

# Introduction to Educational Research

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## LEARNING OUTCOMES

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

1. Briefly describe the reasoning involved in the scientific method.
2. Describe the different approaches to educational research.
3. Briefly define and state the major characteristics of these research approaches: survey, correlational, causal-comparative, experimental, single-subject, narrative, ethnographic, and case study.
4. Identify and differentiate among research purposes, including basic research, applied research, evaluation research, research and development (R&D), and action research.
5. Recognize the ethical obligations that educational researchers have and describe the codes and procedures they follow to ensure they adhere to them.

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

## TASKS 1A, 1B

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

1. The topic (purpose of the study)
2. The procedures
3. The method of analysis
4. The major conclusions

(See Performance Criteria, p. 32.)

## TASK 1C

Classify given research studies based on their characteristics and purposes. (See Performance Criteria, p. 32.)

## WELCOME!

If you are taking a research course because it is required in your program of studies, raise your right hand. If you are taking a research course because it seems like it will be a really fun elective, raise your left hand. We thought you may not be here of your own free will. Although you may be required to take this course, you are not the innocent



victim of one or more sadists. Your professors have several legitimate reasons for believing this research course is an essential component of your education.

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

Despite a popular stereotype that depicts researchers as spectacled, stoop-shouldered, elderly gentlemen (a stereotype I am rapidly approaching!) who endlessly add chemicals to test tubes, every day thousands of men and women of all ages and postures conduct educational research in a wide variety of settings. Every year many millions of dollars are spent in the quest for knowledge related to teaching and learning. For example, in 2009 the federal government allocated \$100 billion dollars to be spent on education (including educational research and evaluation) as part of the American Reinvestment and Recovery Act (ARRA). Educational research has contributed many findings concerning principles of behavior, learning, and retention of knowledge—many of which can also be applied to curriculum, instruction, instructional materials, and assessment techniques. Both the quantity and the quality of research are increasing, partly because researchers are better trained. Educational research classes have become core components of preservice teacher education programs, as well as the cornerstone of advanced degree programs.

We recognize that educational research is a relatively unfamiliar discipline for many of you. Our first goals, then, are to help you acquire a general understanding of research processes and to help you develop the perspective of a researcher. We begin by examining the scientific method.

## THE SCIENTIFIC METHOD

What is knowledge? And how do we come to “know” something? Experience is certainly one of the fundamental ways we come to know about and

understand our world. For example, a child who touches something hot learns that high heat hurts. We know other things because a trusted authority, such as a parent or a teacher, told us about them. Most likely, much of your knowledge of current world events comes secondhand, from things you have read or heard from a source you trust.

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

*Observation:* An instructor examines five research textbooks. Each contains a chapter about sampling.

*Generalization:* The instructor concludes that all research textbooks contain a chapter about sampling.

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

*Observations:* All research textbooks contain a chapter on sampling. The book you are reading is a research text.

*Generalization:* This book must contain a chapter on sampling. (Does it?)

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



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

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

## Limitations of the Scientific Method

The steps in the scientific method guide researchers in planning, conducting, and interpreting research studies. However, it is important to recognize some limitations of the method. First, the scientific method cannot answer all questions. For example, applying the scientific method will not resolve the question “Should we legalize euthanasia?” The answers to questions like this one are influenced by personal philosophy, values, and ethics.

Second, application of the scientific method can never capture the full richness of the individuals and

the environments under study. Although some applications of the method lead to deeper understanding of the research context than others, no application and in fact no research approach provides full comprehension of a site and its inhabitants. No matter how many variables one studies or how long one is immersed in a research context, other variables and aspects of context will remain unexamined. Thus, the scientific method and, indeed, all types of inquiry give us a simplified version of reality.

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

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

## Application of the Scientific Method in Education

**Research** is the formal, systematic application of the scientific method to the study of problems; **educational research** is the formal, systematic application of the scientific method to the study of educational problems. The goal of educational research is essentially the same as the goal of all science: to describe, explain, predict, or control phenomena—in this case, educational phenomena. As we mentioned previously, it can be quite difficult to describe, explain, predict, and control situations involving human beings, who are by far the most complex of all organisms. So many factors, known and unknown, operate in any educational environment that it can be extremely difficult to identify



specific causes of behaviors or to generalize or replicate findings. The kinds of rigid controls that can be established and maintained in a biochemistry laboratory, for instance, are impossible in an educational setting. Even describing behaviors, based on observing people, has limits. Observers may be subjective in recording behaviors, and people who are observed may behave atypically just because they are being watched. Chemical reactions, on the other hand, are certainly not aware of being observed! Nevertheless, behavioral research should not be viewed as less scientific than natural science research conducted in a lab.

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

1. *Selection and definition of a problem.* A problem is a question of interest that can be tested or answered through the collection and analysis of data. Upon identifying a research question, researchers typically review previously published research on the same topic and use that information to hypothesize about the results. In other words, they make an educated guess as to the answer to the question.
2. *Execution of research procedures.* The procedures reflect all the activities involved in collecting data related to the problem (e.g., how data are collected and from whom). To a great extent, the specific procedures are dictated by the research question and the variables involved in the study.
3. *Analysis of data.* Data are analyzed in a way that permits the researcher to test the research hypothesis or answer the research question. Analysis usually involves application of one or more statistical technique. For some studies, data analysis involves verbal synthesis of narrative data; these studies typically involve new insights about the phenomena in question, generate hypotheses for future research, or both.
4. *Drawing and stating conclusions.* The conclusions, which should advance our general knowledge of the topic in question, are based on the results of data analysis. They should be stated in terms of the original hypothesis or research question. Conclusions should indicate, for example, whether the

research hypothesis was supported or not. For studies involving verbal synthesis, conclusions are much more tentative.

## DIFFERENT APPROACHES TO EDUCATIONAL RESEARCH

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

### The Continuum of Research Philosophies

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

<sup>1</sup>Creswell, J. W. (2007). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (2nd ed.). Thousand Oaks, CA: Sage.



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

## Quantitative Research

**Quantitative research** is the collection and analysis of numerical data to describe, explain, predict, or control phenomena of interest. However, a quantitative research approach entails more than just the use of numerical data. At the outset of a study, quantitative researchers state the hypotheses to be examined and specify the research procedures that will be used to carry out the study. They also maintain control over contextual factors that may interfere with the data collection and identify a sample of participants large enough to provide statistically meaningful data. Many quantitative researchers have little personal interaction with the participants they study because they frequently collect data using paper-and-pencil, noninteractive instruments.

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

In the last 20 to 30 years, however, nonquantitative approaches to educational research have emerged. Qualitative research now has as many research practitioners as quantitative research. At the end of this chapter you will find an example of qualitative research published in *Action in Teacher Education* (a refereed journal): “Developing Teacher Epistemological Sophistication About Multicultural Curriculum: A Case Study” (Sleeter, 2009). This research investigates how teachers’ thinking about curriculum develops during a teacher preparation program and how the lessons from the case study might inform teacher education pedagogy. And of course, the use of the word “epistemological” in the title introduces you to the language of educational research!

## Qualitative Research

**Qualitative research** is the collection, analysis, and interpretation of comprehensive narrative and visual (i.e., nonnumerical) data to gain insights into a particular phenomenon of interest. Qualitative research methods are based on different beliefs and designed for different purposes than quantitative research methods. For example, qualitative researchers do not necessarily accept the view of a stable, coherent, uniform world. They argue that all meaning is situated in a particular perspective or context, and because different people and groups often have different perspectives and contexts, the world has many different meanings, none of which is necessarily more valid or true than another.

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

<sup>2</sup> *Argonauts of the Western Pacific* (p. 9), by B. Malinowski, 1922, London: Routledge.





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

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

These two characteristics of qualitative research, the simultaneous study of many aspects of a phenomenon and the attempt to study things as they

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

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

TABLE 1.1 • Overview of qualitative and quantitative research characteristics

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



studies, as when the administration of a (quantitative) questionnaire is followed by a small number of detailed (qualitative) interviews to obtain deeper explanations for the numerical data.

## CLASSIFICATION OF RESEARCH BY METHOD

A research method comprises the overall strategy followed in collecting and analyzing data. Although there is some overlap, most research studies follow a readily identifiable strategy. The largest distinction we can make in classifying research by method is the distinction between quantitative and qualitative research. Quantitative and qualitative research, in turn, include several distinct types or methods, each designed to answer a different kind of research question.

### Quantitative Approaches

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

### Survey Research

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

Although survey research sounds very simple, there is considerably more to it than just asking questions and reporting answers. Because researchers often ask questions that have not been asked before, they usually have to develop their

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

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

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

### Correlational Research

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

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

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

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

Following are examples of research questions tested with correlational studies.

- *What is the relation between intelligence and self-esteem?* Scores on an intelligence test and a measure of self-esteem are acquired from each member of a given group. The two sets of scores are analyzed, and the resulting coefficient indicates the degree of correlation.

- *Does an algebra aptitude test predict success in an algebra course?* Scores on the algebra aptitude test are correlated with final exam scores in the algebra course. If the correlation is high, the aptitude test is a good predictor of success in algebra.

## Causal–Comparative Research

**Causal–comparative research** attempts to determine the cause, or reason, for existing differences in the behavior or status of groups of individuals. The cause is a behavior or characteristic believed to influence some other behavior or characteristic, and is known as the **grouping variable**. The change or difference in a behavior or characteristic that occurs as a result—that is, the effect—is known as the **dependent variable**. Put simply, causal–comparative research attempts to establish cause–effect relations among groups.

Following are examples of research questions tested with causal–comparative studies (note that the word is *causal*, not *casual*).

- *How does preschool attendance affect social maturity at the end of the first grade?* The grouping variable is preschool attendance (i.e., the variable can take one of two values—students attending preschool and students not attending); the dependent variable, or effect, is social maturity at the end of the first grade. The researcher identifies a group of first graders who attended preschool and a group who did not, gathers data about their social maturity, and then compares the two groups.
- *How does having a working mother affect a child’s school absenteeism?* The grouping variable is the employment status of the mother (again with two possible values—the mother works or does not work); the dependent variable is absenteeism, measured as number of days absent. The researcher identifies a group of students who have working mothers and a group whose mothers do not work, gathers information about their absenteeism, and compares the groups.

A weakness of causal–comparative studies is that, because the cause under study has already occurred, the researcher has no control over it. For example, suppose a researcher wanted to investigate the effect of heavy smoking on lung cancer





and designs a study comparing the frequency of lung cancer diagnoses in two groups, long-time smokers and nonsmokers. Because the groups are preexisting, the researcher did not control the conditions under which the participants smoked or did not smoke (this lack of researcher control is why the variable is known as a grouping variable, rather than an independent variable). Perhaps a large number of the long-time smokers lived in a smoggy, urban environment, whereas only a few of the nonsmokers were exposed to those conditions. In that case, attempts to draw cause–effect conclusions in the study would be tenuous and tentative at best. Is it smoking that causes higher rates of lung cancer? Is it living in a smoggy, urban environment? Or is it some unknown combination of smoking and environment? A clear cause–effect link cannot be obtained.

Although causal–comparative research produces limited cause–effect information, it is an important form of educational research. True cause–effect relations can be determined only through experimental research (discussed in the next section), in which the researcher maintains control of an independent variable; but in many cases, an experimental study is inappropriate or unethical. The causal–comparative approach is chosen precisely because the grouping variable either cannot be manipulated (e.g., as with gender, height, or year in school) or should not be manipulated (e.g., as with smoking or prenatal care). For example, to conduct the smoking study as an experiment, a researcher would need to select a large number of participants who had never smoked and divide them into two groups, one directed to smoke heavily and one forbidden to smoke. Obviously, such a study is unethical because of the potential harm to those forced to smoke. A causal–comparative study, which approximates cause–effect results without harming the participants, is the only reasonable approach. Like descriptive and correlational studies, however, causal–comparative research does not produce true experimental research outcomes.

## Experimental Research

In **experimental research**, at least one independent variable is manipulated, other relevant variables are controlled, and the effect on one or more dependent variables is observed. True experimental research provides the strongest results of any

of the quantitative research approaches because it provides clear evidence for linking variables. As a result, it also offers **generalizability**, or applicability of findings to settings and contexts different from the one in which they were obtained.

Unlike causal–comparative researchers, researchers conducting an experimental study can control an independent variable. They can select the participants for the study, divide the participants into two or more groups that have similar characteristics at the start of the research experiment, and then apply different treatments to the selected groups. They can also control the conditions in the research setting, such as when the treatments will be applied, by whom, for how long, and under what circumstances. Finally, the researchers can select tests or measurements to collect data about any changes in the research groups. The selection of participants from a single pool of participants and the ability to apply different treatments or programs to participants with similar initial characteristics permit experimental researchers to draw conclusions about cause and effect. The essence of experimentation is control, although in many education settings it is not possible or feasible to meet the stringent control conditions required by experimental research.

Following are examples of research questions that are explored with experimental studies.

- *Is personalized instruction from a teacher more effective for increasing students' computational skills than computer instruction?* The independent variable is type of instruction (with two values: personalized instruction and computer instruction); the dependent variable is computational skills. A group of students who have never experienced either personalized teacher instruction or computer instruction are selected and randomly divided into two groups, each taught by one of the methods. After a predetermined time, the students' computational skills are measured and compared to determine which treatment, if either, produced higher skill levels.
- *Is there an effect of reinforcement on students' attitude toward school?* The independent variable is type of reinforcement (with three values: positive, negative, or no reinforcement); the dependent variable is attitude toward

school. The researcher randomly forms three groups from a single large group of students. One group receives positive reinforcement, another negative reinforcement, and the third no reinforcement. After the treatments are applied for a predetermined time, student attitudes toward school are measured and compared for each of the three groups.

### Single-Subject Research

Rather than compare the effects of different treatments (or treatment versus no treatment) on two or more groups of people, experimental researchers sometimes compare a single person's behavior before treatment to behavior exhibited during the course of the experiment. They may also study a number of people together as one group, rather than as individuals. **Single-subject experimental designs** are those used to study the behavior change that an individual or group exhibits as a result of some intervention or treatment. In these designs, the size of the **sample**—the individuals selected from a population for a study—is said to be one.

Following are examples of published studies that used single-subject designs.

- *The effects of a training program with and without reinforced directed rehearsal as a correction procedure in teaching expressive sign language to nonverbal students with mental retardation.* Ten students with moderate to severe mental retardation were studied.<sup>3</sup>
- *The effects of instruction focused on assignment completion on the homework performance of students with learning disabilities.* A single-subject experiment design was used to determine how instruction in a comprehensive, independent assignment completion strategy

affected the quality of homework and the homework completion rate of eight students with learning disabilities.<sup>4</sup>

## Qualitative Approaches

Qualitative research seeks to probe deeply into the research setting to obtain in-depth understandings about the way things are, why they are that way, and how the participants in the context perceive them. To achieve the detailed understandings they seek, qualitative researchers must undertake sustained in-depth, in-context research that allows them to uncover subtle, less overt, personal understandings.

Table 1.2 provides a brief description of some of the most common qualitative research approaches. Examining the table shows that the primary difference among the approaches is in the particulars of the social context examined and the participants selected. For example, some qualitative researchers

**TABLE 1.2** • Common qualitative research approaches

Approach	Key Question
case study	What are the characteristics of this particular entity, phenomenon, or person?
ethnography	What are the cultural patterns and perspectives of this group in its natural setting?
ethology	How do the origins, characteristics, and culture of different societies compare to one another?
ethnomethodology	How do people make sense of their everyday activities in order to behave in socially accepted ways?
grounded theory	How is an inductively derived theory about a phenomenon grounded in the data in a particular setting?
phenomenology	What is the experience of an activity or concept from these particular participants' perspective?
symbolic interaction	How do people construct meanings and shared perspectives by interacting with others?
historical research	How does one systematically collect and evaluate data to understand and interpret past events?

Source: M. Q. Patton, *Qualitative Evaluation and Research Methods*, copyright © 1990, by Sage Publications, Inc. Adapted by permission of Sage Publications, Inc.

<sup>3</sup> "Effects of Reinforced Directed Rehearsal on Expressive Sign Language Learning by Persons with Mental Retardation," by A. J. Dalrymple and M. A. Feldman, 1992, *Journal of Behavioral Education*, 2(1), pp. 1–16.

<sup>4</sup> Effects of Instruction in an Assignment Completion Strategy on the Homework Performance of Students with Learning Disabilities in General Education Classes," by C. A. Hughes, K. L. Ruhl, J. B. Schumaker, and D. D. Deshler, 2002, *Learning Disabilities Research and Practice*, 17(1), pp. 1–18.



focus on the exploration of phenomena that occur within a bounded system (e.g., a person, event, program, life cycle; in a *case study*); some focus in depth on a group's cultural patterns and perspectives to understand participants' behavior and their context (i.e., using *ethnography*); some examine how multiple cultures compare to one another (i.e., *ethology*); some examine people's understanding of their daily activities (i.e., *ethnomethodology*); some derive theory using multiple steps of data collection and interpretation that link actions of participants to general social science theories or work inductively to arrive at a theory that explains a particular phenomenon (i.e., *grounded theory*); some ask about the meaning of this experience for these participants (i.e., *phenomenology*); some look for common understandings that have emerged to give meaning to participants' interactions (i.e., *symbolic interaction*); some seek to understand the past by studying documents, relics, and interviews (i.e., *historical research*); and some describe the lives of individuals (i.e., *narrative*). Overall, a collective, generic name for these qualitative approaches is *interpretive research*.<sup>5</sup>

## Narrative Research

**Narrative research** is the study of how different humans experience the world around them; it involves a methodology that allows people to tell the stories of their “storied lives.”<sup>6</sup> The researcher typically focuses on a single person and gathers data by collecting stories about the person's life. The researcher and participant then construct a written account, known as a narrative, about the individual's experiences and the meanings the individual attributes to the experiences. Because of the collaborative nature of narrative research, it is important for the researcher and participant to establish a trusting and respectful relationship. Another way to think of narrative research is that the narrative is the story of the phenomenon being investigated, and narrative is also the method of inquiry being used by the researcher.<sup>7</sup> One of the goals of narrative research in education is to increase understanding of central issues related to

teaching and learning through the telling and retelling of teachers' stories.

Following is an example of the narrative research approach.

Kristy, an assistant professor of education, is frustrated by what she perceives as the gender-biased distribution of resources within the School of Education (SOE). Kristy shares her story with Winston, a colleague and researcher. In the course of their lengthy tape-recorded conversations, Kristy describes in great detail her view that the SOE dean, George, is allocating more resources for technology upgrades, curriculum materials, and conference travel to her male colleagues. Kristy also shares with Winston her detailed journals, which capture her experiences with George and other faculty members in interactions dealing with the allocation of resources. In addition, Winston collects artifacts—including minutes of faculty meetings, technology orders, and lists of curriculum materials ordered for the library at the university—that relate to resource allocation.

After collecting all the data that will influence the story, Winston reviews the information, identifies important elements and themes, and retells Kristy's story in a narrative form. After constructing the story with attention given to time, place, plot, and scene, he shares the story with Kristy, who collaborates on establishing its accuracy. In his interpretation of Kristy's unique story of gender bias, Winston describes themes related to power and influence in a hierarchical school of education and the struggles faced by beginning professors to establish their career paths in a culture that is remarkably resistant to change.

## Ethnographic Research

**Ethnographic research**, or ethnography, is the study of the cultural patterns and perspectives of participants in their natural settings. Ethnography focuses on a particular site or sites that provide the researcher with a context in which to study both the setting and the participants who inhabit it. An ethnographic setting can be defined as anything from a bowling alley to a neighborhood, from a nomadic group's traveling range to an elementary

<sup>5</sup>For a discussion, see *Qualitative Evaluation and Research Methods* (3rd ed), by M. Q. Patton, 2002, Thousand Oaks, CA: Sage.

<sup>6</sup>“Stories of Experience and Narrative Inquiry,” by F. M. Connelly and D. J. Clandinin, 1990, *Educational Research*, 19(5), p. 2.

<sup>7</sup>“Stories,” Connelly and Clandinin, pp. 2–14.

principal's office. The participants are observed as they take part in naturally occurring activities within the setting.

The ethnographic researcher avoids making interpretations and drawing conclusions too early in the study. Instead, the researcher enters the setting slowly, learning how to become accepted by the participants and gaining rapport with them. Then, over time, the researcher collects data in waves, making initial observations and interpretations about the context and participants, then collecting and examining more data in a second wave of refining the initial interpretation, then collecting another wave of data to further refine observations and interpretation, and so on, until the researcher has obtained a deep understanding of both the context and its participants' roles in it. Lengthy engagement in the setting is a key facet of ethnographic research. The researcher organizes the data and undertakes a cultural interpretation. The result of the ethnographic study is a holistic description and cultural interpretation that represents the participants' everyday activities, values, and events. The study is written and presented as a narrative, which, like the study from which it was produced, may also be referred to as an ethnography.

Following is an example of an ethnographic approach to a research question.

■ *What is the Hispanic student culture in an urban community college?* After selecting a general research question and a research site in a community college that enrolls many Hispanic students, the researcher first gains entry to the college and establishes rapport with the participants of the study. Building rapport can be a lengthy process, depending on the characteristics of the researcher (e.g., non-Hispanic vs. Hispanic; Spanish speaking vs. non-Spanish speaking). As is common in qualitative approaches, the researcher simultaneously collects and interprets data to help focus the general research question initially posed.

Throughout data collection, the ethnographic researcher identifies recurrent themes, integrates them into existing categories, and adds new categories as new themes or topics arise. The success of the study relies heavily on the researcher's skills in analyzing and synthesizing the qualitative data into coherent and meaningful descriptions.

The research report includes a holistic description of the culture, the common understandings and beliefs shared by participants, a discussion of how these beliefs relate to life in the culture, and discussion of how the findings compare to literature already published about similar groups. In a sense, the successful researcher provides guidelines that enable someone not in the culture to know how to think and behave in the culture.

## Case Study Research

**Case study research** is a qualitative research approach to conducting research on a unit of study or bounded system (e.g., an individual teacher, a classroom, or a school can be a case). Case study research is an all-encompassing method covering design, data collection techniques, and specific approaches to data analysis.<sup>8</sup> A case study is also the name for the product of case study research, which is different from other field-oriented research approaches such as narrative research and ethnographic research.

Following is an example of a study that used the case study research approach.

Mills (1988)<sup>9</sup> asked, "How do central office personnel, principals, and teachers manage and cope with multiple innovations?" and studied educational change in one American school district. Mills described and analyzed how change functioned and what functions it served in this district. The function of change was viewed from the perspectives of central office personnel (e.g., superintendent, director of research and evaluation, program coordinators), principals, and teachers as they coped with and managed multiple innovations, including the introduction of kindergartens to elementary schools, the continuation of a program for at-risk students, and the use of the California Achievement Test (CAT) scores to drive school improvement efforts. Mills used qualitative data collection techniques including participant observation, interviewing, written sources of data, and nonwritten sources of data.

<sup>8</sup> Yin, R. K. (2003). *Case Study Research: Design and Methods* (3rd ed.). Thousand Oaks, CA: Sage.

<sup>9</sup> Mills, G. E. (1988). *Managing and Coping with Multiple Educational Changes: A Case Study*. Unpublished doctoral dissertation, University of Oregon, Eugene.

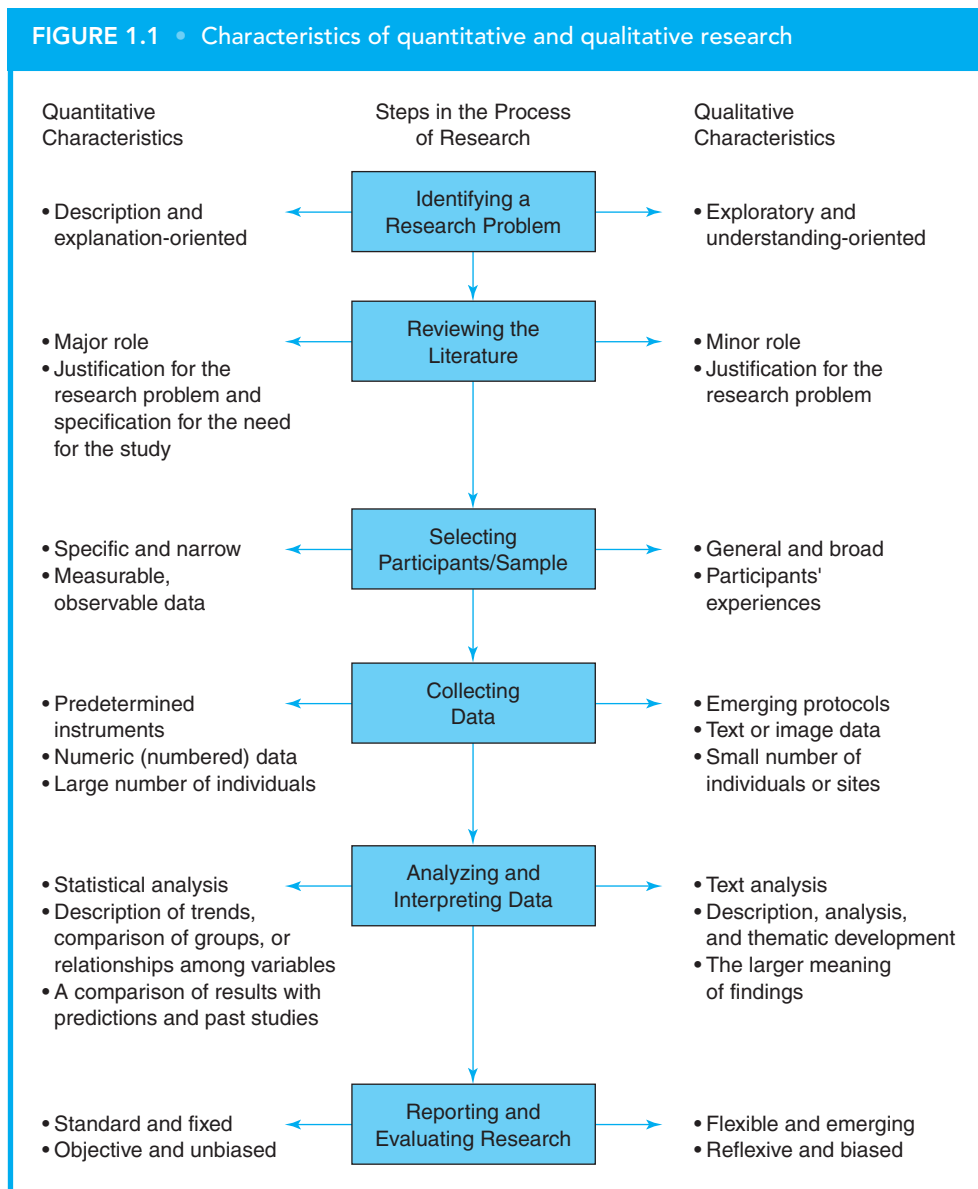


## THE QUALITATIVE RESEARCH PROCESS

Earlier in this chapter we presented four general, conceptual research steps. In this section we expand the steps to six, which are followed by both quantitative researchers and qualitative researchers. However, as we discuss in subsequent chapters, the application of the steps differs depending on the type of research conducted. For

example, the research procedures in qualitative research are often less rigid than those in quantitative research. Similarly, although both quantitative and qualitative researchers collect data, the nature of the data differs. Figure 1.1 compares the six steps of qualitative and quantitative research and lists traits that characterize each approach at every step.

For the most part, the research process is similar for the three qualitative methods discussed in



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this chapter (i.e., ethnographic research, narrative research, and case study):

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

## Characteristics of Qualitative Research

The central focus of qualitative research is to provide an understanding of a social setting or activity as viewed from the perspective of the research participants. As noted previously, the two key characteristics of qualitative research include the collection of narrative and visual data over a period of time in a natural, nonmanipulated setting, but qualitative studies also share several other characteristics.

First, qualitative research includes individual, person-to-person interactions. The researcher strives to describe the meaning of the findings from the perspective of the research participants. To achieve this focus, the researcher gathers data directly from the participants.

Qualitative researchers spend a great deal of time with participants and are immersed in the research setting. The detailed recording of the processes occurring in the natural setting provides the basis for understanding the setting, the participants, and their interactions. Without this immersion, the search for understanding would elude the qualitative researcher.

Second, qualitative data are analyzed inductively. The qualitative researcher does not impose an organizing structure or make assumptions about the findings before collecting evidence. Rather, the

researcher focuses on discovery and understanding, which requires flexibility in the research design.

Third, qualitative researchers avoid making premature decisions or assumptions about the study and remain open to alternative explanations. They typically wait until they are in the research context before making tentative decisions based on initial data analysis. As the data are analyzed, the researcher seeks to find patterns, relations, or common themes among the data. The more data collected, the stronger the foundation for the inductive analysis.

Qualitative research reports include clear and detailed descriptions of the study that include the voices of the participants. The report also includes a description of the role of the researcher and his or her biases or preferences concerning the research topic or research processes. Qualitative researchers must also remain vigilant to their responsibility to obtain ongoing informed consent from participants and to ensure their ethical treatment.

## CLASSIFICATION OF RESEARCH BY PURPOSE

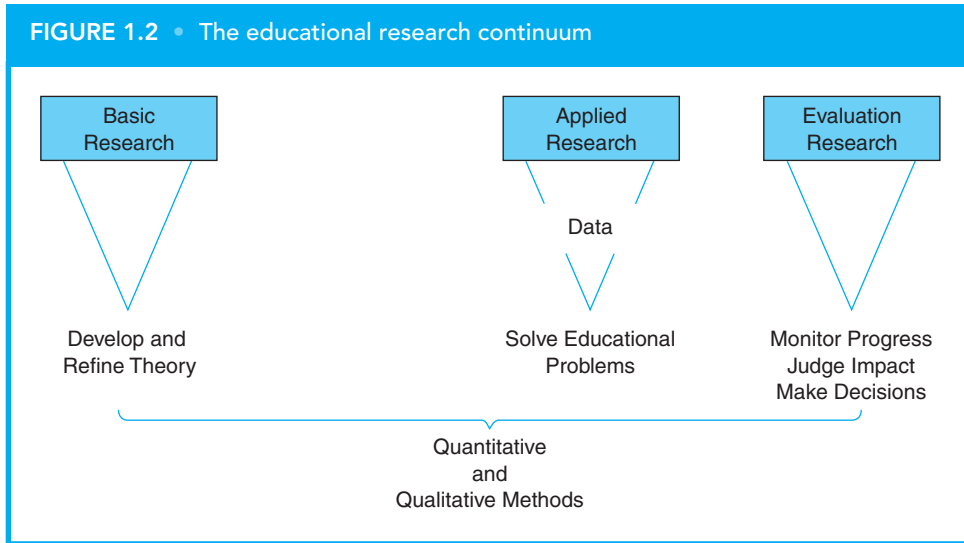
Research designs can also be classified by the degree of direct applicability of the research to educational practice or settings. When purpose is the classification criterion, all research studies fall into one of two categories: basic research and applied research. Applied research can be subdivided into evaluation research, research and development (R&D), and action research.

### Basic and Applied Research

It is difficult to discuss basic and applied research separately, as they are on a single continuum. In its purest form, **basic research** is conducted solely for the purpose of developing or refining a theory. Theory development is a conceptual process that requires many research studies conducted over time. Basic researchers may not be concerned with the immediate utility of their findings because it may be years before basic research leads to a practical educational application.

**Applied research**, as the name implies, is conducted for the purpose of applying or testing a theory to determine its usefulness in solving practical problems. A teacher who asks, “Will the theory of multiple intelligences help improve my students’ learning?” is seeking an answer to a practical classroom question.

FIGURE 1.2 • The educational research continuum



This teacher is not interested in building a new theory or even generalizing beyond her classroom; instead, she is seeking specific helpful information about the impact of a promising practice (i.e., a teaching strategy based on the theory of multiple intelligences) on student learning.

Educators and researchers sometimes disagree about which end of the basic–applied research continuum should be emphasized. Many educational research studies are located on the applied end of the continuum; they are more focused on what works best than on finding out why it works as it does. However, both basic and applied research are necessary. Basic research provides the theory that produces the concepts for solving educational problems. Applied research provides data that can help support, guide, and revise the development of theory. Studies located in the middle of the basic–applied continuum seek to integrate both purposes. Figure 1.2 illustrates the educational research continuum.

## Evaluation Research

At the applied end of the research continuum is evaluation research, an important, widely used, and explicitly practical form of research. **Evaluation research** is the systematic process of collecting and analyzing data about the quality, effectiveness, merit, or value of programs, products, or practices. Unlike other forms of research that seek new knowledge or understanding, evaluation research focuses mainly on making decisions—decisions

about those programs, products, and practices. For example, following evaluation, administrators may decide to continue a program or to abandon it, to adopt a new curriculum or to keep the current one. Some typical evaluation research questions are, “Is this special science program worth its costs?” “Is the new reading curriculum better than the old one?” “Did students reach the objectives of the diversity sensitivity program?” and “Is the new geography curriculum meeting the teachers’ needs?”

Evaluations come in various forms and serve different functions.<sup>10</sup> An evaluation may be either formative or summative, for example. Formative evaluation occurs during the design phase when a program or product is under development and is conducted during implementation so that weaknesses can be remedied. Summative evaluation focuses on the overall quality or worth of a completed program or product.

## Research and Development (R&D)

**Research and development (R&D)** is the process of researching consumer needs and then developing products to fulfill those needs. The purpose of R&D efforts in education is not to formulate or test

<sup>10</sup> See *Evaluation Models: Viewpoints on Educational and Human Services Evaluation*, by D. Stufflebeam, G. Madaus, and T. Kellaghan, 2000, Norwell, MA: Kluwer Academic; *Program Evaluation*, by M. Gridler, 1996, Upper Saddle River, NJ: Prentice Hall; *The Program Evaluation Standards: How to Assess Evaluation of Education Programs* (2nd ed.), by Joint Committee on Standards for Educational Evaluation, 1994, Thousand Oaks, CA: Sage.

theory but to develop effective products for use in schools. Such products include teacher-training materials, learning materials, sets of behavioral objectives, media materials, and management systems. R&D efforts are generally quite extensive in terms of objectives, personnel, and time to completion. Products are developed according to detailed specifications. Once completed, products are field-tested and revised until a prespecified level of effectiveness is achieved. Although the R&D cycle is expensive, it results in quality products designed to meet specific educational needs. School personnel who are the consumers of R&D endeavors may for the first time really see the value of educational research.

## Action Research

**Action research** in education is any systematic inquiry conducted by teachers, principals, school counselors, or other stakeholders in the teaching-learning environment to gather information about the ways in which their particular schools operate, the teachers teach, and the students learn. Its purpose is to provide teacher-researchers with a method for solving everyday problems in their own settings. Because the research is not characterized by the same kind of control evident in other categories of research, however, study results cannot be applied to other settings. The primary goal of action research is the solution of a given problem, not contribution to science. Whether the research is conducted in one classroom or in many classrooms, the teacher is very much a part of the process. The more research training the teachers have had, the more likely it is that the research will produce valid results.

Following are examples of action research.

- *A study to determine how mathematics problem-solving strategies are integrated into student learning and transferred to real-life settings outside the classroom.* An elementary teacher conducts the study in his own school.
- *A study on how a school grading policy change affects student learning.* A team of high school teachers works collaboratively to determine how replacing number and letter grades with narrative feedback affects student learning and attitudes toward learning.

The value of action research is confined primarily to those conducting it. Despite this limitation, action research represents a scientific approach

to problem solving that is considerably better than change based on the alleged effectiveness of untried procedures and infinitely better than no change at all. It is a means by which concerned school personnel can attempt to improve the educational process, at least within their environment.

## GUIDELINES FOR CLASSIFICATION

Determining which approach to research is appropriate for a given study depends on the way the research problem is defined. The same general problem can often be investigated through several different types of research. For example, suppose you wanted to do a study in the general area of anxiety and achievement. You could conduct any one of the following studies:

- A study of whether teachers believe anxiety affects achievement (i.e., survey).
- A study to determine the relations between students' scores on an anxiety scale and their scores on an achievement measure (i.e., correlational).
- A study to compare the achievement of a group of students with high anxiety to that of students with low anxiety (i.e., causal-comparative).
- A study to compare the achievement of two groups, one group taught in an anxiety-producing environment and another group taught in an anxiety-reducing environment (i.e., experimental).
- A study of the cultural patterns and perspectives related to how parents view the link between anxiety and achievement (i.e., ethnographic research).
- A study of a first-year teacher in a rural elementary school who struggles with establishing his teaching credibility on a teaching faculty dominated by female teachers and a female principal (i.e., narrative research).
- A study of how the central office personnel, principals, and teachers in one district manage and cope with the anxiety of implementing multiple educational change initiatives (i.e., case study research).

Note that a research method should be chosen after, not before, the topic or question to be studied. The problem determines which approach is appropriate, and as you can see in the preceding examples, clarifying the problem helps to narrow the choices.



Classifying a study by its method will also help you when you review and evaluate others' research. If you identify a study as correlational, for instance, you'll be reminded to avoid making conclusions about cause and effect. Clearly, the more information you have about a study, the easier it'll be to categorize it. If you have only the title, you may determine the research approach from words such as *survey*, *comparison*, *relation*, *historical*, *descriptive*, *effect*, and *qualitative*. If you have a description of the research strategy, you'll often be able to classify the study based on features such as the number of participants, qualitative or quantitative data, and statistical (e.g., correlational, descriptive, comparative) or nonstatistical (e.g., interpretive, participants' viewpoint) analysis.

The following examples should further clarify the differences among the various types of research. Can you label the research approach for each example? Can you state one characteristic that defines the design?

- *A study determining the teachers' current attitudes toward unions.* Data are collected with a questionnaire or an interview.
- *A study focusing on the personal and educational interactions in a group of teachers developing social studies standards for a high school curriculum.* Teachers' interactions during the development of the standards are observed over time.
- *A study to test a possible relation between Graduate Record Examination (GRE) scores and graduate student performance.* Participants' GRE scores are compared to their grade point averages.
- *A study characterizing the drama–music clique in a suburban high school.* The researcher interviews and observes members and nonmembers of the clique to gather information about the beliefs and activities of those in the drama–music group. Participants are interviewed a number of times over the school year, and their behavior is periodically observed over the same time.

## THE ETHICS OF EDUCATIONAL RESEARCH

Ethical considerations play a role in all research studies, and all researchers must be aware of and attend to the ethical considerations related to their

studies. In research the ends do not justify the means, and researchers must not put the need or desire to carry out a study above the responsibility to maintain the well-being of the study participants. Research studies are built on trust between the researcher and the participants, and researchers have a responsibility to behave in a trustworthy manner, just as they expect participants to behave in the same manner (e.g., by providing responses that can be trusted). The two overriding rules of ethics are that participants should not be harmed in any way—physically, mentally, or socially—and that researchers obtain the participants' informed consent, as discussed in the following sections.

To remind researchers of their responsibilities, professional organizations have developed codes of ethical conduct for their members. Figure 1.3 presents the general principles from the *Ethical Principles of Psychologists and Code of Conduct* adopted by the American Psychological Association. The code provides guidelines and contains specific ethical standards in 10 categories, which are not limited to research: (1) Resolving Ethical Issues, (2) Competence, (3) Human Relations, (4) Privacy and Confidentiality, (5) Advertising and Other Public Statements, (6) Record Keeping and Fees, (7) Education and Training, (8) Research and Publication, (9) Assessment, and (10) Therapy. You may read the full text online at the website for the American Psychological Association (<http://www.apa.org/ethics/code2002.html>). Most other professional organizations for behavioral scientists, such as the American Educational Research Association and the American Sociological Society, have similar codes for ethical research.

The similarity among the ethical codes is not coincidental; they are based in the same history. In 1974 the U.S. Congress passed the **National Research Act of 1974**, which authorized the creation of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. This commission was charged with developing an ethical code and guidelines for researchers. The need for a standard set of guidelines was prompted by a number of studies in which researchers lied to research participants or put them in harm's way to carry out their studies. For example, in a study on the effects of group pressure conducted in the 1960s, researchers lied to participants, telling them to apply high levels of electric shock to another (unseen) person who