CHAPTER 3

The Research Problem

A research problem is not a nuisance; it is a step toward new knowledge.

INSTRUCTIONAL OBJECTIVES

After studying this chapter, the student will be able to:

1. Define a research problem.
2. Identify potential sources of problems for educational research.
3. State the criteria to use for evaluating a research problem.
4. State the characteristics of a worthwhile theory.
5. Evaluate a given problem for research using the accepted criteria.
6. Take a general problem in an area of interest in education and precisely formulate it for empirical investigation.
7. Distinguish between the types of problem statements used in quantitative research and qualitative research.
8. Define terms such as *population* and *variables* as used in a quantitative research study.
9. Identify the population and the variables in a given study.

Systematic research begins with a **research problem.** In a classic work, John Dewey (1933) spoke of the first step in the scientific method as the recognition of a felt difficulty, an obstacle, or problem that puzzles the researcher. Your first step in the research process is therefore to select a problem for investigation. Selecting and formulating a problem is one of the most important aspects of doing research in any field. Beginning researchers are often surprised to find that this initial stage can take up a large part of the total time invested in a research project. There is no way to do research until a problem is recognized, thought through, and articulated in a useful way.

A researcher first decides on a general area of interest. This might be elementary school reading or math instruction, science teaching in secondary schools, multicultural education, and so on. Generally, researchers focus on an area in which they have knowledge or experience. Unless a researcher has knowledge or experience in an area, he or she does not know what additional knowledge is needed or how to obtain it through empirical investigation.

The next step is to isolate a particular problem within that general area for investigation. What specifically do you want to know or what do you want to predict? Beginning researchers often find this step difficult not because of a shortage of problems, but because they must select a problem very early, when their understanding of how to do research is most limited. They are uncertain about the nature of research problems and how to go about solving them. Skill in doing research is to a large extent a matter of making wise choices about what to investigate. This skill takes time and repeated effort to develop, but the willing beginner can do it. Actually, isolating a good research problem is always a concern, even to experienced researchers. When professors, advanced graduate students, or other scientists submit a research paper to a journal for publication, to a professional conference for presentation, or to a grant-funding agency, it is the quality of their research problems that often makes the difference between acceptance or rejection.

It is important that the question chosen for investigation hold deep interest or be one about which the researcher is really curious. The choice must necessarily be very personal or else the researcher may find it difficult to muster the motivation to carry the research through to its end. Find a question that intrigues you and you will enjoy the search for a solution. For example, an elementary school teacher may be interested in finding an effective classroom strategy to use with students diagnosed with attention deficit/hyperactivity disorder (ADHD). A high school biology teacher may want to know if using computer simulations would improve students' problem-solving skills. An elementary school principal may want to know if a mentoring program would improve the effectiveness of beginning teachers.

Unlikely as it may seem, once the researcher has selected a problem area and clearly articulated a question or statement, he or she has accomplished one of the most difficult phases of the research process.

SOURCES OF PROBLEMS

The first question most students ask is, "How do I find a research problem?" Although there are no set rules for locating a problem, certain suggestions can help. Three important sources for research problems are experience, deductions from theory, and related literature. Noneducation sources may also be useful. These sources are appropriate in both quantitative and qualitative research.

EXPERIENCE

Among the most fruitful sources for beginning researchers are their own experiences as educational practitioners. Teachers have intuitions or hunches about new relationships or why certain things in school happen the way they do. Many strategies and practices have come into and gone out of fashion in education. This is because the practices were based more on opinion, tradition, or authority than on any scientific research findings. Teachers can ask questions and gather research evidence about the effectiveness of certain classroom practices. Recent federal legislation has called for evidence-based education, which means that educational interventions and practices should be evaluated to determine their effectiveness before they are put into practice in the classroom. A high school teacher might have a question about strategies purported to improve the achievement of at-risk students. An elementary teacher may have questions about a method to teach reading.

Most graduate students in education have been in the classroom or are currently working full- or part-time in schools. Students who have not had teaching experience can get ideas from discussions and their reading in education courses. You can talk to one of your professors about problems that you could investigate. We recommend that you make a list of ideas, noting things that you question. By studying these notes, you will soon identify a worthwhile research problem.

THEORIES

Theories are a good source of problems for research. We have defined a *theory* as a set of interrelated statements, principles, and propositions that specify the relationships among variables. The application of the general principles embodied in a theory to specific educational problems is only hypothetical, however, until research empirically confirms it. A beginning researcher can find an interesting theory and then make a prediction or hypothesis about what could be expected to happen in a particular situation. He or she would then design a study that tests the hypothesis.

For example, assume a researcher is interested in how adolescents form their academic self-concepts. Social comparison theory suggests that students form academic self-concepts by comparing their self-perceived academic accomplishments to some standard or frame of reference. The frame of reference for most students is the perceived academic abilities of their classmates. A hypothesis that could be deduced from this theory is "Gifted students placed in selective homogeneous classes will have lower academic self-concepts over time than equally gifted students in heterogeneous or mixed-ability classes." This prediction could be investigated by studying the change over time in the academic self-concept of gifted students in homogeneous classes compared with that of gifted students placed in regular heterogeneous classes.

Another interesting theory that has implications for education is Erik Erikson's (1967) classic theory of personality development. Erikson

describes psychosocial development in terms of stages throughout the life span, each of which involves a critical issue or conflict that the person must resolve. Adolescence, which is one of these stages, has as its major task the development of a positive self-concept or, to use Erikson's term, a strong sense of identity. Forming a strong personal identity is difficult because competing roles and values face the young person. Research shows that adolescents who have achieved a sense of identity are more independent, more socially competent, better able to cope with stress, and have higher self-esteem. However, if the adolescent does not resolve the identity crisis, a sense of inferiority and personal alienation may result. It is interesting that students who have committed violent acts at school often report feelings of alienation. A researcher interested in studying school violence might ask "Are there school practices that may contribute to feelings of isolation in some students?," "How can these students be identified?," and "Would an intervention designed to improve adolescents' self-image be effective?" To answer the latter question, the researcher would make a prediction (hypothesis) about the effect of the intervention and proceed to design a study.

A qualitative researcher might conduct a case study of an adolescent who has committed an act of school violence or of one who has been a victim of bullying.

Choosing a Theory

Not all theories are equally useful to a beginning researcher. Let us examine the characteristics one searches for in a good theory for a research study:

1. *An essential characteristic of a good theory is that it is testable.* The theory chosen should be one from which the researcher can make concise predictions (hypotheses) about what will happen in new situations and can verify these predictions through empirical observation. As the hypotheses are supported in research studies, they become part of the theory that adds to the body of knowledge. However, if the theory cannot be tested, it serves no useful purpose.
2. *A good theory is not only testable but also falsifiable.* Falsifiable means that a theory is capable of being proven wrong: It is possible to gather evidence that contradicts the theory. A theory that explains why a tornado touched down in a certain area of a town by stating that the people there are being punished for their sins is not a theory that can be proven wrong. Thus, it is not a useful theory.

   Students sometimes find this concept of **falsifiability** difficult to understand. This concept derived from the philosopher Sir Karl Popper, who, in *Logic of Scientific Discovery* (1965), argued that claims to knowledge "can never be proven or fully justified, they can only be refuted" (p. 40). A theory cannot ever be proved to be true because theories are generalizations that apply to all possible instances of the phenomena they are trying to explain, and it is not possible to test it against all possibilities. We say only that a theory has been supported; the more

support it gets in a variety of research studies, the more confidence we have in its usefulness. However, it is possible to disprove a theory by gathering negative evidence that contradicts it. According to Popper, this is how most scientific progress is achieved. Neuman and Kreuger (2003) give a useful example: "If I want to test the claim that all swans are white, and I find 1,000 white swans, I have not totally confirmed the causal law or pattern. All it takes is locating one black swan to refute my claim—one piece of negative evidence" (p. 40). Negative evidence indicates that the theory needs to be rejected or at least revised. To summarize, a good theory is one for which evidence can be gathered that will either support or refute the theory. Both outcomes must be possible.

3. *A good theory deals with some significant phenomenon or behavior that needs explanation, such as learning or motivation*.
4. *A good theory provides the simplest, clearest, and most plausible explanation for the phenomenon*. A good theory follows the principle of parsimony, which states that a theory should explain the largest number of facts with the smallest number of principles.
5. *A good theory has internal consistency; its propositions do not contradict one another.* For example, a "commonsense" theory of human separation may state "Absence makes the heart grow fonder" but also "Out of sight, out of mind." One could find evidence to support both propositions; thus, the theory would not be useful for predicting what might happen when people are separated.

In summary, think of an educational, psychological, or sociological theory that you find especially interesting. Read a summary of the theory in journals, textbooks, or primary sources, and then ask a question. A theory-based research question is beneficial because the results can be tied to a body of existing knowledge. The research can verify or fail to verify the theory, and it will most likely suggest other questions for research. You might talk to your professors to find out what they are working on or to get their suggestions.

RESEARCH IN THE PUBLIC EYE

In November 2009, the *San Francisco Chronicle* published an article claiming that mental health experts feared that technology addiction would lead to increased incidence of attention deficit disorder, causing an inability to analyze things with any depth. They quoted Dr. John Ratey, associate clinical professor at Harvard Medical School, as using the term "acquired attention deficit disorder" and describing a short-circuiting of the brain's ability to process details.

Drawing on this article, frame some research questions related to education. What sources of evidence do you think the researchers used in making their claims? What theories might you explore to develop a research study around this issue?

RELATED LITERATURE

Another valuable source of problems is the published literature in your area of interest. In published research you will find examples of research problems and the methods used to solve them. You might look at general journals like *Journal of Educational Psychology, American Educational Research Journal,* and *The Elementary School Journal,* or subject-focused journals like *The Reading Teacher, Journal for Research in Mathematics Education, Remedial and Special Education,* and *Child Development.* There is no shortage of journals available to the researcher. A review of related literature in scholarly journals may help in the following ways:

1. You may find a study that needs to be replicated. Although you may not get a prize for originality, you can repeat someone else's study—not exactly, but with some variation. You might use a different age group, different setting, or a different population. You might be able to tweak the methodology in a way that will improve the study. You might undertake a cross-cultural study to determine if the conclusions from research in one culture apply in other cultures. Replication is an essential activity in science because it provides more evidence of the validity of the original findings. As studies are repeated at different times and in different places, and as the findings are supported by each study, our confidence in the scientific validity of the findings increases.

   For example, researchers have conducted numerous replications of Piaget's famous studies (1999) of the development of moral judgment in children. These studies used Piaget's basic approach but investigated the development of moral judgment in children of different socioeconomic classes, in children of the same chronological age but differing in intelligence level, in children differing in the extent of their participation in their own age groups, in children differing in the nature of parental discipline experienced in the home, and in both boys and girls. Recently, other investigators have used techniques that differed from Piaget's in their attempts to confirm his findings and conclusions. In general, the large body of research stemming from Piaget's investigations has supported his original conclusions. Thus, a single research study, if it deals with a significant problem and its findings are exciting, can inspire many other studies.

2. You may find a question that represents the next logical step in the research on a problem. The outcomes of one study very often lead to new questions. In the concluding sections of their research reports, researchers often describe new questions that have arisen and suggest additional studies that should be done. A productive way to extend studies is to introduce new variables into a research design for further control and for determining the effects of interactions among variables. Many multivariate studies are extensions of earlier single-variable investigations (see Chapter 11).

In conclusion, published research can be a great source of ideas for research. With some critical analysis of the research in your field and a bit of creativity, you should be able to find several potentially researchable problems. Reading research will also help you to see how previous researchers measured variables, selected samples, analyzed data, and so on.

Reviews of Research

Reviews of research that integrate and summarize studies on specific topics can be very useful for identifying a research problem. Those produced by the American Educational Research Association (AERA) are particularly useful.

The *Review of Educational Research,* published quarterly by AERA since 1931, reviews and integrates educational research. It generally does not publish empirical data, but reviews articles that are thought to be useful to researchers. Each volume highlights different opinions and interpretations of research articles on a different topic. For example, the topic of volume 80 (1) 2010 was "Equity, Access, Diversity, and Justice," and the theme of volume 80 (2) was "Language and Literacy." In 1973, AERA launched the annual *Review of Research in Education* to provide summaries of research that has been done, that is being done, and that needs to be done in a specific broad topic each year. In addition to integrating and summarizing the work in a field, it promotes discussion and controversy about research problems. Volume 34 (2010) focused on "What Counts as Evidence in Educational Settings: Rethinking Equity, Diversity, and Reform in the 21st Century." Approximately every 10 years, AERA publishes the *Handbook of Research on Teaching* (Gage, 1963; Travers, 1973; Wittrock, 1985; Richardson, 2001). This volume lists, summarizes, and critically analyzes research on teaching characterized by evolving research methodologies and diverse conceptual frameworks. The fourth edition is composed of 51 chapters from 81 authors, all of whom are experts in their respective fields. Comprehensive bibliographies on selected topics are included, providing possibilities for further research. Among the topics in the fourth edition are policies for licensing and assessment of teachers, special education, middle school teaching, teaching as a moral activity, and teaching physical education.

AERA's *Encyclopedia of Educational Research* (2004), designed to present "a critical synthesis and interpretation of reported educational research," contains articles written by prominent scholars that provide well-documented discussions of recent trends and developments, as well as traditional topics. The extensive bibliographies may provide suggestions for additional research. This four-volume encyclopedia includes more than 200 topics. It is a good basic source for preliminary overviews of research in various areas.

There are also more specific reviews, like *Handbook of Research on Math Teaching and Learning* (Grouws, 2007) and *Handbook of Research on Teaching the English Language Arts* (Lapp & Fisher, eds., 2011). For more information on related literature, see Chapter 4.

NONEDUCATION SOURCES

You can adapt theories or procedures you encounter in other fields to apply to education. Often, movements that originate outside a profession lead to new paths of research. The women's movement has led researchers to study gender stereotyping in educational materials, the influence of schools on the learning of sex roles, gender differences in achievement and personality, and so forth. The civil rights movement led to many studies about the education of minority children. The AIDS (acquired immunodeficiency syndrome) epidemic has stimulated a great deal of research on the best procedures and materials to use to acquaint young people in school with the danger of the disease and how best to protect themselves from it. Recent research has looked at the effect of violence in television shows or computer games on children's behavior in school. The inspiration for much valuable research in education comes from such noneducation sources.

QUALITATIVE RESEARCH PROBLEMS

Just as is true for quantitative researchers, beginning qualitative researchers can look to their personal experiences and interests, to theory, to the professional literature, or to current social issues and real-world concerns to find a potential problem. You need to identify an area or a topic about which you have a real interest. For example, you might be interested in how learning-disabled students are integrated into regular high school classrooms. Or suppose you have read about an elementary school in an impoverished area of a large city that has been completely turned around by its teachers. Academic achievement has improved, there are few, if any, discipline problems, parental involvement has increased, and standardized test scores have gone up. It would be interesting to do a case study of the school to determine what the faculty did and how they did it to bring about such positive changes.

Once researchers have selected the initial focus of inquiry, they need to identify exactly what they want to know about that topic. The focus of inquiry is thus narrowed to the aspect of the phenomenon that will be explored in the research study. The focus of inquiry mentioned previously can be stated as follows: "How do other students treat learning-disabled students?" and "How do the learning-disabled respond?" Although the qualitative researcher intuitively arrives at hunches about the phenomenon, he or she does not formulate an initial hypothesis that the study tests.

Suppose the general topic is bullying behavior in elementary schools. Elementary teachers have long observed that some students are bullies and others become their victims. In a qualitative study, a researcher might ask how and why this behavior develops and could use naturalistic observation to investigate it in an elementary school. The investigator could use video cameras and remote microphones to record instances of children being exposed repeatedly to negative verbal or physical actions on the part of one or more classmates. The researcher would want to interview the bullies to

explore their thoughts, motives, and goals. The victims would also be interviewed to learn about their feelings. The researcher might also examine gender differences in bullying behavior and the reaction of peers to this behavior.

EVALUATING THE PROBLEM

After you have tentatively selected a question that interests you, you need to ask if it is a question that warrants an expenditure of time and effort to investigate. Use the following criteria to evaluate a research problem:

1. *The problem should have significance.* That is, it should be one whose solution will make a contribution to educational theory or practice. The problem may fill a gap in current knowledge or help resolve inconsistencies in previous research. You should be able to answer the question "So what?" with respect to your proposed study. Would the solution make any difference to educational practice? Would other educators be interested in the findings? Would the findings be useful in an educational decision-making situation?

2. *The problem should be one that will lead to new problems and so to further research.* A good study, while arriving at an answer to one question, usually generates a number of other questions that need investigation. Avoid trivial problems that have little or no relationship to theory or previous research.

   We suggest that a beginning researcher consider selecting a problem that could possibly be expanded or followed up later in a master's thesis or even a doctoral dissertation. It may be helpful if students familiarize themselves with the research efforts of their professors, who not only can suggest related problems needing investigation but also may later serve as mentors or a doctoral committee member.

3. *The problem must be researchable.* Although this criterion would seem self-evident, in practice, many proposed problems are not researchable. A researchable problem is one that can be attacked empirically; that is, it is possible to gather data that answer the question. Many interesting questions in education cannot be answered by scientific research. Philosophic questions, for example, that ask what should be done are not researchable and should be avoided. Questions such as "Should we offer more vocational training in the high school?" or "Should schools give more attention to character education?" cannot be answered by scientifically gathering and analyzing data.

   It is possible to restate philosophic questions to make them researchable. The previous question could be restated as: "What is the effect of a character education program on the incidence of cheating in high school?" It would be possible to gather data on this question, which could then be used by educators to help make decisions about a character education program.

4. *The problem should be suitable for the researcher*. The problem may be excellent from the standpoint of the previous criteria but inappropriate for the individual. First, the problem should be one in which you, the researcher, have a genuine interest and about which you can be enthusiastic. It should be a problem whose solution is personally important because of what it could contribute to your own knowledge or to improving your performance as an educational practitioner. Unless the problem is meaningful and interesting, it is doubtful whether you will expend the time and energy to do a thorough job.

   In addition to interest, you must have the necessary research skills to carry the study through to completion. You may have to develop and validate instruments or do complex statistical analyses. Another consideration is whether you will have access to participants and the data necessary to answer the research question. Lastly, you should choose a problem that can be investigated in the allotted time and with the resources available. Do not select a problem that is too large or too involved, and be sure to allow adequate time for constructing instruments, administering instruments, conducting interviews or observations, analyzing data, and writing the report.

5. *The problem should be ethically appropriate*. That is, the problem should be one that you can investigate without violating ethical principles. Unlike researchers in the physical sciences, educational researchers are dealing with human subjects whose feelings, sensitivities, and rights must be treated ethically. We discuss ethics in greater detail in Chapters 15 and 20. At this point, we mention briefly three issues the researcher should consider:

   a. *Consent*. Researchers need to obtain consent from the intended participants. Individuals should be able to choose whether they wish to participate in the study or not. Obtain consent from participants after taking steps to ensure that they have a complete understanding of the procedures to be used, any risks involved, and any demands that will be placed on them. Obtain parental consent if minors are to be involved in the study.

   b. *Protection from harm*. Do not plan research that may cause physical harm or psychological harm, such as stress, discomfort, or embarrassment, that could have lasting adverse effects. Fortunately, most educational research does not involve great risk of harm to subjects. However, the potential for harm always exists, and a researcher should be prepared if a participant requests counseling or other help after participating in the study.

   c. *Privacy*. A researcher should keep invasion of privacy to a minimum. For example, a researcher may plan to use an inventory that asks adolescents questions about sexual experiences, religious beliefs, attitudes toward parents, or other sensitive topics. In this case, the researcher should not attach names to the inventories. Participants have the right to expect that their anonymity will be preserved. Most

educational researchers are interested in group data rather than individual responses; the scores or responses of individuals are generally pooled and reported as group averages, which tends to minimize the risk of invading privacy. Table 3.1 summarizes the criteria of a good research problem.

Table 3.1 Characteristics of a Good Research Problem

1. The problem is significant (it will contribute to the body of knowledge in education).
2. The problem will lead to further research.
3. The problem is researchable (it can be investigated through the collection of data).
4. The problem is suitable (it is interesting and suits the researcher's skills, time, and available resources).
5. The problem is ethical (it will not cause harm to subjects).

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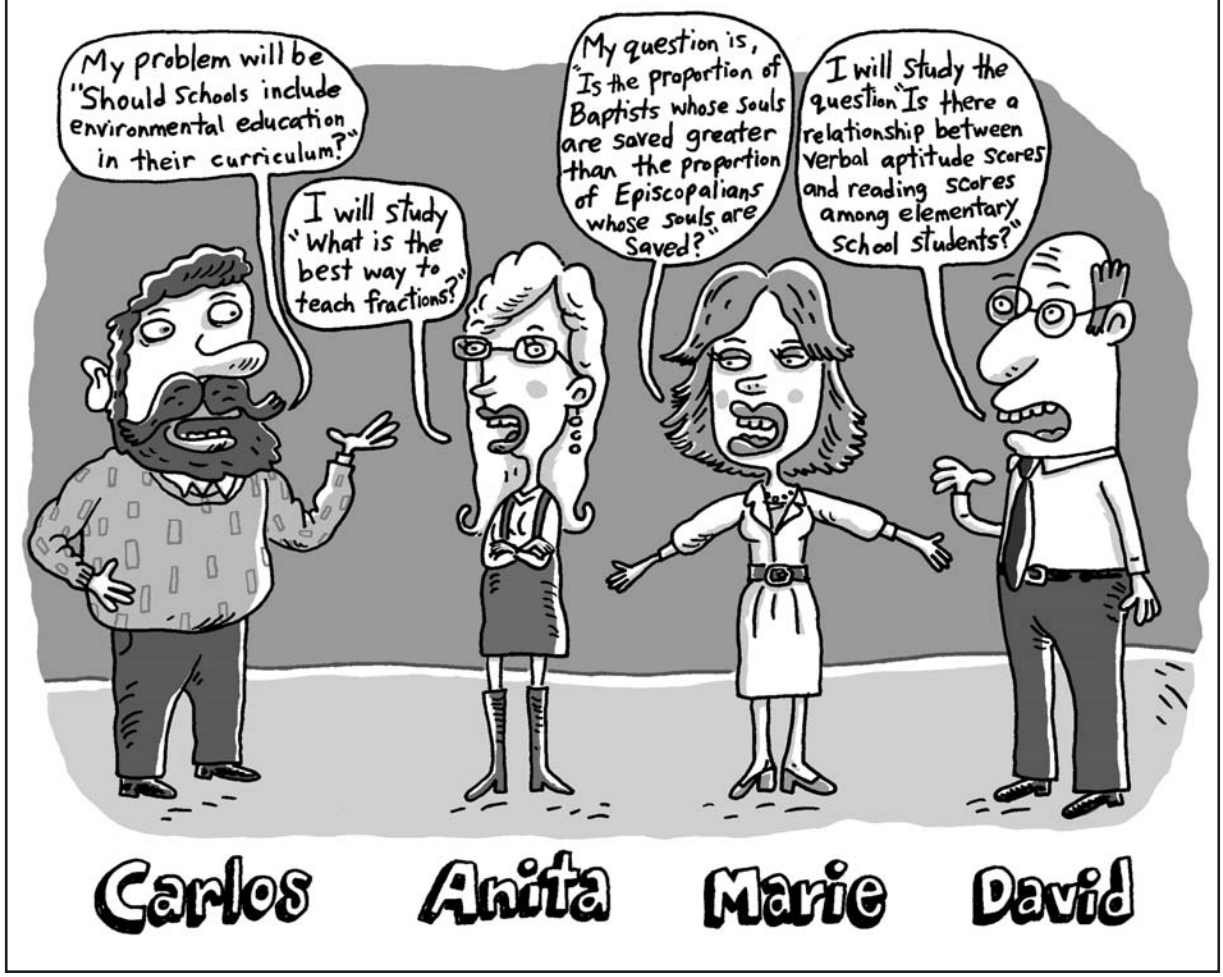

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