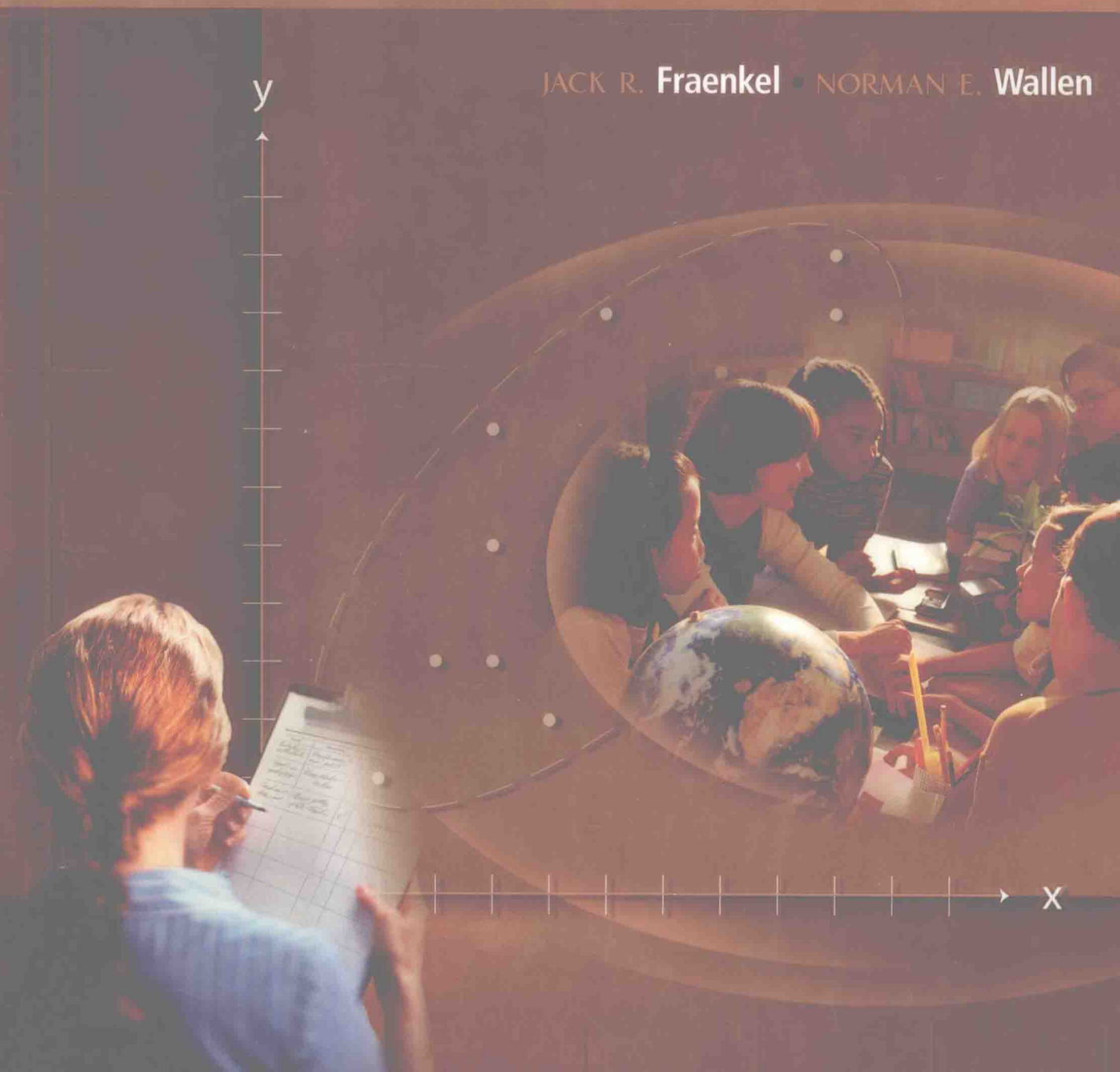
HOW TO Design AND Evaluate Research IN Education

FIFTH EDITION

JACK R. Fraenkel • NORMAN E. Wallen



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San Francisco State University

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Boston Burr Ridge, IL Dubuque, IA Madison, WI New York San Francisco St. Louis
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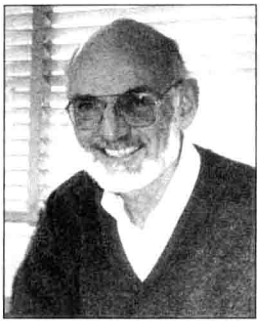
About the Authors



Jack R. Fraenkel is currently Professor of Interdisciplinary Studies in Education and Director of the Research and Development Center, College of Education, San Francisco State University. He received his Ph.D. from Stanford University and has taught courses in research methodology for more than 20 years. In 1997, he received the James A. Michener prize in writing for his writings about the social studies and the social sciences. His current work centers around advising and assisting faculty and students in generating and developing research endeavors.

Norman E. Wallen is Professor Emeritus of Interdisciplinary Studies in Education at San Francisco State University, where he taught from 1966 to 1992. An experienced researcher, he received his Ph.D. from Syracuse University and taught courses in statistics and research design to master's and doctoral students for many years. He is a recent member of the City Council of Flagstaff, Arizona, and the Executive Committee, Grand Canyon Chapter of the Sierra Club.

To Marge and Lina for all their support

Preface

How to Design and Evaluate Research in Education is directed to students taking their first course in educational research. Because this field continues to grow so rapidly with regard to both the knowledge it contains and the methodologies it employs, the authors of any introductory text are forced to carefully define their goals as a first step in deciding what to include in their book. In our case, we continually kept three main goals in mind. We wanted to produce a text that would:

1. Provide students with the basic information needed to understand the research process, from idea formulation through data analysis and interpretation.
2. Enable students to use this knowledge to design their own research investigation on a topic of personal interest.
3. Permit students to read and understand the literature of educational research.

The first two goals are intended to satisfy the needs of those students who must plan and carry out a research project as part of their course requirements. The third goal is aimed at students whose course requirements include learning how to read and understand the research of others. Many instructors, ourselves included, build all three goals into their courses, since each one seems to reinforce the others. It is hard to read and fully comprehend the research of others if you have not yourself gone through the process of designing and evaluating a research project. Similarly, the more you read and evaluate the research of others, the better equipped you will be to design your own meaningful and creative research. In order to achieve the above goals, we have developed a book with the following characteristics.

CONTENT COVERAGE

Goal one, to provide students with the basic information needed to understand the research process, has resulted in an eight-part book plan. Part One (Chapter One) introduces students to the nature of educational research, briefly overviews each of the seven methodologies discussed later in the text, and presents an overview of the research process as well as criticisms of it.

Part Two (Chapters Two through Nine) discusses the basic concepts and procedures that must be understood before one can engage in research intelligently or critique it meaningfully. These chapters explain variables, definitions, ethics, sampling, instrumentation, validity, reliability, and internal validity. These and other concepts are covered thoroughly, clearly, and relatively simply. Our emphasis throughout is to show students, by means of clear and appropriate examples, how to set up a research study in an educational setting on a question of interest and importance.

Part Three (Chapters Ten through Twelve) describes in some detail the processes involved in collecting and analyzing data.

Parts Four (Chapters Thirteen through Seventeen) describes and illustrates the methodologies most commonly used in quantitative educational research. Many key concepts presented in Part Two are considered again in these chapters in order to illustrate their application to each methodology. Finally, each methodology chapter concludes with a carefully chosen study from the published research literature. Each study is analyzed by the authors with regard to both its strengths and weaknesses. Students are shown how to read and critically analyze a study they might find in the literature.

Part Five (Chapters Eighteen through Twenty) and Six (Chapters Twenty-One through Twenty-Three) discuss qualitative research. Part Five begins the coverage by describing qualitative research, its philosophy, and essential features. It has been expanded to include various types of qualitative research as well as combinations of quantitative and qualitative methods. This is followed by an expanded treatment of both data collection and analysis methods. Part Six presents the qualitative methodologies of ethnography and historical research. As with the quantitative methodology chapters, these are followed by a carefully chosen research report from the published research literature, along with our analysis and critique.

Part Seven (Chapter 23) describes the assumptions characteristics, and steps of action research. Classroom examples of action research questions bring the subject to life, as does the addition of a critique of a published study.

Part Eight (Chapter 24) shows how to prepare a research proposal or report (involving a methodology of choice) that builds on the concepts and examples developed and illustrated in previous chapters.

RESEARCH EXERCISES

In order to achieve our second goal of helping students learn to apply their knowledge of basic processes and methodologies, we organized the first 12 chapters in the same order that students normally follow in developing a research proposal or conducting a research project. Then we concluded each of these chapters with a research exercise that includes a fill-in problem sheet. These exercises allow students to apply their understanding of the major concepts of each chapter. When completed, these accumulated problem sheets will have led students through the step-by-step processes involved in designing their own research projects. Although this step-by-step development requires some revision of their work as they learn more about the research process, the gain in understanding that results as they slowly see their proposal develop "before their eyes" justifies the extra time and effort involved.

Problem Sheet templates are located in the Student Workbook, and electronically on the Interactive Student CD-ROM and the Online Learning Center.

ACTUAL RESEARCH STUDIES

Our third goal, to enable students to read and understand the literature of educational research, has led us to conclude each of the methodology chapters in Parts Four, Five, and Six with an annotated study that illustrates a particular research method. At the end of each study we analyze its strengths and weaknesses and offer suggestions as to how it might be improved. Similarly, at the end of our chapter on writing research proposals and reports, we include a student research proposal that we have critiqued with marginal comments. This annotated proposal has proved an effective means of helping students understand both good and questionable research practices.

STYLE OF PRESENTATION

Because students are typically anxious regarding the content of research courses, we have taken extraordinary care not to overwhelm them with dry, abstract discussions. More than any text to date, our presentations are laced with clarifying examples and with summarizing charts, tables, and diagrams. Our experience in teaching research courses for more than 30 years has convinced us that there is no such thing as having "too many" examples in a basic text.

In addition to the many examples and illustrations that are embedded in our (we hope) informal writing style, we have built the following pedagogical features into the book: (1) a graphic organizer for each chapter, (2) chapter objectives, (3) chapter-opening examples, (4) end-of-chapter summaries, (5) key terms with page references, (6) discussion questions, and (7) an extensive end-of-book glossary.

CHANGES IN THE FIFTH EDITION

All chapters have been revised and updated. The book has been reorganized into eight parts. Parts One through Four (Chapters One through Seventeen), dealing with quantitative research, remain as they were in previous editions, although much of the material in each has been revised and updated. Part Five has been expanded and reorganized into two new parts: Introduction to Qualitative Research (Part Five, consisting of three chapters), and Qualitative Research Methodologies (Part Six, consisting of two chapters). We have added a chapter that discusses recent developments in Action Research (Part Seven). Part Eight continues to deal with the writing of research proposals and reports.

Much new material has been added to many chapters, including a comparison of the philosophic assumptions underlying qualitative and quantitative research,

techniques and procedures involved in interview research, mixed-method models, action research, an expanded discussion of power in quantitative research, and the coding of qualitative data.

Several new examples of published research, along with our analysis and annotation of each, have been added. In addition, more than 50 new illustrations and figures have been included.

SPECIAL FEATURES

The fifth edition has retained the popular *More About Research* feature and introduces two new features: *Research Tips* and *Controversies in Research. More About Research* continues to take a closer look at important topics in educational research and application to other fields. *Research Tips* provides practical suggestions for doing research. *Controversies in Research* focuses on controversial issues in educational research. A complete listing of these features is located on pages vii and viii.

INTERACTIVE AND APPLIED LEARNING

The existing theme of interactive and applied learning has been highlighted and expanded in the fifth edition. At the start of each chapter, the *Interactive and Applied Learning Tools* feature lists the different activities and resources available for the student while studying the chapter. At the end of each chapter, students are reminded of the student study guide resources available on the Interactive Student CD-ROM and the Online Learning Center.

STUDENT SUPPLEMENTS

Three supplements were developed for students using *How to Design and Evaluate Research in Education.*

The Interactive Student CD-ROM includes a student study guide (with quizzes and key term practice activities), interactive activities, a statistics program, electronic versions of the problem sheets, and numerous other resources valuable as study, practice, and research tools. Of particular interest is the Learn More About feature, which contains a number of short audio excerpts in which the authors discuss various aspects of research that go beyond what they present in the text, often with interesting and amusing examples.

The Online Learning Center at *www.mhhe.com/fraenkel5e* houses the student study guide, Web links, and other Internet resources.

The Student Workbook contains several practice exercises per chapter, as well as hard copies of the problem sheets.

INSTRUCTOR SUPPLEMENTS

The Instructor's Manual and Test Bank has been revised. A dual platform CD-ROM test bank is available for test construction. New to this edition is an Instructor's Resource CD-ROM that includes the Instructor's Manual and Test Bank, and PowerPoint slides developed for the text. The Instructor's Online Learning Center houses a wealth of resources for the instructor.

ACKNOWLEDGMENTS

Directly and indirectly, many people have contributed to the preparation of this book. We will begin by acknowledging the students in our research classes who, over the years, have taught us much. Also, we wish to thank the reviewers of this edition, whose generous comments have guided the preparation of this text. They include:

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Jack R. Fraenkel
Norman E. Wallen

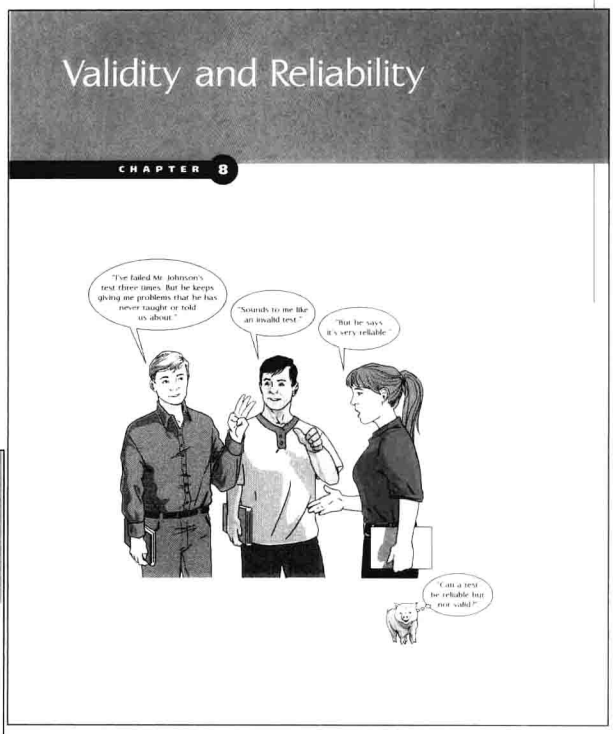
A Guided Tour of *How to Design and Evaluate Research in Education*

Welcome to *How to Design and Evaluate Research in Education.*

This comprehensive introduction to research methods was designed to present the basics of educational research in as interesting and understandable a way as possible. To accomplish this, we've created the following features for each chapter.

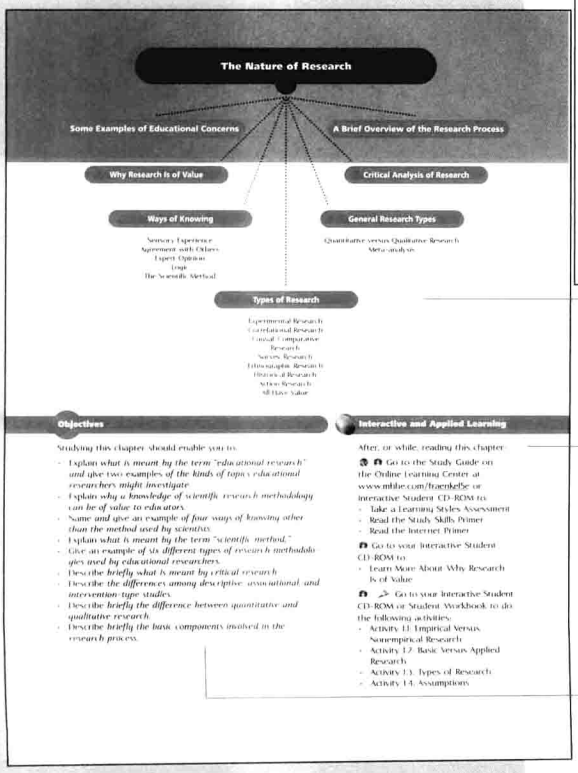
Opening Illustration

Each chapter opens with an illustrative depiction of a key concept that will be covered in the chapter.



Graphic Organizer

Next, a graphic outline lists the chapter topics to follow.



Interactive and Applied Learning Tools

This special feature lists the practice activities and resources related to the chapter that are available in the student supplements.

Objectives

Chapter objectives prepare the student for the chapter ahead.

Marge Jenkins and Jenna Rodriguez are having coffee following the meeting of their graduate seminar in educational research. Both are puzzled by some of the ideas that came up in today's meeting of the class.

"I'm not sure I agree with Ms. Naser (their instructor)," says Jenna. "She said that there are a lot of advantages to predicting how you think a study will come out."

"Yeah, I know," replies Marge. "But formulating a hypothesis seems like a good idea to me."

"Well, perhaps, but there are some disadvantages, too."

"Really? I can't think of any."

"Well, what about . . . ?"

Actually, both Jenna and Marge are correct. There are ***both*** advantages and disadvantages to stating a hypothesis in addition to one's research question. Examples of both are one of the things we'll discuss in this chapter.

Chapter-Opening Example

The chapter text begins with a practical example—a dialogue between researchers or a peek into a classroom—related to the content to follow.

More About Research

These boxes take a closer look at important topics in educational research. See a full listing of these boxes, starting on page vii.

More about Research

The Difficulty in Generalizing from a Sample

In 1936, the *Literary Digest*, a popular magazine of the time, selected a sample of voters in the United States and asked the individuals in the sample for whom they would vote in the upcoming presidential election—Alf Landon (Republican) or Franklin Roosevelt (Democrat). The magazine editors obtained a sample of 2,375,000 individuals from lists of automobile and telephone owners in the United States (about 20 percent returned the mailed postcards). On the basis of their findings, the editors predicted that Landon would win by a landslide. In fact, it was Roosevelt who won the landslide victory. What was wrong with the study?

Certainly not the size of the sample. The most frequent explanations have been that the data were collected too far ahead of the election and that *a lot* of people changed their minds, and/or that the sample of voters was heavily biased in favor of the more affluent, and/or that the 20 percent return rate introduced a major bias. What do you think?

A misconception that is common among beginning researchers is illustrated by the following statement: "Although I obtained a random sample only from schools in San Francisco, I am entitled to generalize my findings to the entire state of California because the San Francisco schools (and hence my sample) reflect a wide variety of socioeconomic levels, ethnic groups, and teaching styles." The statement is incorrect because variety is not the same thing as representativeness. In order for the San Francisco schools to be representative of all the schools in California, they must be very similar (ideally, identical) with respect to characteristics such as the ones mentioned. Ask yourself: "Are the San Francisco schools representative of the entire state with regard to ethnic composition of students?" The answer, of course, is that they are not.

Research Tips

These boxes provide practical pointers for doing research. See a full listing of these boxes on page vii.

Research Tips

Sample Size

Students frequently ask for more specific rules on sample size. Unfortunately, there are no simple answers. However, under certain conditions, some guidelines are available.

Value of sample r	.05	.10	.15	.20	.25	.30	.40	.50
Sample size required	1539	400	177	100	64	49	25	16

Sample size required for concluding that a *difference in sample means* is statistically significant (i.e., the difference between the means of the two populations is not zero) at the .05 level of confidence. These calculations require that the population standard deviation be known or estimated from the sample standard deviations. Let us assume, for example, that the standard deviation in both populations is 15 and each of the samples is the same size.

Difference between the sample means	2 points	5 points	10 points	15 points
Required size of each sample	434	71	18	8

The most important condition is random sampling, but there are other specific requirements that are discussed in statistics texts. Assuming these assumptions are met, the following apply:

Sample size required for concluding that a sample *correlation coefficient* is statistically significant (i.e., different from zero in the population) at the .05 level of confidence.

Controversies in Research

These boxes highlight a controversy in research to provide you with a greater understanding of the issue. See a full listing of these boxes on page viii.

Controversies in Research

High-Stakes Testing

"High-stakes testing" refers to the use of tests (often only a single achievement test) as the primary, or only basis for decisions having major consequences. For students, such consequences include retention in grade and/or the denial of diplomas and awards. For schools, they include public praise or condemnation, sanctions, and financial rewards or punishments. "In state after state, legislatures, governors, and state boards, supported by business leaders, have imposed tougher requirements in mathematics, English, science, and other fields, together with new tests by which the performance of both students and schools is to be judged."*

For years, tests had been used as one indicator of performance, what was new was exclusive reliance on them. "The backlash, touching virtually every state that has instituted high-stakes testing, arises from a spectrum of complaints. A major complaint is that the focus on testing and obsessive test preparation, sometimes beginning in kindergarten, is killing innovative teaching and curricula and driving out good teachers. Other complaints are that (conversely) the standards on which the tests are based are too vague and that students have not been taught the material on which the tests are based. Or that the tests are unfair to poor and minority students; or to those who lack test-taking skills; or that the tests put too much stress on young children. And some argue that they are too long (in Massachusetts they can take up to 13 hours!) or too tough or simply not good enough."†

In response, the American Educational Research Association developed a position statement of "conditions essential to sound implementation of high-stakes educational testing programs."‡ It contained 14 specific points, 4 of the most important being that such decisions about students should not be based on test scores alone; tests should be made fairer to all students; tests should match the curriculum; and that the reliability and validity of tests should continually be evaluated.

Two examples of responses to the guidelines were the following:

- "In the face of too much testing with far too severe consequences, the AERA positions, if implemented, would be a step forward relative to current practice."§
- "The statement reflects what is desired for all state tests and assessments. But, just as all students have not yet met the standards, not all state tests and assessments will immediately meet the goals contained in this statement."¶

What do you think? Are the complaints about high-stakes tests warranted?

*P. Schrag (2000). High stakes are for tomatoes. *Atlantic Monthly*, 286:(August): 19.

†Ibid.

‡American Educational Research Association (2000). Position statement of the American Educational Research Association concerning high-stakes testing in pre-12 education. (2000). *Educational Researcher, 29*, (11), 24–35.

§M. Neill (2000). Quoted in Initial responses to AERA's position statement concerning high-stakes testing. *Educational Researcher, 29*:(11), 28.

¶W. Martin (2000). Quoted in Ibid., p. 27.

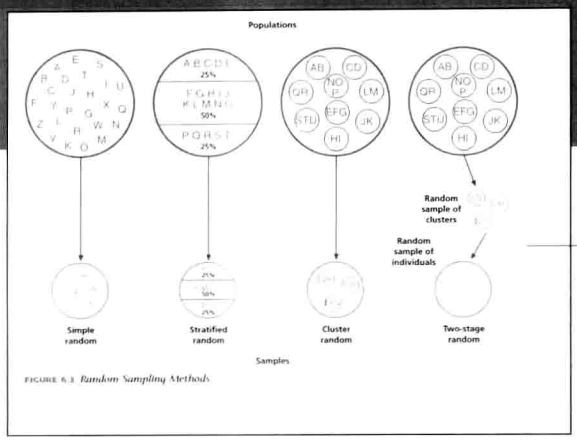


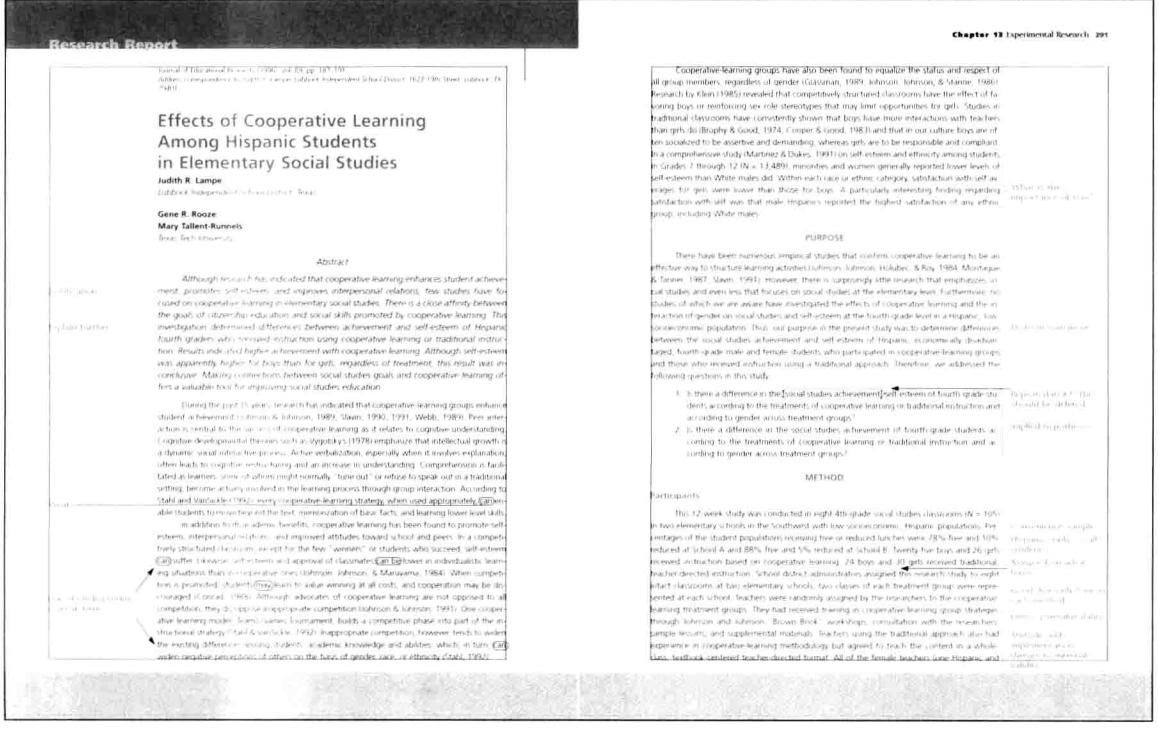
FIGURE 6.3 *Random Sampling Methods*

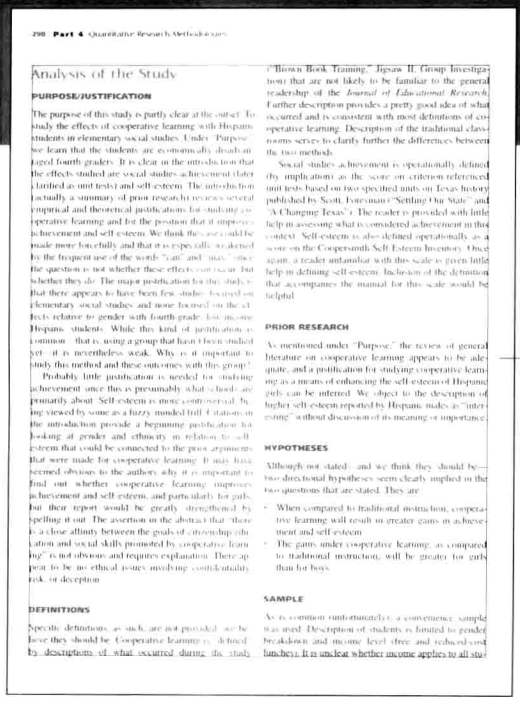
Figures and Tables

Numerous figures and tables explain or extend concepts presented in the text.

Research Reports

Published research reports are included at the conclusion of methodology chapters. The reports have been annotated to provide excellent and practical examples.





290 **Part 4** Quantitative Research Methodologies

Analysis of the Study

PURPOSE/JUSTIFICATION

The purpose of this study is partly clear at the outset. To study the effects of cooperative learning with Hispanic students in elementary social studies. Under "Purpose" we learn that the students are economically disadvantaged fourth graders. It is clear in the introduction that the effects studied are social studies achievement (later clarified as unit tests) and self-esteem. The introduction (actually a summary of prior research) reviews several empirical and theoretical justifications for studying cooperative learning and for the position that it improves achievement and self-esteem. We think the case could be made more forcefully and that it is especially weakened by the frequent use of the words "can" and "may." Once the question is not whether these effects can occur but whether they do. The major justification for this study is that there appears to have been few studies focused on elementary social studies and none focused on the effects relative to gender with fourth-grade low-income Hispanic students. While this kind of justification is common—that is, using a group that hasn't been studied yet—it is nevertheless weak. Why is it important to study this method and these outcomes with this group?

Probably little justification is needed for studying achievement since this is presumably what schools are primarily about. Self-esteem is more controversial, being viewed by some as a fuzzy-minded fad. Citations in the introduction provide a beginning justification for looking at gender and ethnicity in relation to self-esteem that could be connected to the prior arguments that were made for cooperative learning. It may have seemed obvious to the authors why it is important to find out whether cooperative learning improves achievement and self-esteem, and particularly for girls, but their report would be greatly strengthened by spelling it out. The assertion in the abstract that "there is a close affinity between the goals of citizenship education and social skills promoted by cooperative learning" is not obvious and requires explanation. There appear to be no ethical issues involving confidentiality, risk, or deception.

DEFINITIONS

Specific definitions, as such, are not provided, nor do we have they should be. Cooperative learning is defined by descriptions of what occurred during the study ("Brown Book Training," Jigsaw II, Group Investigation) that are not likely to be familiar to the general readership of the *Journal of Educational Research*. Further description provides a pretty good idea of what occurred and is consistent with most definitions of cooperative learning. Description of the traditional classrooms serves to clarify further the differences between the two methods.

Social studies achievement is operationally defined (by implication) as the score on criterion-referenced unit tests based on two specified units on Texas history published by Scott, Foresman ("Settling Our State" and "A Changing Texas"). The reader is provided with little help in assessing what is considered achievement in this context. Self-esteem is also defined operationally as a score on the Coopersmith Self Esteem Inventory. Once again, a reader unfamiliar with this scale is given little help in defining self-esteem. Inclusion of the definition that accompanies the manual for this scale would be helpful.

PRIOR RESEARCH

As mentioned under "Purpose," the review of general literature on cooperative learning appears to be adequate, and a justification for studying cooperative learning as a means of enhancing the self-esteem of Hispanic girls can be inferred. We object to the description of higher self-esteem reported by Hispanic males as "interesting" without discussion of its meaning or importance.

HYPOTHESES

Although not stated, and we think they should be—two directional hypotheses seem clearly implied in the two questions that are stated. They are

- When compared to traditional instruction, cooperative learning will result in greater gains in achievement and self-esteem.
- The gains under cooperative learning, as compared to traditional instruction, will be greater for girls than for boys.

SAMPLE

As is common unfortunately, a convenience sample was used. Description of students is limited to gender breakdown and income level (free and reduced-cost lunches). It is unclear whether income applies to all stu-

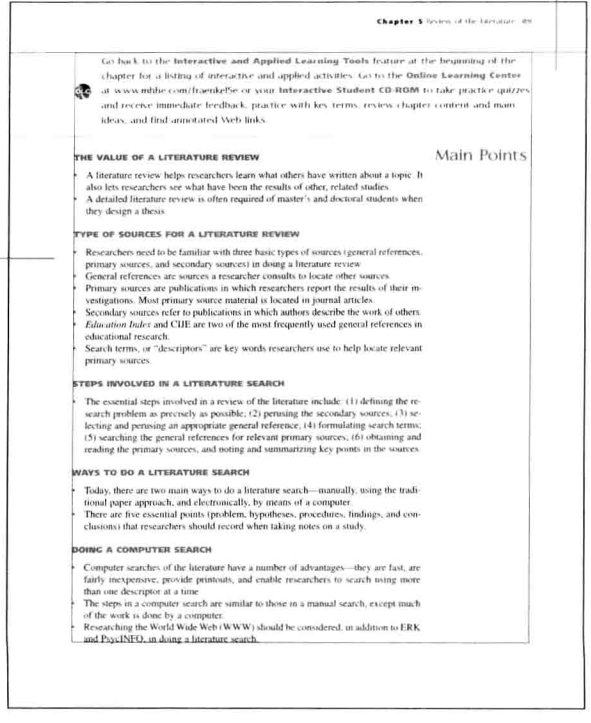
Each research report is critiqued by the authors, with both its strengths and weaknesses discussed.

Chapter Review

The chapter ends with a listing of the review resources available for the student in the student study guide located on the Online Learning Center and on the Interactive Student CD-ROM.

Main Points

Bulleted main points highlight the key concepts of the chapter.



Chapter 5 Review of the Literature 89

Go back to the **Interactive and Applied Learning Tools** feature at the beginning of the chapter for a listing of interactive and applied activities. Go to the **Online Learning Center** at www.mhhe.com/fraenkel5e or your **Interactive Student CD-ROM** to take practice quizzes and receive immediate feedback, practice with key terms, review chapter content and main ideas, and find annotated Web links.

Main Points

THE VALUE OF A LITERATURE REVIEW

- A literature review helps researchers learn what others have written about a topic. It also lets researchers see what have been the results of other, related studies.
- A detailed literature review is often required of master's and doctoral students when they design a thesis.

TYPE OF SOURCES FOR A LITERATURE REVIEW

- Researchers need to be familiar with three basic types of sources (general references, primary sources, and secondary sources) in doing a literature review.
- General references are sources a researcher consults to locate other sources.
- Primary sources are publications in which researchers report the results of their investigations. Most primary source material is located in journal articles.
- Secondary sources refer to publications in which authors describe the work of others.
- *Education Index* and CIJE are two of the most frequently used general references in educational research.
- Search terms, or "descriptors" are key words researchers use to help locate relevant primary sources.

STEPS INVOLVED IN A LITERATURE SEARCH

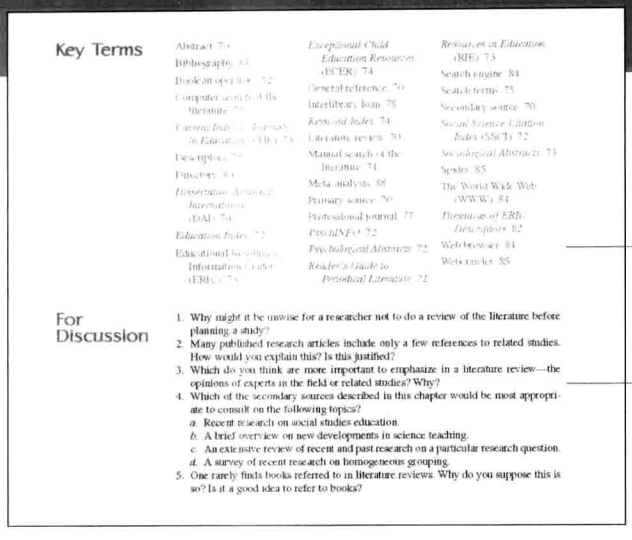
- The essential steps involved in a review of the literature include: (1) defining the research problem as precisely as possible; (2) perusing the secondary sources; (3) selecting and perusing an appropriate general reference; (4) formulating search terms; (5) searching the general references for relevant primary sources; (6) obtaining and reading the primary sources, and noting and summarizing key points in the sources.

WAYS TO DO A LITERATURE SEARCH

- Today, there are two main ways to do a literature search—manually, using the traditional paper approach, and electronically, by means of a computer.
- There are five essential points (problem, hypotheses, procedures, findings, and conclusions) that researchers should record when taking notes on a study.

DOING A COMPUTER SEARCH

- Computer searches of the literature have a number of advantages—they are fast, are fairly inexpensive, provide printouts, and enable researchers to search using more than one descriptor at a time.
- The steps in a computer search are similar to those in a manual search, except much of the work is done by a computer.
- Researching the World Wide Web (WWW) should be considered, in addition to ERIC and PsycINFO, in doing a literature search.



Key Terms

Abstract 70
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Boolean operator 82
Computer search of the literature 78
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Thesaurus of ERIC Descriptors 82
Web browser 84
Web crawler 85

For Discussion

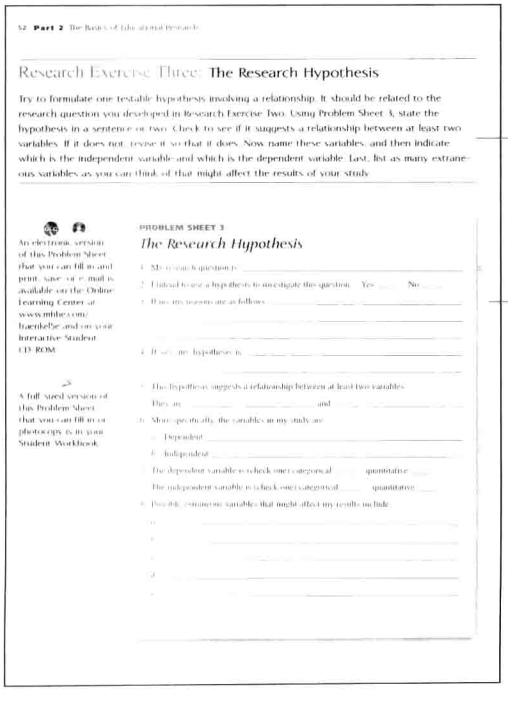
1. Why might it be unwise for a researcher not to do a review of the literature before planning a study?
2. Many published research articles include only a few references to related studies. How would you explain this? Is this justified?
3. Which do you think are more important to emphasize in a literature review—the opinions of experts in the field or related studies? Why?
4. Which of the secondary sources described in this chapter would be most appropriate to consult on the following topics?
   a. Recent research on social studies education.
   b. A brief overview on new developments in science teaching.
   c. An extensive review of recent and past research on a particular research question.
   d. A survey of recent research on homogeneous grouping.
5. One rarely finds books referred to in literature reviews. Why do you suppose this is so? Is it a good idea to refer to books?

Key Terms

Key terms are listed with page references.

For Discussion

End-of-chapter questions are designed for in-class discussion.



52 **Part 2** The Basics of Educational Research

Research Exercise Three: The Research Hypothesis

Try to formulate one testable hypothesis involving a relationship. It should be related to the research question you developed in Research Exercise Two. Using Problem Sheet 3, state the hypothesis in a sentence or two. Check to see if it suggests a relationship between at least two variables. If it does not, revise it so that it does. Now name these variables, and then indicate which is the independent variable and which is the dependent variable. Last, list as many extraneous variables as you can think of that might affect the results of your study.

An electronic version of this Problem Sheet that you can fill in and print, save, or e-mail is available on the Online Learning Center at www.mhhe.com/fraenkel8e and on your Interactive Student CD-ROM.

A full-sized version of this Problem Sheet that you can fill in or photocopy is in your Student Workbook.

PROBLEM SHEET 3

The Research Hypothesis

1. My research question is: _____
2. I intend to use a hypothesis to investigate this question. Yes _____ No _____
3. If so, my reasons are as follows: _____
4. If not, my hypothesis is: _____
5. The hypothesis suggests a relationship between at least two variables.
   They are _____ and _____
6. More specifically, the variables in my study are:
   a. Dependent _____
   b. Independent _____
   The dependent variable is (check one): categorical _____ quantitative _____
   The independent variable is (check one): categorical _____ quantitative _____
7. Possible extraneous variables that might affect my results include:
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

Research Exercises

The research exercise explains how to fill in the Problem Sheet that follows.

Problem Sheets

Individually, the problem sheets allow the student to apply their understanding of the major concepts of each chapter. As a whole, they walk the student through each step of the research process.

List of Features

Research Reports

Research Tips

More About Research

Controversies in Research

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Tables