**. Using inductive reasoning, you make a casual observation (e.g., you see that all the students in Ms. Garcia's history class raise their hand to participate in a discussion) or collect and measure data (e.g., you record the number of times each student raises their hand for 1 week). You then generate an idea to explain what you observed or measured (e.g., students raise their hand because Ms. Garcia passes out candy to the students who participate in the discussions). The idea you generate to explain the observation is your hypothesis. Hence, using inductive reasoning, you start with an observation to generate new ideas; you generalize beyond the limited observations you made. Using inductive reasoning, then, the data or observations guide the ideas you generate and observations you make.

To illustrate the distinction between deductive and inductive reasoning, we can revisit the "front row theory" example to show how inductive reasoning could lead to the same idea we developed using deductive reasoning. Suppose you observe that three students sitting in the front row always score highest on exams. From this starting point, you hypothesize that all students who sit in the front row will score higher on exams than those who sit in the back row. You record the grades of all students and record where they sat in class. Notice that we arrive at the same idea and the same study to test that idea using both types of reasoning. Figure 1.7 illustrates the "front row theory" example using inductive reasoning.

Learning Check 1.3

1. Fill in the blank with H=hypothesis, and T=theory. A _____ is a broad statement used to account for an existing body of knowledge and also provide unique predictions to extend that body of knowledge, while a _____ is a specific, testable claim or prediction about what you expect to observe given a set of circumstances.
2. Indicate whether each of the following situations is an example of deductive reasoning (D) or inductive reasoning (I).
   a. You observe two students arguing loudly in a hallway. About 2 minutes into the argument, a teacher walks down the same hallway. After that, they no longer argue. From this you conclude that the presence of a teacher can prevent disruptive behavior in the hallways.
   b. While reading a professional paper, you come across a theory called model-lead-test that improves reading skills. You resolve that if this is true, then if you teach using the model-lead-test theory, the reading scores of your students will increase.
   c. You notice that students do better on a test after participating in a collaborative group project. You conclude then that providing more collaborative group projects will increase learning.

1.4 Performing a Literature Review

LO 1.4 Delineate the process and strategies of performing a literature review.

To develop an idea, you must perform a **literature review**. The *literature* is the general body of published scientific knowledge. The *review* is the search you perform of this general body of knowledge.

The literature is most often published in peer-reviewed journals and academic books. Other sources, such as newspapers, popular magazines, and internet websites, are not part of the scientific literature because the information provided in these sources is not typically subjected to a peer review.

A key objective of the literature review is to develop new ideas that can be converted into a hypothesis that is both interesting and novel. Research is not an isolated process; rather, it is one of collaboration and peer review. Therefore, reviewing the general body of knowledge in your topic area is important to determine what is known and to develop ideas for what is yet to be discovered. In this section, we will explain how to get started with your literature review to develop new ideas and select a research topic. We will then explain how to use searchable databases and organize your search results.

Getting Started: Choosing a Research Topic

Inquiry begins with a question. What topics interest you? What questions do you want to ask about those topics? When choosing a research topic, be sure to select one that interests you. The research process can be tedious. Asking questions about topics that interest you can make this process fun. Certainly, topics involving food, sports, family involvement, video gaming, teacher morale, instructional methods, or classroom discipline may interest you as an educator. Right now a researcher is probably studying just about any topic or behavior you can think of. It will be difficult to stay committed to a research project if you are not interested in the topic you are studying.

Getting Organized: Choosing Appropriate Sources

After you find an interesting research topic, you will review the literature about that topic. Keeping track of the types of sources you come across as you perform your review is important. A *source* is any published or printed article, chapter, or book from which information can be obtained. There can be thousands of sources for even a single research topic, and reviewing them all can be challenging. To organize the sources, you come across and make a literature review more efficient:

Begin with a search of review articles.

Search only from peer-reviewed or other scientific sources.

You can categorize sources as primary and secondary. A **secondary source** is any source in which an author describes research or ideas that are not necessarily their own. Secondary sources can include textbooks, newspaper and magazine articles, online sources, and review articles. *Review articles* provide a full summary of a research topic by an author who is regarded as an expert on that topic. It is good to begin with these types of articles for the following two reasons:

Key sources pertaining to a topic of interest are described in a review article.

Review articles are typically published in peer-reviewed journals.

Review articles include dozens of the most up-to-date findings in an area of research. To summarize the literature for a topic, an author will review many sources from other researchers in that topic area. Each source reviewed in the article that was not the actual work of the author is

called a secondary source. In a review article, the author or authors provide a thorough review of sometimes hundreds of secondary sources. By reading review articles, you can quickly review a diverse number of sources that you can be confident are related to your topic of interest.

Each time you come across a secondary source that interests you, you can find the reference cited in that review article and read it for yourself. As you review secondary sources, be sure to record the full reference of each source that interests you. For most sources, you should write down the author, publication year, title, journal, issue, and page numbers. Or you can create an electronic file or spreadsheet with this information to keep your search organized. You can be more efficient by having this information ready when it comes time to find the secondary sources that interest you.

The original source of an idea or research is called a **primary source**. In an *empirical article*, in which the authors conduct a firsthand study, the introduction for these articles is a great place to find secondary sources. Empirical articles can often be readily identified because these include a detailed method and results section, in addition to a concluding discussion section. These additional sections are a primary source (or the original ideas/design of the authors). In your review, keep track of secondary sources so that you can find the primary source later. It is important to find and read a primary source from the original author of a work. You should not develop your ideas based upon secondary sources because a secondary source is someone (e.g., the author of the review article) telling you what someone else (e.g., the original author of the work) observed. You need to check your sources. Find the primary source and read what the original author of that work did. You do this to check that what was reported in the review article was accurate and to be more confident in the ideas you develop from your review.

Most of the primary and secondary sources you find in your review can be found using online databases. Many databases for searching only peer-reviewed and scientific works are available at colleges throughout the world. If you have access to these library databases, then this will make your search far easier and more efficient.

Making Sense—Primary and Secondary Sources

A common misconception is that a source is either primary or secondary. In fact, most journal articles, especially those published in peer-reviewed journals, are a mix of both. Review articles mostly consist of secondary sources. However, secondary sources can also be found in original research articles from primary sources. For any research, authors must explain how their research is novel, and to do so, authors must show how their research study (primary source) builds upon the known body of research typically published by various authors (secondary sources). For this reason, most articles published in peer-reviewed journals begin with an introduction, which is where authors will explain what is known (typically by reviewing secondary sources) and what is yet to be explained and so tested in their study (primary source).

After you spend days or weeks reviewing a research topic, it is often all too easy to forget whether the information came from primary or secondary sources. One contributing factor to this problem is that you can find secondary sources in most articles you read, even in articles you list as being a primary source. Keeping track of primary and secondary sources as you review them can minimize this problem.

Getting Searching: Using Online Databases

Online databases allow researchers to search for, save, and print thousands of primary and secondary sources in all topic areas in the education sciences. Popular databases in the education sciences, the contents of which are described in Table 1.2, include ERIC (Education Resources Information Center), PsycINFO, and Education Research Complete. Many of these databases offer **peer-reviewed articles** in **full text**, meaning that the full article is provided and can be downloaded and saved on your computer, usually as a PDF.

Table 1.2 ▪ Descriptions for Three Widely Used Online Databases in the Behavioral Sciences

Database	Description
ERIC	A bibliographic and full-text internet-based digital library that contains more than 1.6 million records, updated twice weekly for journal articles, books, conference and policy papers, technical reports, and other education-related materials (Education Resources Information Center, n.d.).
PsycInfo	An abstract database containing more than 5.5 million records updated twice weekly, from 50 countries and in 30 languages. Ninety-nine percent of journals covered are peer reviewed from areas in psychology and related disciplines such as education (American Psychological Association [APA], 2024).
Education Research Complete	This full-text database, available via EBSCOhost, covers areas of curriculum instruction, administration, policy, funding, and related social issues found in journals, books, and education-related conferences (EBSCO Information Services, 2024).

When searching for peer-reviewed articles, it is important to recognize the types of articles you can find. Searching in the databases suggested here is the safest way to ensure that you are finding only peer-reviewed articles. However, if you are ever uncertain as to whether your source is peer reviewed—whether using the databases suggested here or other databases such as Google Scholar—it is often beneficial to check that your source is indeed peer reviewed. You can do this by visiting the journal website and referring to the *about this journal* or *aims and scope* sections. For inexperienced students, it can also be a good idea to check with your professor or other more experienced professionals.

Systematic Reviews of Literature and Meta-Analyses

During a search for literature, you can start by finding articles of individual research studies, then move on to two other types of research articles: a literature review (or systematic review of literature) or a meta-analysis. A systematic review of literature is a synthesis of research studies conducted on a particular topic. The researcher will systematically conduct an extensive search for all the research conducted on the topic in a given period. The purpose of this search is to describe all the research that has been conducted on the topic and to critically evaluate it. The review establishes to what extent the topic has been studied and will identify consistencies, inconsistencies, and gaps in the research, which leads to directions for future research. In this type of research article, expect the researcher to clearly describe the search process, search terms used to locate the literature, criteria for articles to be included or excluded from the review, and the publication time frame for the articles. A meta-analysis takes a systematic review of literature

one step further by combining the data derived from all of the studies to understand and to statistically analyze what the entire body of research says about the topic. There are different methods for conducting a meta-analysis, but the idea is to provide an overall estimate of the effect of an intervention or validity on a theoretical argument. If you are lucky enough to find a systematic review of literature or meta-analysis on your topic, you can use it as your starting point for finding new literature. You can be confident that all relevant literature prior to the date of the systematic review or meta-analysis is included by reviewing the search procedures and inclusion/exclusion criteria. If these seem reasonable, you only need to search for research that was published after the date of the systematic review or meta-analysis.

Ethics in Focus: Giving Proper Credit

One important reason for organizing your sources when conducting a literature review is to avoid confusion when giving credit for sources cited in your research study. If you cite these sources incorrectly or without reference to the primary source, ethical problems arise. Ways to avoid such ethical problems include:

Always double-check your sources for accuracy. When referring to a secondary source, be sure to cite it properly and accurately so your readers can find the source should they wish to pursue the subject you are writing about. Readers may become frustrated if they try to locate the source and cannot find it.

Obtain the primary source of an article you cite. One way to find the primary source is to check the references of secondary sources, particularly review articles. In that way, you can find the original work that should be given proper credit.

Avoid "**abstracting**." Abstracting in this sense refers to instances in which an individual cites the full reference of some work after simply skimming through an abstract. This is poor practice because it can lead to misinterpretation of the results. When you cite a reference, be sure that you have read it in full to ensure that you properly represent the work.

Be aware of citation bias. Citation bias occurs when an author or authors cite only evidence that supports their view and fail to cite conflicting evidence. For example, Ferguson (2020) identified such a problem in the video game aggression literature, that many articles in this area of research only cited one side for or against the dangers of video game violence. Make sure you cite sources for all findings in your area of interest and be aware of possible citation biases when reviewing the work of others.

In this section, we described four ethical concerns related to giving accurate and proper credit. The Office of Research Integrity offers a more exhaustive list of ethical considerations which you can find by searching the Office of Research Integrity's website for "Research Misconduct."

Connecting to the Classroom

Once you have identified a classroom- or school-based problem, performing a literature review is a very important first step to understanding the problem and identifying a potential solution. It is highly likely that you are not the only person to be experiencing a

specific problem, and there is information about potential solutions available. A literature review can help you understand the whole picture of the issue. There may be aspects of the issue that you have not thought about that are important for you to know. It may also serve as a sense of relief to know that you are not alone in experiencing this issue.

We have an identified gap in education research called the research-to-practice gap. Research has identified evidence-based practices that are not being put to good use in everyday classrooms. Researchers publish their work in research journals and share it at education conferences that are not often read by educators. We need to do better in disseminating our work to a wider audience in ways that are usable. The U.S. Department of Education has established the What Works Clearinghouse (WWC, as part of the Institute of Education Sciences website) as a repository for identified evidence-based practices. The criteria for being included in the WWC are rigorous, so you can be confident in the practices that are identified as being effective. Once you identify a potential practice on the site, you can link onto a summary of the research studies that were used to identify it as an effective practice.

Learning Check 1.4

1. True or False: A primary source includes the observations of the author.
2. State the ethical pitfall that is described for each example given below: A=inaccuracy of citation; B=failed to obtain primary source; C=abstracting; D=citation bias
   a. A student reads an interesting abstract of an article. They try to find the full article but are unable to locate it. They still cite the full article in their research paper.
   b. A professor reads an interesting review article stating that other researchers have shown a link between diet and addiction. They later write about this link and give credit to the review article but not the original researchers who showed this link.
   c. An author makes a claim that watching television reduces the attention span of a child and cites only those sources that support their view even though some evidence exists that refutes their view.
   d. A researcher reads an article that includes a study that piques their interest. When they go to find the reference cited, they notice that the publication year is wrong.

1.5 Testing Your Idea: Confirmation and Disconfirmation

LO 1.5 Discriminate between a confirmational and a disconfirmational strategy.

Any idea you develop must be testable—it must make specific predictions that can be observed under specified conditions. In this section, we consider two ways to test a theory or hypothesis: a confirmational strategy in which a researcher tests *anticipated* outcomes and a disconfirmational strategy in which *unanticipated* outcomes are tested by a researcher.

Confirmational Strategy

A **confirmational strategy** is a method of testing a theory or hypothesis in which a positive result confirms the predictions made by that theory or hypothesis. A *positive result* confirms a

hypothesis or theory and occurs when an effect or a difference is observed. A confirmational strategy is often used to test a new theory or hypothesis in terms of the predictions that it anticipates will occur if the theory or hypothesis is correct. Using an "if . . . then" logic statement, a confirmational strategy can be represented as follows:

If A is true, then B is true.

B is true.

Therefore, A is true.

The problem with using this type of logic, referred to as *affirming the consequent*, is that it can be fallacious or not true, as the following example demonstrates:

If you are a scientist (A), then you are educated (B).

You are educated (B).

Therefore, you are a scientist (A).

The conclusion that you are a scientist is not always true. While scientists are certainly educated, not all educated people are scientists. Thus, the logic is not valid. This problem of logical fallacy means that using the confirmational strategy alone to test theories and hypotheses is not good practice. To balance this major limitation, researchers also use a disconfirmational strategy.

Disconfirmational Strategy

A **disconfirmational strategy** is a method of testing a theory or hypothesis in which you test an outcome that is not predicted by the theory or hypothesis you are testing. A *positive result* in this case disconfirms a hypothesis or theory. Using this strategy, for example, suppose we hypothesize that students will increase the performance of a behavior if it is followed by a positive outcome, which is called a *theory of positive reinforcement*. To test this theory, we first record the number of classroom disruptions in a day by disruptive students. Then some of the disruptive students receive pleasant verbal compliments from a teacher following appropriate behavior, such as following a teacher's direction, and some do not receive any compliments. Finally, we record the number of classroom disruptions after 2 weeks of receiving the pleasant verbal compliments.

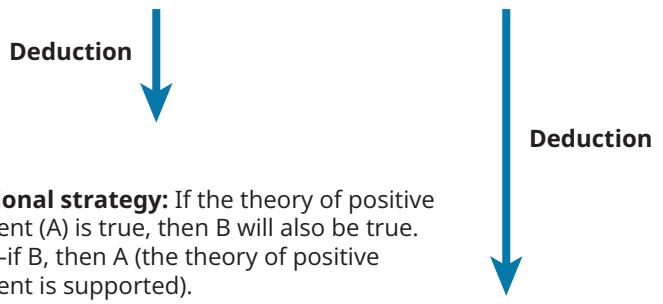
In this example, we applied both a confirmational and a disconfirmational strategy. Our hypothesis predicts that students who received the pleasant verbal compliments will perform the appropriate behaviors more often. As illustrated in Figure 1.8, this test is a confirmational strategy: If A, then B. For our hypothesis to be correct, we also must observe that students who did not receive the pleasant verbal compliments from the teachers will not perform appropriate behaviors more often. As illustrated in Figure 1.8, this test is a disconfirmational strategy: If A, then not C. If we do observe C, then the pleasant verbal compliments are not causing the increase in appropriate behavior.

A benefit of using the disconfirmational strategy is that we can refute a theory or hypothesis with a positive result. Alternatively, to refute a theory or hypothesis using a confirmational strategy, we would need to observe a *negative result*, meaning no effect or difference.

Because of problems related to statistical power (i.e., the likelihood of detecting an effect or a difference), negative results alone are rarely published in peer-reviewed journals. For this reason,

Figure 1.8 ▪ Using Confirmational and Disconfirmational Strategies to Test a Theory

Theory of positive reinforcement operant conditioning: Students will increase performing a behavior that is followed by a pleasant outcome



Confirmational strategy: If the theory of positive reinforcement (A) is true, then B will also be true. Therefore—if B, then A (the theory of positive reinforcement is supported).

Disconfirmational strategy: If the theory of positive reinforcement (A) is true, then C cannot be true (not C). Therefore—if C, then not A (the theory of positive reinforcement is refuted).

Key:
A = The theory of positive reinforcement.
B = Student increased performance of a behavior that was followed by a pleasant outcome.
C = Student increased performance of a behavior that was not followed by a pleasant outcome. In this example, the theory of positive reinforcement anticipates B—a confirmational strategy is used to test this outcome. But the theory of positive reinforcement does not anticipate C—a disconfirmational strategy is used to test this outcome.

Note: In this example, the aversion theory anticipates B—a confirmational strategy is used to test this outcome. But the theory of positive reinforcement does not anticipate C—a disconfirmational strategy is used to test this outcome.

much of the peer-reviewed literature is biased in favor of studies showing positive results, a situation described as publication bias. **Publication bias** is the tendency for editors of peer-reviewed journals to preferentially accept articles that show positive results and reject those that show only negative results. As a result, many researchers do not even try to publish negative findings, instead choosing to file them away, a situation described as the **file drawer problem**.

The publication bias means that the size of an effect could be overstated for many behavioral phenomena reported in the peer-reviewed literature. For this reason, a disconfirmational strategy is the best strategy for refuting a theory.

Learning Check 1.5

1. A researcher proposes the following theory: The more often students miss class, the worse their class grade will be. The following two studies, A and B, tested this claim. Indicate the type of strategy, confirmational (C) or disconfirmational (D), used in each study.

a. You select a sample of high school students who have missed at least six classes during the semester. Half the students work full-time, and half do not work. You record the GPA of all students to see if there is a difference between groups. Because all students sampled in this study missed the same number of classes, the theory does not predict a difference between groups.

b. You obtain school records from a random sample of high school freshmen. You record the semester GPA and the number of classes missed during the semester for each student sampled. If the theory is true, then it should also be true that the more classes students miss during the semester, the lower their semester GPA will be.

Chapter Summary

LO 1.1 Define science and the scientific method, including six steps for engaging in the scientific method.

- **Science** is the acquisition of knowledge through observation, evaluation, interpretation, and theoretical explanation.
- Science is specifically the acquisition of knowledge using the scientific method, which requires the use of systematic techniques, each of which comes with a specific set of assumptions and rules that make it *scientific*.
- The scientific process consists of six steps:

  Step 1: Identify a problem: Determine an area of interest, review the literature, identify new ideas in your area of interest, and develop a research hypothesis.

  Step 2: Develop a research plan: Define the variables being tested, identify participants or subjects and determine how to sample them, select a research strategy and design, and evaluate ethics and obtain institutional approval to conduct research.

  Step 3: Conduct the study. Execute the research plan and measure or record the data.

  Step 4: Analyze and evaluate the data as they relate to the research hypothesis and summarize data and research results.

  Step 5: Communicate the results. Results can be communicated orally, in written form, or as a poster. The styles of communication follow standards identified by the APA.

  Step 6: Generate more new ideas. Refine or expand the original hypothesis, reformulate a new hypothesis, or start over.

LO 1.2 Distinguish between basic and applied research, as well as between quantitative and qualitative research.

- **Basic research** uses the scientific method to answer questions that address theoretical issues about fundamental processes and underlying mechanisms related to the behaviors and events being studied. Applied research uses the scientific method to answer questions concerning practical problems with potential practical solutions.
- **Quantitative research** is most commonly used in the behavioral sciences and uses the scientific method to record observations as numeric data. **Qualitative research** uses the scientific method to make nonnumeric observations, from which conclusions are drawn without the use of statistical analysis.

LO 1.3 Differentiate between a hypothesis and a theory, and between induction and deduction.

- A **hypothesis** is a specific, testable claim or prediction about what you expect to observe given a set of circumstances. A **theory** is a broader statement used to account for an existing body of knowledge and also provide unique predictions to extend that body of knowledge. A theory is not necessarily correct; instead, it is a generally accepted explanation for evidence, as it is understood.
- Three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific include: testable/falsifiable, replicable/precise, and parsimonious.
- **Deductive reasoning** is a "top-down" type of reasoning in which a claim (hypothesis or theory) is used to generate ideas or predictions and make observations.
- **Inductive reasoning** is a "bottom-up" type of reasoning in which a limited number of observations or measurements (i.e., data) are used to generate ideas and make observations.

LO 1.4 Describe the process and ethical concerns of conducting a literature review.

- Getting started: Find a research topic that interests you because your interest in the topic will make the scientific process more worthwhile.
- Getting organized: Review **secondary sources** to identify primary sources that are most relevant to your research topic. Then follow up and read the **primary sources** to check what is reported in those sources.
- Getting searching: Use online databases, such as PsycINFO, ERIC, and Education Research Complete. Each online database allows you to use keyword searches to review thousands of articles and books.
- These concerns are as follows: incorrectly citing reference articles, failing to obtain or give proper credit to a primary source, citing a source after only reading the abstract for that source, and citation bias.
- **Citation bias** occurs when citing only evidence that supports your view without also citing existing evidence that refutes your view.

LO 1.5 Distinguish between a confirmational and a disconfirmational strategy.

- A **confirmational strategy** is a method of testing a theory or hypothesis in which a positive result confirms the predictions made by that theory or hypothesis.
- A **disconfirmational strategy** is a method of testing a theory or hypothesis in which a positive result disconfirms the predictions made by that theory or hypothesis.
- **Publication bias** is the tendency for editors of peer-reviewed journals to preferentially accept articles that show positive results and reject those that show only negative results.
- Publication bias is also called the **file drawer problem** because researchers have a tendency to file away studies that show negative results, knowing that most journals will likely reject them. Publication bias means that the size of an effect could be overstated for many behavioral phenomena reported in the peer-reviewed literature.

Review Questions

1. Which of the following is *not* one of the six steps in the scientific method?
   - **a.** Developing a research plan
   - **b.** Analyzing and evaluating the data
   - **c.** Identifying a problem
   - **d.** Inductive reasoning

2. Fill in the blank with V = variable or O = operational definition: An educational researcher is interested in seeing how classroom disruption differs by grade level, so they record the number of outbursts in a sample of different classrooms at a local middle school. In this example, number of outbursts is the _____ and classroom interruption is the _____.

3. State whether each of the following is an example of basic research (B) or applied research (A).
   - **a.** A researcher is driven by curiosity and interest to explore the theoretical relationship between culturally responsive instruction and academic achievement among Black elementary school boys.
   - **b.** A researcher is interested in exploring whether Black elementary school boys who receive culturally responsive instruction score higher on a science exam than those who do not receive culturally responsive instruction.

4. Identify the population in this statement: A research methods class has 25 students enrolled, but only 23 students attended class.
   - **a.** 25 students enrolled
   - **b.** 23 students attending class
   - **c.** Research methods class
   - **d.** none of the above

5. True or false: A hypothesis is described as a statement that has been rigorously tested and supported by scientific observations.

6. Fill in the blank with P = primary and S = secondary: A _____ source is useful to begin your literature review search; however, you should develop your ideas based on _____ sources.

7. Which scenario describes ethical behavior by a student researcher?
   - **a.** A student attends a conference and reads an abstract on a poster that they find interesting as a source for their own paper. The presenter of the poster tells them that the research described in the abstract has been published in the journal *Reading Research Quarterly*. The student finds the full-text article, reads it, and cites it in their paper.
   - **b.** A student conducts a literature review by searching articles in ERIC. In their search, they find three secondary sources that give many interesting primary sources. They are unable to find these primary sources; however, they still cite them in their paper.

8. Fill in the blank with I = inductive or D = deductive: Top-down best describes _____ reasoning, while bottom up best describes _____ reasoning.

Questions and Activities for Classroom Discussion

1. Assuming all of the following variables are both observable and measurable, state at least two operational definitions for each:
   - Character development of elementary school students
   - Teacher patience
   - Quality of life among autistic high school students
   - Student texting during class time
   - Costs of obtaining a college degree
2. Choose one of the topics suggested by your instructor and use the ERIC database to find at least three articles relevant to the topic. Indicate whether each one is a primary or secondary source, and any information from the title or abstract that made it obvious this was a good reference for your topic.

Learning Check Answer Key

Learning Check 1.1

1. D

2. A, T

Learning Check 1.2

1. False

2a. B

2b. A

2c. A

2d. B

Learning Check 1.3

1. T, H

2a. I

2b. D

2c. I

Learning Check 1.4

1. True

2a. C

2b. B

2c. D

2d. A

Learning Check 1.5

1a. D

1b. C

Review Question Answer Key

1. D

2. O, V

3a. B

3b. A

4. A

5. False

6. S, P

7. A

8. D, I

Key Terms

Abstract
Abstracting
Applied research
Basic research
Citation bias
Confirmational strategy
Data
Deductive reasoning
Disconfirmational strategy
File drawer problem
Hypothesis
Full-text article
Full-text database
Inductive reasoning
Literature review
Operational definition
Parsimony
Peer-reviewed journal
Population
Primary source
Publication bias
Qualitative research
Quantitative research
Research hypothesis
Research method
Sample
Science
Scientific method
Score
Secondary source
Theory
Variable

Chapter 2

Research Ethics

Source: iStock.com/maruco

Learning Objectives

2.1 Define the term *research ethics*.

2.2 Trace the history leading to the Nuremberg Code and the Belmont Report.

2.3 Describe the ethical concerns for two landmark studies in psychology: Milgram's obedience experiments and the Stanford prison study.

2.4 Identify the standards in the AERA Code of Ethics relating to human participant research and scientific integrity

Introduction

We often think of ethics as the distinction between right and wrong, such as the Golden Rule: "Do unto others as you would have them do unto you." Sometimes ethics can be confused with common sense; however, issues of ethics are far more difficult to resolve than common sense. Many of ethics' concerns are universally recognized, but the interpretation or application for resolving these issues can vary based on individuals' perspectives.

One's perspective is shaped in different ways, often depending on one's values and life experiences. The perspective an individual takes can have a substantial impact on the actions of an individual to address ethical concerns. Consider academic dishonesty, for example. Being a dishonest student is an ethical concern; however, perspectives differ on how to address this concern. A student may assess the consequences of cheating in the classroom with pressures for academic scholarships and college enrollment status; a teacher may assess the consequences of cheating on class grading; a school administrator may assess the fairness of awarding high school diplomas to students who cheat. In each case, the issue of academic honesty is addressed from a divergent perspective.

Researchers also have divergent perspectives regarding ethical conduct in behavioral research. The information we obtain using the scientific method is typically important. For example, studying academic dishonesty is important. However, how we obtain information about academic dishonesty is also of ethical concern. For example, would it be ethical to tell a student to cheat so we can observe cheating? Is it ethical to video record a classroom to check for possible cheating during a test without making students aware that they are being recorded? The evaluation of these types of ethical questions and many more in scientific research are introduced in this chapter.

2.1 Ethics in Educational Research

LO 2.1 Define the term *research ethics*.

The term *ethics* describes appropriate human action in areas such as business, medicine, health, religion, and research. In addition, most schools have ethical guidelines concerning cheating and academic dishonesty as well as showing respect to classmates. In educational research, the term **research ethics** is used to identify the actions that a researcher must take to conduct responsible and moral research. Engaging in responsible research requires a researcher to anticipate what might happen, react to what is happening, and reflect on what happened.

The research process begins with an idea or hypothesis from which researchers devise a research plan. In the plan, the researcher must make ethical considerations such as anticipating what type of sample is needed and how to treat those in the sample. The difficulty of anticipating what will happen in a study is the biggest ethical challenge that researchers face. After all, the best-case scenario is to avoid ethical problems altogether, and the best way to do that is to fully anticipate concerns before the study is conducted.

We begin this chapter with an overview of the history of ethics in research that can also be found by taking the free certification Protecting Human Research Participants course at http://phrp.nihtraining.com. This course is offered by the National Institutes of Health specifically for researchers who receive federal funding to cover the costs of their research. We suggest that all individuals who plan to conduct human participant research complete this course prior to conducting research.

Learning Check 2.1

1. True (T) or False (F): The most significant ethical challenge faced by researchers is selecting what type of sample is needed.

2.2 The Need for Ethics Committees in Research: A Historical Synopsis

LO 2.2 Trace the history leading to the Nuremberg Code and the Belmont Report.

Guidelines for conducting ethical research are relatively new, particularly in the educational sciences. Ethical considerations in educational research originate from the actions of researchers in other fields, such as medicine and psychology. Researchers in the past were seldom required to consider the effects of their research on participants and abuse often caused much pain and suffering to participants. In this section, we describe two past events in which research caused harm to human subjects. These two events were instrumental in establishing ethical guidelines for all research and shaped our modern views of how to treat research participants.

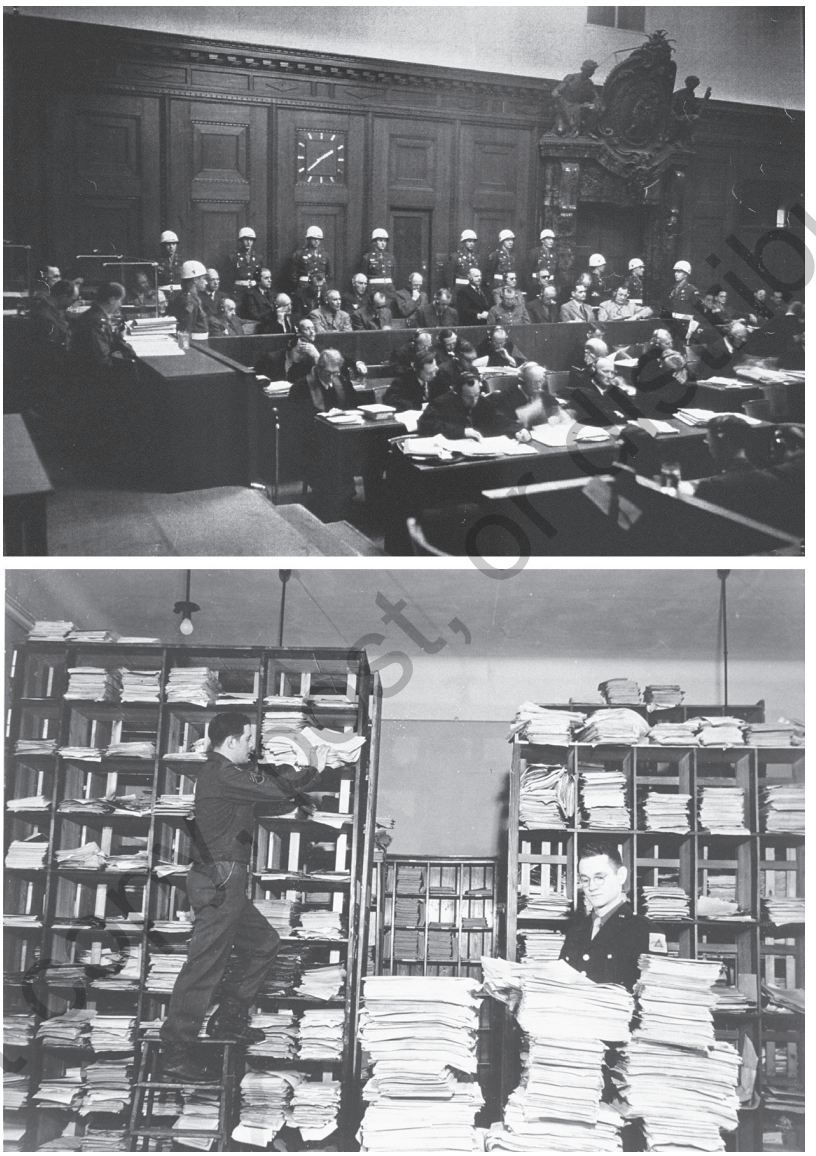
The Nuremberg Code

The ethical conflict in research arises from researchers' desires to achieve *outcomes* regardless of the *means* required to achieve those outcomes. That is, before there were ethics committees, a few researchers valued what they learned from their study more than what they had to do to gain that knowledge. Hence, they favored the outcomes of their research over the means needed to achieve those results. Examples of harmful research on unwilling participants in which researchers sought outcomes above all else include the Nazi medical experiments in concentration camps during World War II. These experiments were unprecedented in the scope and degree of harm to unwilling participants.

These experiments, which took place between 1939 and 1945, included exposing prisoners to harmful gases, infecting them with diseases such as tuberculosis, immersing them in icy waters, placing them in compression chambers deprived of oxygen, and even cutting them with slivers of glass. These experiments, which often resulted in death, were conducted to learn something: the outcomes. The compression chamber experiments, for example, were conducted to determine the altitudes at which aircraft crews could survive without oxygen. However, these experiments were conducted with no concern for how prisoners were treated (the means) to gain that knowledge.

From 1945 to 1947, the individuals and physicians responsible for conducting the Nazi medical experiments were tried in international courts. Because of the enormous amount of evidence, shown in a file photo in Figure 2.1, and the number of defendants involved, many trials were required to investigate all the claims of misconduct. The first trial was held before the International Military Tribunal, which tried the most important and high-ranking criminals. Subsequent trials held under the Control Council Law No. 10 at the U.S. Nuremberg Military Tribunals prosecuted lesser war criminals. Among these trials included the Doctors' Trial between December 1946 and July 1947. In August 1947, the verdict from this trial included a section called Permissible Medical Experiments, which has come to be known as the **Nuremberg Code**—the first international code of research ethics (International Military Tribunal, 1949; BMJ, 1996).

Figure 2.1 ▪ The Nuremburg Trials: The International Military Courtroom (top) and U.S. Army Staffers Organizing Documents That Were Presented as Evidence Against the Defendants (bottom).



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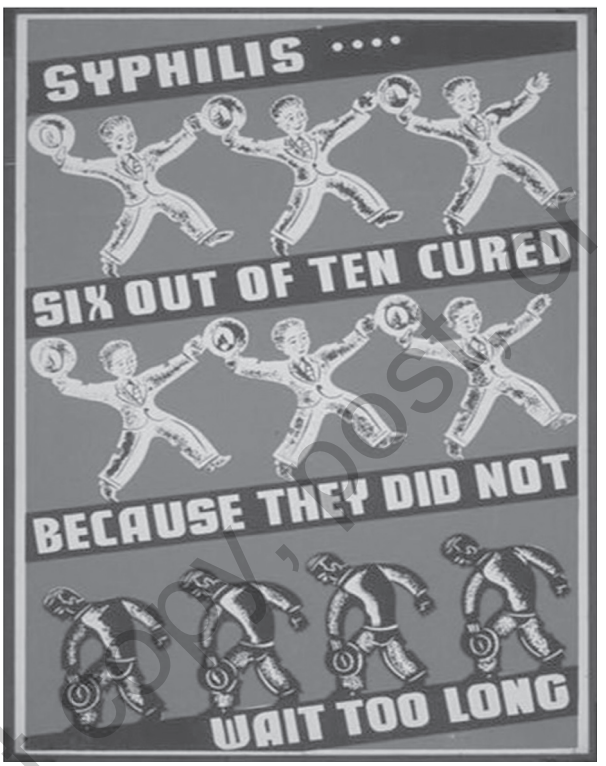
The Tuskegee Syphilis Study

A second event of unethical research behavior was the Tuskegee Syphilis Study. This study, which began in 1932, was performed on 600 Black men, 399 who had syphilis and 201 who did not. The health of the men was compared between the two groups for many decades. Most of those in the study were illiterate sharecroppers from one of the poorest counties in Alabama.

Researchers told the men that they would be treated at no cost for "bad blood," a local term used to describe ailments ranging from fatigue to syphilis. In truth, the men did not receive proper treatment, and the researchers conducting the study never intended to treat the men. Their true purpose was to determine the course of the disease through death, the outcome.

In the 1940s, penicillin became widely available as an effective treatment for syphilis; one such common advertisement used to promote the use of penicillin is shown in Figure 2.2. Yet, with little apparent concern for the health and well-being of participants in this study, the researchers denied the men access to penicillin, and the study continued for another quarter-century.

Figure 2.2 ▪ A Poster Encouraging Early Syphilis Treatment for U.S. Citizens During the 1940s



Source: Library of Congress; http://www.loc.gov/pictures/item/98514735. Public Domain.

Note: Although treatments were available, participants in the Tuskegee Syphilis Study were prevented from receiving treatment.

It was not until 1968 that a researcher would voice concerns about the study, ultimately leading to the termination of the study in 1972. Over the 40 years that this study continued, it was supported at one time or another by such government agencies as the U.S. Public Health Service (USPHS), the Centers for Disease Control and Prevention (CDC), and local chapters of the American Medical Association (AMA), and the National Medical Association (NMA).

The Belmont Report

Public outrage following the first published accounts of the Tuskegee Syphilis Study by the Associated Press in 1972 led Congress to establish a National Commission for the Protection of Human Subjects

of Biomedical and Behavioral Research in 1974. This national commission was charged with identifying and developing ethical guidelines for all human participant research. In 1979, the commission drafted its recommendations in what is called the **Belmont Report**. The Belmont Report identifies three principles for the ethical conduct of research using human participants:

- Respect for persons
- Beneficence
- Justice

In addition to being capable and informed, all potential participants in research must be free of coercion or undue influence. To adhere to this recommendation, researchers must provide certain protections for special populations. For example, to protect children younger than 18 years, a parental waiver to participate in a research study is required; parents give consent for their underage children. This protection is especially important for protecting children who participate in sensitive areas of research such as those investigating possible pharmacological treatments for drug abuse (see Curry et al., 2009) or children considered to be vulnerable, such as those with a developmental disability.

Beneficence means that it is the researcher's responsibility to minimize the potential risks and maximize the potential benefits associated with a research study. Anticipating the risks and benefits in a study is also called a **risk-benefit analysis**. To apply a risk-benefit analysis, you must determine whether the benefits of a research study outweigh the risks. If not, then the study is potentially unethical.

The principle of beneficence can be subjective and difficult to assess. Researchers must anticipate potential risks, including the potential for physical and psychological harm, stress and health concerns, and loss of privacy or confidentiality. They must also anticipate potential benefits, including the potential for monetary gain, the acquisition of new skills or knowledge, and access to treatments for psychological or physical illnesses. To meet the challenges of anticipating potential risks and benefits in research, all research institutions appoint ethics committees that consist of many trained professionals from diverse educational backgrounds who provide additional review of the risks and benefits anticipated in a study before any research is conducted.

Justice refers to the fair and equitable treatment of all individuals and groups selected for participation in research studies in terms of the benefits they receive and the risks they bear from their participation in research. Justice is applied to ensure equality in the selection of potential participants in research. Educational researchers often select participants based on such criteria as age, gender, ethnicity, or educational need. The principle of justice ensures that any decision to include or exclude certain individuals or groups from participating in a research study is scientifically justified. For example, a study on the effects of response to intervention (RTI) on academic achievement can include only children who are at risk for or already underperforming in school. The scientifically justifiable reason to exclude children performing at grade level is that they are not in need of intensive educational intervention.

Learning Check 2.2

1. The verdict from the Doctors' Trial in 1947 included a section called _____, which has come to be known as the _____.
   a. Belmont Report; Nuremberg Code
   b. Permissible Medical Experiments; Belmont Report

c. Nuremberg Code; Belmont Report
d. Permissible Medical Experiments; Nuremberg Code

2. Which of the following is *not* a directive of the Nuremberg Code?
a. Appropriate scientific qualifications and skill of experimenter/researcher
b. Voluntary consent of participants
c. Prohibition of experiments that could cause death or disabling injury
d. Degree of risk to participants should not outweigh potential humanitarian benefits

3. Which principle of the Belmont Report would best describe a situation where researchers decide not to conduct a study because the risks to participants outweigh the benefits?
a. Respect for persons
b. Beneficence
c. Justice
d. None of the above

2.3 Ethics in Focus: Classic Examples from Psychology

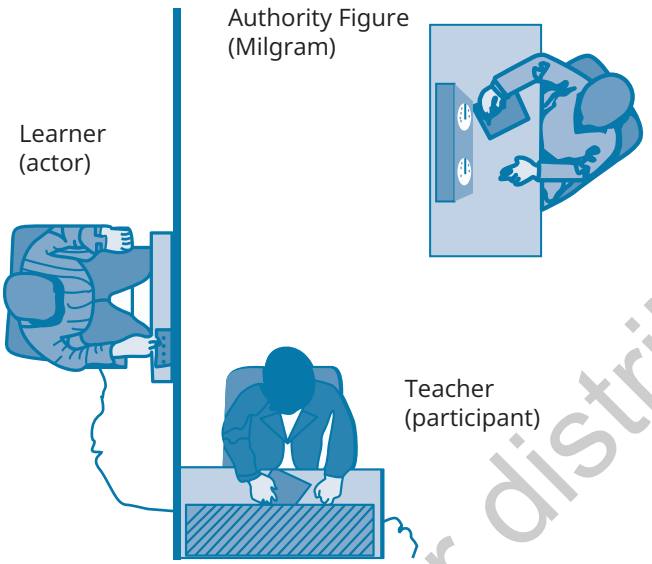
LO 2.3 Describe the ethical concerns for two landmark studies in psychology: Milgram's obedience experiments and the Stanford prison study.

There are classic examples of ethically problematic studies in psychology, many of which are landmark studies. Two such studies are described here: the Milgram obedience experiments and the Stanford prison study.

Milgram's Obedience Experiments

Beginning in the 1960s, Stanley Milgram conducted his obedience experiments that were staged to make the participant think that they were causing harm to another participant by administering electric shocks (Milgram, 1963). In his classic study conducted at Yale University, Stanley Milgram was the authority figure. He assigned one participant as a "teacher" and another person as a "learner," who, unbeknown to the participant, was paid to act as a participant. The general setup of the experiment is shown in Figure 2.3. The task of the learner (the actor) was to memorize word pairs. The task of the teacher was to state one word and wait for the learner to respond with the correct second word in the pair. For each incorrect response, the teacher was told by Milgram (the authority figure) to administer shocks to the learner in increments of 15 volts for each successive incorrect response. The experiment was set up to appear real to the participant. For example, the apparatus for administering shock was realistic and labeled with the different shock levels; the learner was prearranged to give incorrect answers and respond or act as if painful shocks were being administered. However, in truth, no shocks were ever administered. The results were astonishing: 100% of participants shocked the learner up to 300 volts, and 65% of participants shocked the learner to the maximum 450 volts—enough to kill a human being.

Figure 2.3 ▪ Milgram Obedience Experiment



Source: Milgram (1963). Reproduced with permission.

Note: The teacher (participant) administered "shocks" from another room to a learner (actor). The authority figure gave orders to the participant to continue as the experiment progressed.

The key ethical concern of this study involved the significant stress placed on the participant. Although most participants followed the orders of the authority figure, most also complained and pleaded with the authority figure to stop the experiment very early on. For example, one participant complained, "He's [the learner] banging in there! I'd like to continue, but I can't do that to a man . . . I'll hurt his heart" (Milgram, 1963, p. 376). Clearly, participants experienced great stress in this experimental setting. When Milgram disclosed to participants the true intent of his experiment and that no shocks were ever administered, some participants were relieved while others remained upset that they had been obedient.

Stanford Prison Study

In the summer of 1971, Philip Zimbardo conducted the Stanford prison study (Haney & Zimbardo, 1977; Zimbardo, 1975). The aim of this study was to understand how social roles influence behavior. Participants responded to an ad and were randomly assigned to play a prisoner or a guard in a fake "prison" in the basement of the psychology building at Stanford University for a two-week period. The prisoners were "arrested" and brought in by police, read their *Miranda* rights, and fingerprinted before being brought to the prison. The guards wore official uniforms and sunglasses and followed 8-hour shifts throughout the day. Once all "inmates" were in their cells, the study began, and the prison guards were left to run the prison. Participants got into their roles, and it did not take long for things to get out of hand. The guards became aggressive whenever a prisoner was disobedient in any way. At first, they took away prisoner privileges, such as the opportunity to read or talk to other prisoners. Punishment progressed later to taking away meals and bedding, tedious work such as cleaning toilets with bare hands, physical work such as doing push-ups while

a guard stepped on the prisoner's back, and even "solitary confinement" in what was a utility closet. Keep in mind that these punishments were developed by the guards (not the researchers) during the study.

The prisoners faced increased psychological and physical harm as the guards' actions progressed. Some prisoners cried uncontrollably, became violent and rebellious, suffered from severe depression, and started referring to themselves by their "prison number," and one developed a psychosomatic rash due to the stress. Therefore, to resolve ethical concerns, the researchers terminated the study after only 6 days, because at that point, the risks to participant welfare far outweighed the benefits of continuing the study as planned.

Ethics in Educational Research

The goal of most educational research is to promote learning, prevent school failure, and understand the issues regarding the learning process. Education is a very socially sensitive topic and involves many key stakeholders such as students, parents, educational personnel, community members, and policy makers. There is often a delicate balance of quality research, and the three principles for ethical conduct in research when the topic affects long-term quality of life and involves so many perspectives.

Let's go back and think about the three principles of ethical conduct—respect for persons, beneficence, and justice. What is the balance between quality research and respect for persons when the participants are young children or children with a disability who may not have the capacity to understand their role in the research process? How about the element of being free from perceived coercion when the classroom teacher is conducting the research? What is the balance between quality research and beneficence when little is known about a potentially beneficial intervention? The risk could be in participating in an intervention that turns out to be not effective or the risk could be in not participating in an effective intervention. Justice involves equity and fairness in the selection process. What is the balance between quality research and justice when there are more eligible students who could possibly benefit from an educational intervention than available resources in the study? The balance between quality research and the three principles of ethical conduct depends upon the perspective, whether they are the researcher, parent, teacher, or student. To help protect this balance between quality research and the three principles of ethical conduct, educational research is reviewed and approved by an institutional review board before it can begin.

Connecting to the Classroom

One ethical dilemma that educators face when approached about conducting research on a new instructional strategy in the classroom is the decision regarding who should receive the innovation and who will not. By conducting the literature review and identifying a potential solution to a problem, an educator has some notion that the new idea will be effective. The teacher or administrator will want all students to receive the new strategy. However, until we conduct the research study to determine if the strategy is effective, and for whom, we really do not know if the strategy will be effective. Therefore, as you will learn, we must have some students who participate in the new strategy and others who do not participate. This is necessary so that we can compare the two strategies to decide if the new strategy is more effective. There are a lot of fads in education. You can probably think of a few that have come and gone already and some that may still

be lingering (like learning styles). It is important to examine these new ideas before we implement them in schools. So, when thinking about the decision where some students may not get the new idea, remember that it can be more ethical to investigate it first before committing it to everyone.

Learning Check 2.3

For Questions 1–2, state which landmark psychology study is described based on the ethical dilemma identified (enter M for Milgram's obedience experiments, or S for Stanford's prison study).

1. To resolve ethical concerns in this study, the study was terminated after only 6 days because at that point, the risks to participant welfare far outweighed the benefits of continuing the study as planned.
2. The key ethical concern in this study involved the significant stress placed on the participant, which was caused by the manipulation of the authority figure.

2.4 Human Participant Research: IRBs and the AERA Code of Ethics

LO 2.4 Identify the standards in the AERA Code of Ethics relating to human participant research and scientific integrity.

The ethical principles outlined in the Belmont Report are included in the Code of Federal Regulations issued by the U.S. Department of Health and Human Services (2007). Under these regulations, every institution receiving federal funding must have an **institutional review board (IRB)** for human participant research. IRBs have at least five members, one of whom comes from outside the institution. A primary function of the IRB is to review **research protocols** submitted by researchers at that institution. In a research protocol, the researchers provide details of a human participant study they wish to perform and describe how they will respond to any potential ethical conflicts. An IRB then categorizes the research as involving no risk, minimal risk, or greater-than-minimal risk and will make the final determination pertaining to the level of risk potentially involved in the research study. Only upon the IRB's approval are researchers permitted to conduct their research study.

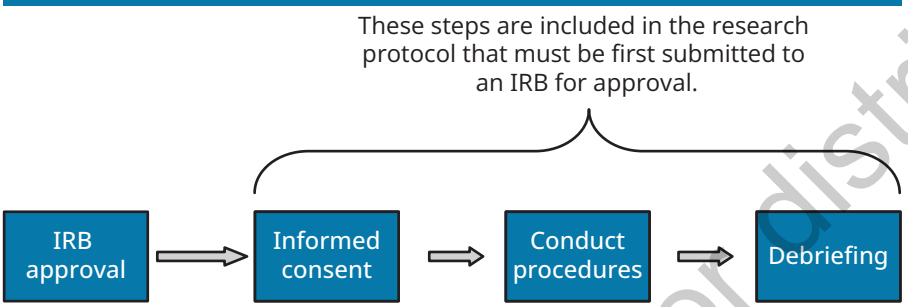
The American Educational Research Association (AERA), the largest association of educational researchers worldwide, has adopted a method of assessing risk in its publication of the *Code of Ethics* (AERA, 2011). This code extends the ethical principles outlined in the Belmont Report to include five overarching principles (professional competence; integrity; professional, scientific, and scholarly responsibility; respect for people's rights, dignity, and diversity; and social responsibility) and 22 ethical standards.

First adopted in 1992 (AERA, 2011), this code identifies expected standards of ethical conduct in educational research and publication. The remainder of this chapter will discuss the important features of the 22 ethical standards, as they apply to ethical conduct in educational research.

Making Sense—Getting Research in Order

Figure 2.4 shows this sequence of steps involved in the research process in relation to the protection of participants. The process begins with IRB approval and ends with full disclosure of a study.

Figure 2.4 ▪ The Order in Which Most Human Participant Research Is Conducted



Institutional Approval

Educational researchers are required to conform to the IRB requirements set forth by the educational agency, such as those set by public school systems and universities with whom they want to conduct research. An IRB application provides complete and accurate information regarding the purpose and process of the research being proposed. IRB approval is specifically required for research that involves the following:

- Waivers of informed consent
- Deception
- Audio, video, or photography

Once approved, the research protocol acts as a legal document to which the researcher(s) and the institution(s) must comply. Approval by an IRB ensures that any research that is conducted has been fully reviewed for ethical conduct beforehand.

Informed Consent to Research

In research, it is the right of every person to make informed decisions regarding whether to participate in a research study, as required in the Belmont principle of respect for persons. The AERA applies this principle by requiring that all participants give **informed consent** *prior* to participating in a research study. Informed consent is typically provided using a written informed consent form that is signed by participants and/or parents before a study begins. Box 2.1 shows an annotated example of an informed consent form, describing each of its key sections. Although more sections can be added to an informed consent form, the 10 sections shown in Box 2.1 are typically sufficient to meet the requirement of obtaining informed consent.

Informed Consent Form

Introduction: State the purpose of requesting informed consent using this form.

Example for introduction:

The purpose of this form is to provide you with information to help you decide whether or not to allow your child to participate in this research.

Invitation/identification: Invite potential participants and identify the researchers who are involved in this study by name.

Example invitation line:

[Insert name of each researcher involved] at [insert university/institution name] invites you to participate in a research study.

Purpose: In two or three sentences, state what area of research you are investigating and why you are studying this area.

Example for a hypothetical educational intervention study:

The purpose of this study is to evaluate the effectiveness of a new iPad app to teach phonics. Your participation in this study can help us better understand if iPads can serve as a tool for teaching phonics to struggling readers.

Description of research study: Describe exactly what you will do and what you require of participants in terms of their time and effort. In this section, you should also identify the approximate number of participants involved in the study.

Example for a parent consent form for a hypothetical educational intervention study:

If you decide to allow your child to participate, they will join a study that examines the effectiveness of the Early Reading Skills Builder (ERSB) curriculum to teach phonics involving at least 100 students. Your child will receive daily phonics instruction using the ERSB curriculum for 30 minutes as part of their typical reading instruction from their teacher. The study will begin September 1, 2024, and end December 15, 2024. The ERSB is an app that uses iPad technology to teach phonics skills with text-to-speech software. The ERSB is expected to improve your child's reading skills. We will also need to collect data on your child's reading skills. Once a week, we will ask your child to read a short passage for 5 minutes and record their reading errors.

Risks and benefits: This part of the consent form can be split into two sections, but all potential risks and benefits associated with participation in the research must be clearly stated.

Confidentiality: A statement should be made regarding protecting each participant's privacy and confidentiality. This description should explicitly state how you will protect the participant's identity and for how long.

Example confidentiality paragraph:

All information obtained in this study is strictly confidential unless required by law. The results of this research may be used in reports, presentations, and publications, but the researchers will not identify your child. To protect your child's privacy and identity, all records of their participation will be given a unique number that does not allow anyone (including the project staff) to personally identify them. These records will be kept in a locked cabinet in a locked room where they will remain for at least 3 years following the completion of this research study or until the records can be safely destroyed.

Compensation: To recruit participants, it is often necessary to compensate them. The most common types of compensation are financial reimbursement and credit toward a college course. If the study does not involve compensation, then state it here.

Questions/contact information: The researcher must offer to answer any questions about the research and the participants' rights. When appropriate, it is advisable to include who to contact in the event of a research-related injury or question. In all cases, the telephone number or address of a researcher must be provided. Some IRBs may also require you to include a contact number of the IRB

Example questions/contact information paragraph:

If you have questions following your participation, they can be answered by [*insert name and contact information*]. If you have questions about your rights as a participant in this research, or if you feel you have been placed at risk, please contact [*insert name and contact information*].

Disclaimer: Explicitly state that participation is voluntary and that participants can quit or withdraw from the study at any time without penalty. When appropriate, also inform participants that they can refuse any portions of the study without withdrawing from the entire study.

Signature lines: A participant or parent must sign the informed consent form to be recognized as an individual voluntarily consenting to participate in a research study. For this reason, it is necessary to have each participant sign the form. The researcher should also sign the form. A statement similar to this should precede the signature and date lines.

Example signature line paragraph:

Parent statement: This form explains the nature, demands, benefits, and any risks associated with this research. I have read the informed consent form. I have had the chance to ask questions about this study, and those questions have been answered to my satisfaction. I am at least 18 years of age, and I agree for my child to participate in this research project. I understand that I will receive a copy of this form after it has been signed by me and the principal investigator of this research study.

_____	_____	_____
Parent signature	Printed name	Date
_____	_____	_____
Investigator signature	Printed name	Date

The 10 sections shown in the informed consent form are meant to meet AERA requirements, stating that participants must be informed of the following:

- Purpose of the research
- Expected duration and procedures being used
- Participant's right to decline or withdraw participation at any time
- Foreseeable consequences for declining or withdrawing
- Potential risks of participation
- Potential benefits of participation
- Limits of confidentiality
- Incentives of participation
- Information for whom to contact about any questions a participant may have regarding the research and research participants' rights

A copy of the informed consent form must be submitted to an IRB as part of a research protocol. The AERA code of conduct also provides special provisions for persons who are legally incapable of giving informed consent, including minors. For example, researchers must attain **assent** when children are participants in research. In other words, for minors to participate in research, they must agree to participate only after receiving an appropriate explanation in reasonably understandable language. Obtaining consent from a child's parent or other legal guardian is also necessary.

The purpose of obtaining informed consent is to demonstrate the Belmont principle of respect for persons by providing all pertinent information in an informed consent form. Some additional guidelines for preparing and writing an informed consent form include:

- Avoid exculpatory language. That is, participants should not be asked to waive or appear to waive any legal rights or to release the institution or its agents from liability for negligence.
- Use numeric values (such as <1%) to describe the probability of "rare" risks when possible. The more severe the potential risks, the less likely participants think they will occur, even when the same word is used to describe their probability (Fischer & Jungermann, 1996; Mazur & Merz, 1994; Rector, 2008).
- Provide a translator for participants who require or request one. The translator, in addition to the participant, should sign the form.
- Avoid technical jargon. Write in simple language at less than a high school level throughout the form.
- Write as if you are speaking to the participant. Use the second person using the pronoun *you* throughout the form.
- Use black, nonitalicized, 11-point font (or larger, if appropriate) throughout the form.

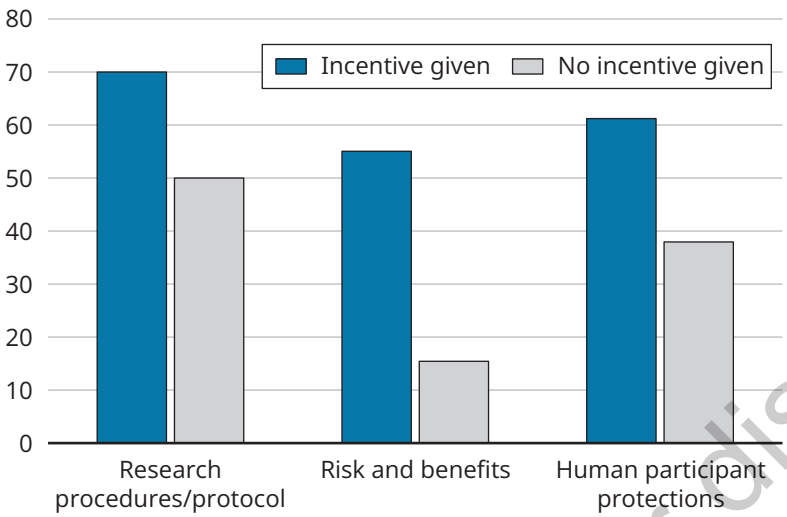
An important, yet often overlooked, concern is what participants recall about a research study—particularly with regard to communicating risks (Lipkus, 2007; Parascandola et al., 2002; Sieber, 2007). Evidence appears to indicate that participants recall very little (Flory & Emanuel, 2004). In one study intended to determine how researchers could improve participants' recall, the researchers paid participants $5 for each item correctly recalled in an informed consent form. As the data shown in Figure 2.5 indicate, this financial incentive increased recall of the items in the form (Festinger et al., 2009). Also, the finding that participants in this study recalled less than 20% of risks and benefits listed in an informed consent is somewhat concerning, particularly for research with the potential of severe risks to participants.

When possible, after parental consent is obtained, researchers should also obtain agreement from child participants, called an assent. Assents contain the basic information of the study and are written at a level that the child can understand. Assents should be read to young children and any other student who may have difficulty reading. It is possible to obtain agreement from young children or children with a disability using graphics such as a smiley/frown face or thumbs up/thumbs down images.

Informed Consent for Recording Voices and Images in Research

Some research uses video or voice recorders. Recording devices such as these are particularly useful in interviews and to observe instruction in classrooms. Before making recordings, however, researchers must obtain informed consent, with two exceptions. Researchers do not need to obtain informed consent when either of the following occurs:

Figure 2.5 ▪ The Percentage of Items on the Informed Consent Form That Recipients Recalled Correctly



Source: Adapted from Festinger et al. (2009).

Note: Notice that participants who received an incentive of $5 for each item correctly recalled significantly increased their recall in each section of the form. Data are adapted from Festinger et al. (2009).

- The research is conducted strictly in naturalistic settings and poses no anticipated risk of personal identification or harm.
- The research requires *deception*, and consent is obtained after the recordings have been made (the use of deception in research is described later in this section).

Client/Patient, Student, and Subordinate Research Participants

Researchers must also protect potential participants from adverse consequences associated with declining or withdrawing participation in a research study. For example, as an incentive for teachers to participate, researchers often offer a monetary stipend or gift, such as books or classroom supplies. The informed consent must disclose the incentive and how the incentive will be distributed if they withdraw from the study before it ends. All potential participants have the right to decline or withdraw participation at any time without undue influence or coercion.

Dispensing With Informed Consent for Research

To minimize bias and ensure the integrity of the data collected in a research study, it is sometimes permissible to initially exclude information in an informed consent form or dispense with or waive the need for an informed consent. An informed consent can sometimes "give away" what the study is about, which could bias participant responses during a study. To overcome this, or a related concern, a researcher may wish to withhold specific information critical to a research hypothesis or seek a consent waiver. However, for an IRB to approve this action (i.e., not being fully forthcoming or waiving informed consent), the researcher must show that the potential of distress or harm to participants in a proposed study is minimal to none and that it is permitted by law and federal or institutional regulations.

Offering Inducements for Research Participation

Sometimes research participants will receive incentives to participate. Incentives can include monetary compensation, gift cards, or entry into a prize drawing. Whatever the incentive, researchers must ensure that it is not excessive or inappropriate. The idea is that if a researcher made the incentive large enough, participants may participate in a study because the "payoff is too good to pass up," even when their actual intention would be to decline participation. Excessive incentives are viewed as a type of coercion or undue influence on the part of the researcher to gain participation. Therefore, excessive incentives should never be offered for participation in a study.

Deception in Research

Deception in research occurs when participants are deliberately misled about the purpose or nature of a research study. Deception can be active (deliberately untruthful, e.g., telling a lie, often by using a **cover story**) or passive (omission of key information about a study, e.g., not telling participants what the true nature of the study is about). According to the AERA Code of Ethics, to use deception, the researcher must show the following:

- The deception is necessary, and the use of nondeceptive alternatives is not feasible.
- There is no more than minimal risk to the participants.
- The deception would not affect the participants' willingness to participate, such as physical risks, discomfort, or unpleasant emotional experiences to participants as a result of the deception.
- Participants are informed of the deception as early as possible, meaning at the end of the study but no later than at the end of the data collection.

The use of deception is sometimes unavoidable. For example, in research investigating the effects of medication, when participants expect a drug treatment to cause some change, such as to relieve stress, they often report experiencing that change even if the drug treatment they received was fake. This response to the fake drug is called a *placebo effect*. To avoid a placebo effect, researchers use deception and do not let participants know whether they will receive a treatment or not (Kaptchuk, 1998; Miller et al., 2005). Deception may be used in educational research in sensitive areas, such as academic dishonesty when full disclosure of what the study is about might lead to changes in participant behavior.

For example, in a study by Evans et al. (2021), children aged 7 to 11 years were placed in a small groups to make puzzles for a prize. Once their achieved group score was tallied, a counselor encouraged the students to cheer if they would like to round up their score by 5 points. After the students cheered, the counselor asked that they not tell anyone about how they falsely increased their score. For score reporting, students were either in an active or passive transgression condition, i.e., each student actively reported the inflated score, or the counselor reported the score, and the students simply reported which group they belonged to. The children were not told the true purpose of the study or that they would be interviewed later. The deception was necessary so that researchers could observe whether students would lie to cover their group's cheating. Determining if the use of deception is justified can still be subjective, which is why researchers must include any use of deception in their research protocol for an IRB to review.

Debriefing

When deception is used in a research study, debriefing is required. At the conclusion of a study, all participants and/or parents receive a **debriefing** in which the researcher discloses the true purpose of the study. A debriefing form can be read aloud to participants by the researcher. When no deception is used, participants can often be given a printed debriefing form to read on their own. Another option for debriefing in education research conducted across schools is to hold an information session for parents at the end of the study. The debriefing is included at the end of a study to meet the Belmont principle of respect for persons by being upfront with participants regarding their role in a research study. As part of a debriefing, the researcher should do the following:

- Take appropriate steps to answer participant questions and address any misconceptions or concerns the participants may have.
- Take reasonable steps to reduce risk or harm to participants if the researcher can justify delaying or withholding information in a debriefing.
- Take reasonable steps to protect participants if or when the researcher becomes aware that research procedures have harmed a participant.

The debriefing is especially important for studies that use deception to inform the participant of the deception used. Consider, for example, the study conducted by Evans et al. (2021) that used deception to study children's willingness to lie to cover up a group transgression. The participants were given a prize and debriefed after the interview, where they were told the purpose of the study and that all of the groups falsified their scores.

Suppose that the researchers let the children leave without disclosing what the study was about. This is an unethical situation that researchers want to avoid; the debriefing is a researcher's opportunity to "come clean," so to speak, when deception is used in a study. Interestingly, participants are rarely offended by being misled and instead often feel it is justified (Christensen, 1988; Resnick & Schwartz, 1973).

Anonymity and Confidentiality

In the AERA (2011) *Code of Ethics*, researchers are required to protect the privacy of research participants. Consequently, researchers take steps to protect the anonymity and confidentiality of participants. **Anonymity** is the stricter standard in which the identity of a participant remains unknown to all people throughout a study. Hence, not even those involved in the study, including the researchers, can identify participants. This standard is often hard to meet, particularly for research that requires observing participants multiple times, thereby requiring researchers to keep track of participants.

When anonymity is not possible, researchers instead take steps to protect the confidentiality of participants by ensuring that the identity of a participant is not made available to anyone not directly involved in a study. The researchers can identify participant information, and they promise not to share that information with anyone. Confidentiality allows researchers to track participants using personal identifiers and protect participant information from being seen by anyone else, such as parents, friends, and other participants. Unfortunately, the terms *anonymity* and *confidentiality* are often used interchangeably, especially in ordinary speech. Be sure you are aware of the distinction between these terms when conducting research studies.

Scientific Integrity

The remaining AERA (2011) *Code of Ethics* provides ethical guidelines for **scientific integrity**, which reflects the personal and professional conduct of the researcher. These additional considerations are discussed in this section.

Reporting Research Results

Researchers are expected to truthfully report data and never fabricate research results by making up data that were never observed or measured. If or when researchers make a mistake regarding the data they report, they must correct the mistake as soon as the mistake is discovered. While there aren't any recent examples of known fabrication of data in the education sciences, there are other recent examples in other fields of study. Recent examples of **fabrication** include a postdoctoral health sciences researcher who falsified and fabricated the whole content of 14 studies, and created fictitious author names and affiliations to disguise their offenses; numerous clinical researchers who reused, relabeled, or manipulated images to falsely report data; and a researcher from an elite Ivy League medical school who fabricated up to 50% of reported data on sleep apnea in severely obese patients (Office of Research Integrity, 2023). However infrequent, examples such as these occur each year.

Plagiarism

Researchers are expected to represent their own ideas in published work, and when they use ideas from other people, to appropriately give credit to them. If a researcher represents someone else's ideas as their own, then the researcher is guilty of **plagiarism**. The National Science Foundation Office of Inspector General (2022) found 134 cases of research plagiarism between 2007 and 2017, involving 137 researchers and 106 unique institutions. Plagiarism accounted for 81% of all cases of research misconduct during this timeframe. Keep in mind that you should feel free to use the work of others, so long as you acknowledge the source of those ideas. To avoid plagiarism, do not represent it as your own work. As you read about the work of others throughout this book, you'll notice that sources and credits are given.

Publication Credit

When publishing or professionally presenting research data, all individuals who "have made a substantive contribution to an intellectual product" (AERA, 2011) to the work should be recognized as an author. Authors should be listed in order of their relative contribution to the work, with the first author listed being recognized as the individual having made the largest contribution. It is recommended that all potential authors discuss authorship prior to conducting a study to avoid possible concerns later.

Duplicate Publication of Data

The same work should never be published twice without recognition of what is being republished and why. It is unethical to duplicate or republish previously published data as original data unless it is "published with a citation to the first publication and undertaken consistent with any applicable laws and agreements" (AERA, 2011). Sun et al. (2010) identified 282 pairs of duplicate full-text articles in a review of biomedical publications available on the search engine PubMedCentral. Among the pairs of duplicate articles, the highest similarities were within the results (94%) and methods (89%) sections. Avoiding this kind of **duplication** is an ethical concern.

Sharing Research Data for Verification

Researchers are expected to share their data upon request from others for the purposes of replication or other verification analyses, which is one reason that researchers are expected to maintain their research data for years. **Replication** refers to the reproduction of research procedures under identical conditions for the purposes of observing the same phenomenon. One common way researchers share data today is by placing nonidentifiable data onto public archives such as the Odum Institute Archive Dataverse (The Odum Institute for Research in Social Science, 2024). Researchers can opt to make the data available upon permission or open to anyone without permission. At a minimum, the data upon which researchers base their conclusions should be made available to other scientists upon request in the following situations:

- The data do not compromise the confidentiality of participants.
- Sharing the data is expected if it does not violate any proprietary agreements already made.

Reviewers

To publish a scientific work, researchers can submit their work for publication in a scientific journal where their peers review their work. Once a **peer review** is complete, then an article can be rejected or accepted for publication in a scientific journal. As part of this process, peer reviewers can sometimes have access to information that should be protected. For this reason, the AERA (2011) *Code of Ethics* requires peer reviewers to respect the confidentiality and propriety rights of those who submit their work for review. Reviewers must also disclose any conflicts of interest when requested to review the work of others.

Learning Check 2.4

1. True or False: By informing participants of their rights as research participants prior to asking them to participate in a research study, a researcher meets the AERA ethical standard of informed consent to research.
2. A researcher studying teacher judgments of student competency in a series of vignettes does not tell the teachers that the study is about how they rate the competency of similar students who differ only in ethnicity. At the conclusion of the study, the researcher should…
   a. Provide an incentive
   b. Promise not to share the results of the study
   c. Keep the true purpose a secret to preserve the validity of the experiment
   d. Give a debriefing to disclose the true purpose of the study
3. Which of the following situations is an example of plagiarism?
   a. A researcher uses ideas described in another work and submits them as if they were their own ideas or work.
   b. A researcher loses the data for a study and then decides to make up the data and defend them as original data.
   c. A junior researcher is listed as third author, even though they made the largest contribution to the publication
   d. A researcher shares data that includes identifying information of participants

Chapter Summary

LO 2.1 Define research ethics.

- **Research ethics** identifies the actions that researchers must take to conduct responsible and moral research. In science, researchers must *anticipate* ethical considerations in a research plan, *react* to ethical concerns during a study, and *reflect* on what happened in their study after the plan is executed.

LO 2.2 Trace the history leading to the Nuremberg Code and state the 10 directives listed in the code.

- The individuals and physicians responsible for the conduct of harmful experiments on concentration camp prisoners were put on trial between 1945 and 1947. Many trials were held during this time. The Doctors' Trial was prosecuted between December 1946 and July 1947. In August 1947, the verdict from this trial included a section that has come to be known as the **Nuremberg Code**, the first international code of research ethics.
- In 1932, the Tuskegee Syphilis Study began in which 600 Black men—399 with syphilis and 201 who did not have the disease—were studied to determine the course of the disease through death. The true purpose of the study was not revealed to the men. In the 1940s, penicillin became widely available as an effective treatment for syphilis; however, participants in the study were denied treatment, and the study continued for another quarter-century. In response to public outrage, the study ended in 1972. In 1974, Congress established the national commission that drafted the **Belmont Report** in 1979, which states three ethical principles: respect for persons, beneficence, and justice.
- **Respect for persons:** Participants in a research study must be autonomous agents capable of making informed decisions concerning whether or not to participate in research.
- **Beneficence:** It is the researcher's responsibility to minimize the potential risks and maximize the potential benefits associated with conducting a research study.
- **Justice:** All participants should be treated fairly and equitably in terms of receiving the benefits and bearing the risks in a research study.

LO 2.3 Describe the ethical concerns for two landmark studies in psychology: Milgram's obedience experiments and the Stanford prison study.

- Stanley Milgram at Yale University studied obedience using a manipulation in which participants thought they were administering significant levels of shock to another participant. One participant was told by Milgram (the authority figure) to administer shocks in increments of 15 volts to another participant (the confederate) for each incorrect response to a series of word pairs. The experiment was set up to appear real to the participant. However, in truth, no shocks were ever administered. The key ethical concern of this study involved the significant stress placed on the participant. To alleviate the stress caused by his manipulation, Milgram disclosed to participants that no shocks were ever administered, after the experiment was completed.
- Philip Zimbardo conducted the Stanford prison study in 1971. The aim of this study was to understand how social roles influence behavior. Participants were randomly assigned to be a prisoner or a guard. However, the guards began to use excessive force once the study began; the guards became aggressive whenever a prisoner was

disobedient in any way, and the prisoners began to show signs of significant stress. The prisoners faced increased psychological and physical harm as the guards' actions progressed. The main ethical concern was for the welfare of the participants, and the prisoners in particular. Because the potential for serious harm to participants escalated in only a few days, the study was terminated after only 6 days.

LO 2.4 Identify the standards in the AERA Code of Ethics relating to human participant research.

- An **institutional review board (IRB)** is a review board with at least five members, one of whom comes from outside the institution. These members review for approval research protocols submitted by researchers prior to the conduct of any research. Every institution that receives federal funding must have an IRB.
- All research requiring institutional approval is bound by the information in a research protocol, and the research can only be conducted after receiving approval.
- **Informed consent** is obtained prior to the conduct of research, and it must provide full information regarding all aspects of a research study.
- In most cases, informed consent must be obtained prior to the recording of voices or images obtained during research.
- Client/patient, student, and subordinate research participants must be protected from adverse consequences associated with declining or withdrawing from participation.
- In some situations, it is permissible to initially exclude information from an informed consent form so long as the potential harm to participants is minimal.
- Researchers should avoid offering excessive or inappropriate incentives that are likely to coerce participants.
- The use of **deception** is allowable in research in certain circumstances outlined by the AERA *Code of Ethics* aimed to protect human participants from harm.
- Researchers must disclose to participants the true purpose or intent of a study in a **debriefing**.
- Researchers must not **fabricate** research data and methods.
- Researchers must not **plagiarize**.
- All individuals making substantial contributions to a work must be recognized as authors.
- Researchers must not **duplicate** work published by them or another author.
- Researchers must store and maintain their data for the purposes of **replication**.
- Peer reviewers must respect the confidentiality and propriety rights of those who submit their work for **peer review**.

Review Questions

1. True or false: The conflict between ethics and research stems from the focus on *outcomes* versus *means*.

2. Among the many trials held for harmful experiments on concentration camp prisoners was the Doctors' Trial from 1946–1947, which led to what code?
   a. Nuremberg
   b. Belmont
   c. AERA
   d. Tuskegee

For questions 3–5, which principle of the Belmont Report best describes each of the following? R=respect for persons; B=beneficence; J=justice

3. A researcher requests permission from teachers to record their instruction.
4. Researchers studying the influence of play behavior in early development justify that only preschool-aged children can be included in the study.
5. A study investigating the effects of a treatment to reduce bullying is approved by an IRB after the board determines that the benefits in the study outweigh the risks involved.
6. The AERA *Code of Ethics* requires that all research be approved prior to the conduct of the research. The _____is charged with reviewing research that uses human participants, and researchers must submit the _____document to this committee for review.
   a. Institutional review board (IRB), informed consent
   b. Peer review committee, informed consent
   c. Institutional review board (IRB), research protocol
   d. Peer review, research protocol
7. A researcher studying academic dishonesty uses a cover story in an informed consent form that tells participants that they are being asked to participate in a study concerning school pride. Is this type of deception allowed? Yes (Y) or No (N)

   For questions 8–11, state whether each of the following is an example of fabrication (F) or plagiarism (P).

8. A researcher submits a manuscript to a research journal that includes two figures summarizing data that were not actually recorded.
9. A student uses the ideas from a book review to write a paper on the role of play in child development. They do not cite the book in their paper.
10. A student notices a cool graphic that he decides to include in their research paper without giving credit to the original author of the graphic.
11. A researcher notices that there are data missing, so they fill in the missing data with (made-up) scores that help show that their hypothesis is correct.

Questions and Activities for Class Discussion

1. For each of the following research situations, discuss any potential ethical concerns covered in this chapter. Provide suggestions on how the hypothesis could be studied in an ethical manner.
   a. Researchers hypothesize that a moderate level of music leads to higher mathematical test scores. To test this idea, they play music with low, moderate, or high volume during math instruction. They measure the numbers of items correct on a math test, debrief the students, and dismiss them from the study.
   b. An educator hypothesizes that parental involvement in Head Start program activities improves student achievement. To test this idea, they record parent attendance at Head Start functions, and record student scores on an achievement test at the end of the year.

c. A researcher hypothesizes that teachers will rate the same disruptive behavior differently based on student gender identity. They develop nine different vignettes describing behaviors by severity (mild, moderate, high), each with a male, female, or neutral pronoun. Teachers are asked to rate the severity of the disruptive behavior in each vignette on a scale from 1 to 10 and are not told about the purpose of the study.

Learning Check Answer Key

Learning Check 2.1

1. True

Learning Check 2.2

1. D
2. C
3. B

Learning Check 2.3

1. S
2. M

Learning Check 2.4

1. True
2. D
3. A

Review Questions Answer Key

1. True
2. A
3. R
4. J
5. B
6. C
7. Y
8. F
9. P
10. P
11. F

Key Terms

Anonymity
Assent
Belmont Report
Beneficence
Confidentiality
Cover story
Deception
Debriefing
Duplication
Fabrication
Informed consent
Institutional review board (IRB)
Justice
Nuremberg Code
Peer review
Plagiarism
Replication
Research ethics
Research protocol
Respect for persons
Risk-benefit analysis
Scientific integrity