THE ELEMENTS OF INQUIRY

Research and Methods for a Quality Dissertation

Second Edition

PETER J. BURKE
SARA JIMENEZ SOFFA

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ROUTLEDGE

The Elements of Inquiry

The Elements of Inquiry covers the basic guidelines for graduate students doing an investigation or inquiry project. It distils the rubrics necessary for teaching research methods and completing research projects, and gives the student researcher a list of steps to follow to complete any type of inquiry project – including formal research projects such as doctoral dissertations. It was written to support the work of students in an educational leadership doctoral program, but it will also assist the research efforts of college students at any level in any discipline.

The book begins by establishing the underlying philosophical concepts upon which all good research is based, preparing students to get down to the "nuts and bolts" of conducting their own research and evaluating the research of others. Fundamental concepts and rules of research are explained both for producers and consumers of social science and educational research. Numerous practical examples illustrate the steps in the research process presented in the text. There are end-of-chapter exercises for students to apply the concepts discussed in the chapter. Templates for organizing and presenting research provide students with a game plan for success with their research. The book ends with an up-to-date annotated bibliography of beginning and advanced research texts allowing students easy access to books that detail the more specialized research topics.

While most research books detail one or more method in depth, this text provides a broad introduction to many techniques and models used in doctoral dissertations, and will be of particular value to those who are consumers of inquiry studies and research reports. Key to the overview provided is the annotated bibliography that leads the reader to the next stage of understanding or doing research.

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This book is dedicated to Dr. Peter J. Burke, for his conviction that Edgewood College could compassionately shape a community of learners and educators from the very beginning. Thank you, Dr. Burke, for envisioning a superintendent licensure program that has flourished into our program that prepares educational leaders across Wisconsin and beyond to lead with truth, compassion, partnership, community, and justice. Your leadership and vision is evident in the graduates of our program who make meaningful differences in the lives of those whom they serve.

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Contents

Introduction

The Elements of Inquiry: Research and Methods for Producing a Quality Dissertation, Second Edition, provides an updated look at the basic principles to be considered when reading or writing about original research. It includes a new and expanded set of examples for the steps to be followed along with recent modes of handling research data and information. While stated as "steps" the real idea is to have a manageable inventory of standards, or benchmarks, or touchstones – basically a list of process steps or stages – that describe what researchers or consumers should consider or include when reading or doing research. There is a strong focus on the research dissertation for graduate students.

The distinctive features of this book are as follows:

- The concept of research is set in a larger context of inquiry, and a discussion of the philosophical basis and historical growth of research as inquiry is provided.
- The steps for research provide a reference for reading research reports to individuals not familiar with the basic techniques. These steps allow readers to analyze, synthesize, interpret, and use research reports based on the widely accepted tenets of professional inquiry.
- The research steps in the text provide a checklist for those who are carrying out research projects in their work or in school, especially in projects separate from formal learning about research, or in learning situations that require, but do not include, instruction in inquiry.
- The process provided can aid in the design of a project and in the decision-making necessary as a project progresses through the basic stages of research to completion.
- There are in-class exercises, items for class discussion, and possible assignments at the end of each chapter that provide an opportunity to think about and apply the constructs discussed in the chapter. Flexibility in the responses allows for application and extension across the wide range of topics that exist in research.
- Examples of the use of the basic steps are provided that can be compared to other sources or to the topic of a current

project. Each chapter in Part II contains examples specific to the research step under consideration.
- Templates for success, including a dissertation template and dissertation quality review guide, are included with the text, and provide a step-by-step guide for writing a traditional five-chapter dissertation.
- There is an annotated Bibliography of over 250 research textbooks separated into specific research topics that can lead to rich sources of analysis as a research project grows and develops.
- The Glossary provides immediate and succinct access to the basic definitions of terms used in the lexicon of research.

Why Is It Important to Know the Basic Steps of Research?

- Inquiry and research are the basic tools used to grow the knowledge base for any topical area. Consumers and producers of research must follow the accepted path of creating and interpreting research in order to assure that the results are reliable, valid, and applicable to their own circumstance.
- Data-based decision-making is important for assessment and evaluation that leads to change and improvement in the professions. Using valid and reliable data to reach conclusions that lead to program enhancements requires an understanding of the process and techniques of research.
- Readers of research must take care to scrutinize publications offered as research-based materials to sift false information or erroneous conclusions from valid and reliable findings derived from authentic and ethical research.
- A true and reasonable familiarity of the foundation of research paradigms and their appropriate use is essential for the interpretation and critique of research projects.

Hints on Using the Text

- Clearly, the basic use of this book is as a textbook for a short course on research and research methods. The steps provided outline a process that students could use to design and carry out an in-class research project either individually or as a group endeavor.
- At the authors' home institution, the book is used as both a teaching tool for research coursework, and as a continuing guide for students as they complete their doctoral dissertations.
- Another basic use of the book is as a reference tool when reading research reports. The reader may ask: "Is that an accepted method of drawing a sample?" The answer may be found by checking the section on sampling in the text.

- A third method is as a checklist for doing a research project. A student can plan a project by using the steps in the process, making an educated judgment whether each step applies, and how it applies if it does. Selections from the annotated Bibliography can be made to emphasize one or more research types with more depth of coverage.
- Templates for writing a dissertation in the text provide a roadmap or checklist for graduate students as they complete their research and write their dissertation.
- Finally, this book should become a desk reference for those who are not full-time researchers, but who are called upon occasionally to do a data-based project, or who need to review the research literature to help with a professional decision. By checking the book's Index and finding the succinct discussion of the item that needs exposition, the reader can refresh her or his memory of that particular research topic.

Acknowledgments

First and foremost, the students of research who have interacted with the content of this book in its several forms prior to formal publication, and in its first edition, must be recognized. Student reactions to the use of the raw materials helped immeasurably in determining the final presentation of the steps, and the work done by students provided real-life examples of the use of these steps. Next, the research team of staff and faculty at Edgewood College, who contributed to the development of the templates for success that are included in this book, must also be recognized. The people and the supportive environment at Edgewood College helped make the idea become a reality.

Preface

Inquiry is an exploration of a situation or circumstance to determine the facts or condition of an event, circumstance, or phenomenon. Human inquisitiveness is actualized as inquiry when it includes the investigation of an object or phenomenon. When the study becomes formalized the inquiry becomes research. Inquiry as investigation most often involves a process of research and writing. Research and writing are two components of professional communication that are essential not only between individuals, but also for growth and development in agencies, programs, or personnel in order for improvement to occur. Inquiry, and the research and writing that accompany it, are essential to grow a knowledge base in any topical area. Research and writing are very much intertwined. To do inquiry using research is to test theories or hypotheses, or to analyze and appraise situations, circumstances, or events. In order to communicate the results of research, the basic features of professional writing must be mastered. In addition to the rules of writing, there are, of course, basic structures to the research process that must be mastered as well.

A great deal has been written about inquiry and research, and of the aspects of professional communication necessary to convey the message. For writing, one text is referenced and used more often than any other on the long list of rhetorical support books. That book is *The Elements of Style*, 5th Edition (Strunk and White, 2009). First published by William Strunk, Jr. (1918) and later revised and expanded by E.B. White, this text is still widely recommended as a support document for writing clearly and concisely.

The rules of writing in *Elements of Style* began with an edition that the student E.B. White used in Professor Strunk's English composition class at Cornell University. What Professor Strunk authored and called "that little book" has become a classic for writing at all levels in all fields. One example from the original version is Rule #13.

> **13. Omit needless words.**
>
> Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences,

> for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all his sentences short, or that he avoid all detail and treat his subjects only in outline, but that every word tell.
>
> (Strunk, 1918, p. 24)

The point of including this reference to Strunk and White is to remind the reader that good writing is timeless. Those rules recommended in 1918 are still valid today. The use of language, like the foundation of a building, must be solid and well-constructed at the very basic level in order for successful expansion to occur. This is true for inquiry as well.

Inquiry means the examination or investigation of some topic, and research is most often the tool used to do the inquiry. Research, like composition, has its basic rules to follow too. Much has been written about doing research as well. The tomes devoted to the study, analysis, and implementation of research are, for the most part, lengthy texts that delve deeply into, and attempt to explain thoroughly, the minutest aspects of the research process. Interestingly, much has been written about doing the research but little about consuming it. This text offers a concise look at the process of inquiry, including some basic rules that may be used by the producers and consumers of educational research so that the stability and veracity of any conclusions voiced or projections made can be assured.

This text is designed to help build a solid foundation for consumers and creators of research. Like *The Elements of Style, The Elements of Inquiry* is a basic book that will serve a multiple of uses. First, it will be helpful to consumers of research reports as a touchstone to measure the validity and accuracy of the published inquiry. Consumers will be able to use the structure provided in this text to judge the value of written research reports when they are planning professional inquiry projects at their workplace.

Second, this book will serve as an outline for those readers who are interested in inquiry, or who may become producers of research. The text will aid in the initial organization of an inquiry or research project. One of the most difficult parts in undertaking a research project is getting the initial start. This text provides the rudimentary structure for a neophyte researcher to organize her or his thoughts around a process of inquiry. Questions to ask, data to collect, how the data should be organized and analyzed, what conclusions are warranted, and how to select salient features for reporting are covered. Students completing coursework with a research requirement, especially graduate students tasked with writing a research dissertation, can rely on this text to direct their work. Professional work teams focusing on a specific project may find this text valuable as an organizational tool when doing action research projects.

As with rules for writing, the rules for inquiry provided in this book are not intended to be a linear step-by-step process. Just as there are ebbs and flows of the writing process, the research process may have circular influences, depending on method, which should not be lost in the rubric of strict rules. However, there is a generally accepted construct for inquiry reflected in these rules that all consumers and producers of research should keep in mind.

The Elements of Inquiry may be used as a means to find and use the larger treatises regarding research – the books that are often used in advanced research courses. This shorthand version to the structure of inquiry as research should prove valuable as a side text to help students map a path through a research course. Finally, it may also be used as a supplement to discipline specific courses that include inquiry through research projects as an instructional tool. The student who needs to read the research, write a research paper or carry out a basic or applied research project in any discipline, or who is a member of an action research cooperative group, will find this text valuable as a reference for those learning tasks and more.

Those who read the professional literature to keep abreast of the changes and improvements in their profession need to have a basic understanding of what they are reading when it comes to research articles or inquiry reports, especially when a replication or program change is planned based on the published research. This book will fill that need. Sometimes even peer-reviewed and published reports may not meet the standards applicable to the research method used. The consumer of research can use this book to validate the procedures and techniques used to ensure that the results reported are reliable prior to adaptation, replication, or other use.

Those who are tasked with carrying out a research project will find the book helpful at the very beginning stages of design and development. As mentioned above, the most difficult part of any inquiry endeavor – like a lot of things in life – is often just getting started on the project. The rules in this book will outline a structure that will provide an impetus to support that start for most beginning researchers, especially those who are working alone or at a distance from a supportive environment like a college campus.

The authors of this book are faculty members in a department of education; thus many of the examples and exercises come from inquiry and research in education, particularly educational leadership. It is important to remember, however, that the basic research concepts provided apply to all fields of study. Examples of the process of inquiry described in this book may be found in the education profession. The field of education has been replete with the use of most of the various heuristics in inquiry, including formal research techniques. Data-based decision-making – looking for ways to improve programs – is one of the more important devices in an educator's tool-box. This book was written to help professional educators and others use that tool.

Educators often need to provide evidence that program change recommendations can be documented with "scientifically based research." This means that program planners need to read and interpret the research literature in education. Another consequence is that educators are continually pushed to create and carry out research on topics or issues where no current research exists, or where previous research had been inconclusive. This book will support the continuation of both tasks.

Also in mind as the book was planned and written were those students who are left to their own devices to fulfill a requirement for a research paper, a research project, or even a research dissertation. Many colleges and universities have instituted a research culture at undergraduate as well as graduate level. This text can guide those students through the process of academic inquiry. While not exactly a checklist of things "to do," this book gives the steps to consider when designing and carrying out a research project. The references to additional existing literature in research that are provided, along with the annotated bibliography, will aid that student in moving through the steps necessary to complete the research task.

Actually, it is exactly this latter circumstance that led directly to the writing of this book. The authors, as faculty members and leaders in an education doctorate program, realized the need for a simple and direct text on research techniques for students designing and completing a doctoral dissertation. This is especially true when those students are professional educators who are employed full time, not to mention full-time students. The class notes and handouts prepared for the research classes, notes that were supplemental to the more wide-ranging research textbooks, have been compiled and edited, and they form the basis of this book. Many of the examples used to explain the concepts in the book are drawn from completed dissertations at the authors' home institution, namely Edgewood College in Madison, Wisconsin. While the examples are just pieces of larger and complete research projects, they do serve as models of how each step in the process may be considered in the context of a larger research project.

Of course the basic stages of research presented here transcend more areas and disciplines of inquiry than just education. Care was taken to provide research students and consumers with something similar to what Strunk and White have provided with rhetoricians for decades, an easy-to-use reference text that gets at the nub of the inquiry process and provides the basic steps to consider when reading and doing research. There are four distinct parts to this book and each could stand alone in its use.

First, there is a very basic description of the different and commonly accepted types of research and their applications in Part I. These descriptions set the stage for the consumer and practitioner to build on the foundations of research types without delving too deeply into one or more of the techniques. Basic assumptions and principles of each type are discussed, and an attempt is made to reduce the research lexicon into more usable lay terms. In addition, there is a direct connection to the larger library of research literature for each of the topics summarized.

Second, there is common-sense advice for those who are consumers of professional inquiry projects. When the research literature is reviewed regarding any topic in any profession, the basic structure provided in Part I should be helpful. The common pitfalls that occur in research, such as bias or miscalculation, are exposed for the reader so that bad research is not replicated, or used for program development, based on the good faith of the reader. Recommendations for points at which the consumer can stop consuming are provided.

Third, and most important, there are the rudimentary steps of research in Part II. Really more of a list of points for consideration than a set of absolute regulations, these steps apply across techniques and topics, and provide a foundation for all types of inquiry. The steps should be at least considered, if not followed, by anyone who is planning to carry out authentic research. Like the 22 rules of style in Strunk and White (2008), the ten steps of research in Part II are intended to provide an elemental structure to professional inquiry. As mentioned above, the steps are not intended to be a step-by-step process. They are rather a set of touchstones to help guide the reader through a research paradigm.

Part III brings these basic steps together into a sequence for the reader to plan and carry out a research project. In order to get a start, the steps in the research process are provided in what may be used as a logical and sequential summary. Part III has a particular focus on the completion of a research dissertation, and provides specific rubrics for the organization and display of authentic research.

There are in-class exercises, discussion items, and possible assignments at the end of each of the chapters. These are provided for the independent reader to reflect upon the content provided, or for the class or group using the text to substantiate what they may have learned in the chapter. Group discussions of these points may help readers to better comprehend the concepts.

The fourth and final component in this text is the Annotated Bibliography. The Annotated Bibliography of the larger research texts found in Chapter 20 is provided as a bridge from the early stages of reading and doing research to the more complex stages. Suggestions for expanding one's reading of research at the end of each chapter in Part II are linked to the annotated bibliography entries in Chapter 20. As the steps for research are presented in Part III, many of the seminal and current texts in research are cited. The Annotated Bibliography (Chapter 20) gives the reader the opportunity to select those references that fit the category of research under consideration, or in use, and to take the next step in understanding the research, or in designing the research project.

Taken as a whole, this book provides the foundational elements of what academic inquiry and research are all about, from the research paper to the doctoral dissertation. It is the author's hope that teachers and learners across the many levels of education and across the many disciplines of study find this text helpful. The contents have certainly helped many former students on this campus.

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Part I

An Introduction

The first six chapters in Part I of this text provide the connection from inquiry to research. Beginning with the scientific method, the discussion moves through the current thought regarding research concepts and conditions. Types of data and methods of research are reviewed, and techniques for reading and using research are provided.

1 Research as Inquiry

What is inquiry? Why is research a human endeavor? Human beings are a naturally curious species imbued with an unquenchable thirst for new knowledge, and a natural inquisitiveness that stems from a basic need for substantiation and verification of events, circumstances, or behaviors. Inquiry – the need to know – has been a human trait from the earliest recorded times. Classical inquiry began with the Socratic method of asking the right question, expanded through the period of Archimedes' contemplation of natural conditions, and grew into Pythagoras forcefully demanding intellectual honesty in explaining phenomena like irrational numbers. There is an international journal devoted to publishing work in all areas of philosophy called *Inquiry*. To inquire is to investigate a topic, examine or explore a phenomenon, seek information or new knowledge, solve a problem, resolve a doubt, or probe for the truth. Formal investigative research is one form of inquiry, and the concept of formal research is the focus of this book.

Inquiry as a philosophical tradition suffered through the medieval times when religion and superstition ruled the day. Then the Renaissance ushered in the beginning of the scientific method, and inquiry developed into the concept of *research,* as we know it today. Knowledge and philosophy create the foundation of research efforts, and the STEPS of research presented in this text are built on the philosophical traditions.

It starts with inquiry. Inquiry is a request for information, often just a simple question. "How are you?" is an inquiry that stands both as a common greeting and a question as to a person's well-being. In most cases there is little structure to an innocent inquiry. However, inquiry can include a formal investigation to determine the facts of a case. When a physician asks, "How are you?" and then orders tests to be done the inquiry has moved to research.

Research as inquiry is a productive and scholarly investigative activity commonly accepted to be either examination or experimentation. Research is used to confirm theories or ideas, solve problems, answer questions, test hypotheses, uncover and explain interrelationships between or among people or things, build an argument to revise old theories and create new ones, or to test new theories. Research is a positive and important tool for business, government, science, industry, education as well as all other professions, and, actually, for everyday life.

When a homeowner inspects an attic to determine why the living room ceiling is damp, that person is doing research. When a car buyer reviews consumer reports regarding different models that might be purchased, that person is doing research. When an investor constantly reviews the stock market trends and prices, that person is doing research. When an investigator is looking into the causes for some action or lack of action on the part of an individual or group, that person is doing research. When a voter is interested in how neighbors might vote in an election and engages those neighbors in a conversation around politics, that person is doing research. The examples are endless.

Reporting on research projects often requires careful scripting and sometimes includes the preparation of summary documents that detail the research and the results of the events that represent the research process; that is, research and writing are often combined. Research and writing are combined when a journalist interviews subjects and creates a story for a periodical or newspaper. Research and writing are combined when a market analyst surveys prospective buyers of a product and completes a report on the sales potential of the product. Research and writing are combined when a student reads several sources of literature and combines the information into a term paper. Research and writing are combined when a graduate student designs and carries out a research proposal as part of a dissertation. Once again, there are numerous examples of how research is the precursor to a writing project.

Those who read research reports or those who carry out the research – the consumers and producers of research – must have a solid foundation in both the investigative and communication processes. In order for research to lead to knowledge growth or program improvement, the basic elements in the research tradition, the STEPS of research if you will, must be followed, just as the basic STEPS of professional writing must be followed.

In order for improvement to occur in any endeavor, there must be change. Continuously and repeatedly using the same mode of operation – the same teaching or grouping techniques in education, for example – will not lead to improved results. But change just for the sake of change with the hope that positive results may occur could lead to disaster. That is why research has become the basic ingredient for thoughtful change. Decisions should be data-driven, and the data used should be valid, reliable, and the result of well-planned and careful inquiry.

Consuming Research

Consumers of research reports are the first audience for this book. A consumer of research is one who needs to find and interpret valid research in order to implement research-based projects or structures in a work environment, or to make data-driven decisions. Research consumers include those who need to keep up to date with the latest changes in their work environment by reading, and understanding, what has been studied, validated, and published as research results in the field for the purpose of making positive advances in their professional lives. In order to become a knowledgeable consumer of research, one must have, first, a solid background knowledge of research methodology and, second, a basic repertoire of interpretative skills.

Authors of research texts in the field of education have worked to help consumers of education research be judicious in their selection and use of quantitative data in scientifically based research reports (see, e.g., Bracey, 2006). As educators consume research they need to understand how data are used, and abused, how data may be manipulated in politically motivated research, whether conclusions from the research are valid, and how the use of student test scores may or may not be appropriate as data in research. Bracey, for example, provides 32 principles of data interpretation that are intended to help readers of educational research sort out the good from the bad in quantitative research. These principles are separated into four major theme areas:

- understanding data and how they are used – and misused;
- uncovering how variables are used in the construction of scientifically based research – and manipulated in politically motivated research;
- drawing conclusions about a study and deciding whether the data presented are meaningful;
- assessing the data that come from the research.

Consumers also need to develop a basic understanding of research reports from other research paradigms in addition to strict scientific experimental research. This would include qualitative approaches and those that use mixed quantitative and qualitative methods. Research reports in periodicals and other literature, once the appropriate sources for these reports are found, need to be understood and digested. One-stop shopping does not work. Readers of research must have the tenacity to gather a plethora of information or data from several locations, using various library and internet resources in locating research references to build a solid foundation of supportive literature.

Once consumed, readers need to understand the function of research in designing, developing, monitoring, evaluating, and conducting professional programs. It is here that the value of research is most often displayed. Actions that have been the subject of study, and publication, may provide the basis for informed, data-driven decisions regarding program growth and improvement. Program planners need to be aware of the potential for the "garbage in, garbage out" potential for using published research.

The results from a project are only as good as the design and implementation of the project allow them to be. Program improvement relies heavily on valid and reliable research.

Research Fundamentals

The second audience is those who are in the beginning stages of planning and designing a research project, especially graduate students preparing to write a doctoral dissertation. There exist certain fundamentals that form the basis for what is considered to be authentic "research." This chapter focuses on the quantitative methods commonly used in a scientific approach to research. Expansion of qualitative methodologies will be found in the chapters that follow.

A researcher needs to identify the reason why, confirm the research problem, present the relevant theoretical lens by which to understand the problem, state the significance of the study, present relevant literature about the problem, and discuss steps for designing a study that can answer the research question. These basic steps are important for all types of research. One methodology that is most recognized for research is the method of science.

The scientific method of research is based on theory and often provides the foundation model for what people consider "true" research, and the accepted steps in the research process are as follows:

- *Hypothesize*: identify a phenomenon and conjecture about its being or make-up; have an idea about the interaction of research variables.
- *Control*: manage the environment around the phenomenon; focus the idea.
- *Experiment*: design a way to look at the phenomenon; test the idea.
- *Analyze*: inspect the results of the experiment; review the test.
- *Appraise*: assess and evaluate the results.
- *Conclude*: make a judgment about the phenomenon.

The logic of research in science is usually based on either the inductive approach or the deductive format. Induction involves gathering together a collection of pieces of information such as observations, experimental results, or other kinds of data that may be available, and then formulating a generalization which reasonably explains all collected pieces of information. Deduction, as a form of reasoning, begins with a generalization. Predictions are made based on the generalization, and those predictions are challenged. That is, many cases are studied, or many experiments are carried out, and conclusions for future groups or future trials are made based on the results of those earlier experiments. Deduction, in essence, is the testing part of science. This "scientific model" for research, also known as "scientifically based" research, has become the coin of the realm for many research arenas.

But not all work that is considered "scientific" follows the same controlled, experimental design of research. Within the scientific method there are, for example, case studies where there may be no treatment, or quasi-experimental designs where strict control of some variables may be lacking. In addition, the broad research community uses several different ways to organize and categorize the legitimate efforts made to resolve issues or solve problems that are, in fact, authentic research. Research design is, in the end, the structure, plan, or strategy of investigation that is created and assembled in order to answer the research questions. It is the overall scheme or process for the research and it may follow several approaches, each one appropriate for answering different kinds of questions.

The scientific model that was developed and refined in the hard sciences, a term used to distinguish natural and physical science from social science, is a quantifiable, or numbers-based, approach. There are research fundamentals that include other types of data and other methods of study as well. There are ethnographic or qualitative approaches to research, based on words or text and not numbers, which are well-accepted methodologies in the social sciences. There is the analysis and appraisal of archival documents that seeks to explain events or other structures in the past – historical research – that is also a well-accepted technique.

Today, many research efforts use a combination of qualitative and quantitative methods – an analysis of both text, transcripts, documents, experiences, and numbers – to produce a well-rounded research project. This combination is often referred to as a "mixed-methods" approach. Researchers who conduct mixed-methods research need to be knowledgeable about the scientific method for collecting and analyzing quantitative data and to understand qualitative techniques for establishing trustworthiness and credibility as they synthesize and report results. The following sections provide basic descriptions of these methods. The quantitative methods described are the strict scientific approach, along with the quasi-experimental method. Survey research is discussed. Ethnography, grounded theory, case study, phenomenology, and narrative inquiry are discussed as primary qualitative traditions. Action research is also presented as a common method used by practitioners who conduct applied research. Dissertation research, as an application of several of the techniques, is emphasized in the final section.

Readers are reminded that the descriptions included here are an attempt to only scratch the surface of research techniques in very general terms. A more complete and inclusive description of these basic methodologies in the following chapters, and additional information on specific techniques, may be found in one or more of the references included in the Annotated Bibliography in Chapter 20. The first approach to be discussed here is what is commonly accepted as the scientific method.

The Scientific Approach to Inquiry

Science as a discipline includes a systematically organized body of knowledge that has been produced by careful study and that has been carried out according to accepted methodologies. These scientific methods are techniques for investigating phenomena and acquiring new knowledge based on empirical evidence. Most people think of research as a strictly controlled scientific event. That is not the case. None of the examples provided above would be considered strict scientific research, but they are all, nonetheless, research. There is more to research than the scientific method as the basic research model. However, anyone interested in consuming research reports or doing authentic (genuine and original) research must be familiar with the scientific method as the basic research model. They may then use that knowledge as a basis of comparison to other research methods. The next section outlines the very basic methods used in research across all fields of study, including the profession of education.

The National Research Council appointed a committee to review the issue of scientific research in education (National Research Council, 2002). The committee report began with the premise that "At its core, inquiry is the same in all fields" (p. 2). This report went on to indicate that there were six basic scientific principles that all research must consider and follow. The six basic benchmarks for research as stated by the National Research Council (pp. 3–5) are as follows:

- pose significant questions that can be investigated empirically;
- link research to relevant theory;
- use methods that permit direct investigation of the question;
- provide a coherent and explicit chain of reasoning;
- replicate and generalize across studies;
- disclose research to encourage professional scrutiny and critique.

These benchmarks provide the same basic principles for all types of inquiry and for all research methods. These scientific principles that form the standards for inquiry from the National Research Council also provide the basis for the STEPS of research to be considered, if not applied, which are detailed in Part II.

Scientific Approach to Inquiry: Six Steps

The scientific method of research is a solid technique to use when situations permit and conditions warrant its use. The scientific method of research posits that there are six main steps to follow as an investigator. These steps include identifying the purpose, or the why, of the research; articulating the problem being investigated; stating the research hypothesis; developing a procedure to collect data to test or explore the hypothesis; collecting data and analyzing results; and drawing conclusions based on findings. The following paragraphs include details for carrying out each step of the scientific method of inquiry, including practical examples.

The first step to using the scientific method is to have some basis for conducting the research – a reason why. The "reason why" is usually generated from existing knowledge, or from a known theoretical base, with which the researcher has strong expertise. The theory that forms the foundation of the research is usually the result of earlier scientific experiments and research. In research, *theory* means the body of rules, ideas, principles, or concepts that apply to or define a particular subject.

The research topic or subject matter, therefore, comes from an area of interest for the researcher. In order to pose a significant research question, the researcher must identify a gap in the literature that has not been investigated, or has not been explored in a particular context. That is, in the scientific method of research, first an idea is formulated about the subject matter based on a theoretical or practical need that has not been adequately examined in the current literature. We call this *identifying the gap*, and it is a critical step for researchers to follow in order to establish significance. For a medical researcher, this may be how a specific drug affects a certain physical condition. For educators, this may be a new teaching technique, a different way of grouping students, a change in time allocations for instruction, or other changes in the standard operating procedures of a school.

After the investigator conducts a thorough review of the literature and identifies a gap in need of further investigation, the next step in the scientific method of inquiry is to articulate the research problem being investigated. The research problem is the practical description of the investigator's need for conducting the research. The problem statement establishes the context for the reader, articulates the gap in current knowledge, and offers a proposed solution. A well-written problem statement is substantiated by evidence from the literature. The investigator should state the problem in a way that the reader recognizes how the research will address or answer the problem.

In quantitative studies, the third step is to formulate a research hypothesis. In qualitative studies, the third step is to formulate a theory grounded in the literature. In both cases, this step is the investigator's attempt to explain some aspect of the observations of the problem being investigated. The hypothesis/theory formation is basically a practical description of how the researcher thinks or supposes the idea formulated from the topic might work. In quantitative studies, the hypothesis is a prediction of potential outcomes of an experiment or series of experiments or research trials. The hypothesis has two essential characteristics. It is a statement of the relationship between two variables, namely the independent and dependent variables, and it carries clear implications for testing. It is important to note that hypotheses may be directional or non-directional in nature. A directional hypothesis may be "as we increase reading instruction time test scores will improve." A non-directional hypothesis could state, "academic leadership style has an impact on faculty satisfaction."

A hypothesis is a prediction that is developed from a theory. Hypotheses are often cause-and-effect statements about two or more phenomena – If A, then B. The statements represent the researcher's conjecture about the relationship. Then that posited relationship is subjected to scrutiny through the collection of data and the analysis of those data to determine the exact nature of the relationship. Important to the design and reporting on research is the existence of extraneous variables. Not all quantitative research can be carried out in the controlled conditions of a laboratory. While researchers can accept or reject a hypothesis based on the data collected, it is essential to acknowledge the existence of other influences that may qualify the tested results.

Outside influences, however, must be controlled in a scientific experiment. Then the formal scientific method, at least according to the federal education requirements, follows the traditional control/experimental research design. Two groups are formed for the study. One is a treatment group, or intervention group, that is subject to the planned change. In classic research this is the experimental group. The second is a control group that continues with the standard way of completing the tasks or is not subject to the intervention or treatment. The scientific test is a comparison of the two groups following the treatment. In a classical design a test is used to try to disprove the hypothesis, and a level of confidence, or the probability that the conclusion may be an error, is used to describe the accuracy of the test.

In medicine, for example, a scientific experiment may be a series of trials for a new drug. The hypothesis may be that this new drug will be an effective pain reliever. Two groups are formed that exhibit the same physical symptoms, say, migraine headaches. The new drug is tested by dividing the group of migraine sufferers in half, giving the experimental drug to one and either giving nothing or giving a placebo (a prescription that contains no medicine) to the other (control) group. The relief from pain is measured and a conclusion is drawn regarding the effectiveness of the drug.

In education, the focus of a research project may be a new textbook and testing procedure. A third-grade class may be subjected to the new curriculum and assessment, while another third-grade class is allowed to continue with the existing curriculum. The hypothesis may be that better test scores on a standardized test will result from the use of the new curriculum. The students' content knowledge is measured following the application of the new curriculum, a comparison is made, and a conclusion is drawn regarding the new curriculum. Again, repeated trials are called for to ensure that the single result was not due to spurious events.

The steps for hypothesis testing in the scientific method of research, especially the basic steps, are the same for any type of professional research. In order to test a hypothesis a researcher should:

- Become an expert with the basic *theoretical* aspects of a subject or topic.
- Identify or recognize a *problem*, or ask a basic *question* based on the theory.
- Determine the *variables* interacting in the problem/question/issue.
- State the *relationship* between or among variables that is to be tested (the *hypothesis*).
- Give operational *definitions* to the variables that allow for measurement.
- *Operationalize* the theoretical concepts – find a way to empirically measure the variables.
- *Test* the hypothesis – observe, experiment, apply treatment – repeatedly.
- Draw *conclusions* – accept or reject the hypothesis through deductive reasoning, or generalize about the issue or problem based on the observations through inductive reasoning.

One important aspect to remember about hypothesis testing is that true scientific research does not "absolutely prove" anything. It is a technique that allows the new "treatment" to be tested and not rejected as an invalid approach within the limits set in the study. The scientific method requires a hypothesis to be eliminated if trials or experiments repeatedly contradict predictions. The failed hypothesis may be due to poor sampling procedures, or to invalid or unreliable measurements. These are two reasons why replication is crucial before reaching a conclusion. No matter how great a hypothesis sounds, it is only as good as its ability to consistently predict results for the treatment, or experimental, group.

The fourth step in the scientific process of inquiry is to develop a procedure to collect data to test or explore the research hypothesis. It is important to note that there are many ways to design data-collection methods that can properly address the research problem and answer the research question. Specific data-collection procedures will be covered in Chapter 12, but the important thing to recognize is that multiple sources of data can work together to provide the investigator with answers to the research questions being posed.

The fifth step is to collect data and analyze results of the data collected. In this step, the investigator is challenged to rigorously and, in many cases, repeatedly test the prediction. Remember, a researcher cannot "prove" the hypothesis. Research results can only fail to disprove it. Unlike pure mathematics where there are absolute right or wrong answers, statistics allows for errors to be considered as part of the explanation. Statistical tests have been invented to provide a level of confidence around the potential for rejecting a hypothesis. Therefore, for the scientific method to work the hypothesis must be quantifiable and testable. It must allow for predictions to be made and for experimental research to be done confirming the predictions. The test used must adhere to the standard methods of measurement accepted by the scientific community. Too often an inadequate or inappropriate test is applied to research data where the data type does not fit the measurement used. Different types of numerical data are discussed later in Chapter 2 in the Quantitative Data section.

The final step of the scientific approach to inquiry is to draw conclusions based on the results. In the case of a dissertation, this step happens in the final chapter, or discussion chapter. It is important to distinguish conclusions from results – they are not the same thing. Conclusions expand the results of a test (in quantitative studies) or a theme (in qualitative studies) to provide insight into the problem under investigation – to answer research questions in a meaningful way. In some instances, conclusions may be generalized across an entire population. In other instances, conclusions are only relevant for a specific, local group, such as a school or a district. Whether the research was an experiment of some kind, like a new way of teaching a subject, or an explanation of something, like a review of attitudes toward an innovation, the conclusions drawn need to be related to the question asked and aligned with supporting research in the field.

The six steps in quantitative/scientific research are as follows:

1. Know the theoretical literature.
2. Articulate the problem.
3. Formulate a hypothesis.
4. Design the research procedure.
5. Collect and analyze the data.
6. Draw conclusions.

Challenges with Using the Scientific Method of Inquiry

There are cautions to be explored when using the strict scientific research method in social science research. One mentioned above is the existence of extraneous variables that may have an impact upon the study. Another is researcher bias. Too often the researcher is wedded to an outcome that may not be substantiated in the data. Another challenge is an attempt to confirm a hypothesis through common observation or common sense. Scientific validity is missing when careful empirical observations are absent. While there is more on validity in Chapter 12, validity in research is basically a guarantee that the measurements do in fact accurately describe the phenomenon under scrutiny. One approach to increase validity is to encourage replication through repeated trials. *Replication* occurs when several similar or exactly copied studies come to the same conclusion or find the same result.

Repeated trials may be part of one long term research endeavor. In addition, there are independent trials or experiments that focus on the same or similar topics. Research journals and specialty journals often publish what is termed a "meta-analysis" on a research subject. These meta-analyses are a single source for reviewing multiple iterations of similar hypothesis tests. One concern to keep in mind here, however, is that the circumstances that led to the same results may have been widely different.

Another issue with using the scientific method of inquiry is the need to step back from the repeated trials and ask the question about professional significance. As a research project increases in size – as more subjects are included in the study – there is a greater opportunity for statistical significance to occur when standard measurement tools are used. A statistically significant difference simply means that there is statistical evidence that there is a difference; it does not mean the difference is necessarily substantial, important, or significant in the context of the research. Sometimes a statistically significant finding has little or no meaning in the context of the discipline under study – such as having "educational significance." Readers and researchers need to keep in mind the theoretical foundation of the project, and whether minute statistical findings have real meaning for the profession.

Summary

Reading, planning, or doing research is a method of inquiry that has a specific design. Research is done to examine something, or to test an idea – examination or experimentation. A very common type of research is experimentation done in science, which comprises six basic steps:

- Study the theory and articulate why the study is to be done.
- State the question or problem in research terms.
- Formulate the research hypothesis.
- Design the method to be used to answer the question.
- Collect the data to test the hypothesis.
- Draw conclusions based on the results.

Two important caveats need to be considered for any research. Does replication of the research provide similar results? Are the results significant to the phenomenon being studied? Well-accepted methods of research in addition to experimentation in science are provided in the following chapters.

Resources

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In-class Exercises

1. Create small groups to discuss and report on the purpose and use of exit polls during elections. Are they experimental or explanatory? What information can be gleaned from the results?
2. Pair students and ask them to create a list of potential outside influences on a research project designed to measure the impact of social media on school work.

Discussion Items

1. What is a research question you would like to answer? Are there variables? How can they be measured?
2. Differentiate inductive reasoning from deductive reasoning.
3. Why is replication important in scientific research?

Assignments

1. Discuss and give examples of potential researcher bias based on the source of funding for a research project. In what ways can bias be addressed and minimized?
2. Outline the steps you would take to design and carry out a research project based either on the question “Why do some college freshmen not enroll for their sophomore year?” Or “To what extent is consensus bargaining effective?”

2 Sources of Data

Researchers rely on sources to answer their research questions. Some sources are human beings, others are documents, and still others are media clips. Diligently seeking reliable sources of data contributes to the validity or credibility of the research findings. The purpose of this chapter is to present the many different sources of data, and to show how sources of data differ depending on the type of research conducted.

The information that is gathered and used to answer the research question, or test the research hypothesis, or solve the problem under study, is often referred to as "data." Sometimes in the qualitative arena the concept of data is subsumed within the inquiry where the research participants may become, or at least provide, the information needed to move the issue forward. Research data come from a variety of sources and take on a variety of types and formats. One easy distinction that helps qualify data types is to distinguish between information that is in the form of numbers and information that is in the form of words or text. While the usual separation used between numbers and words as data is the distinction between quantitative (numbers) and qualitative (words) research, there is often overlap between types of information, or sources of data, that may blur the lines of this basic distinction.

Outlined below are some of the most common information sources and data types for basic research projects. The basic types of numbers used in quantitative research are outlined, and the generally accepted descriptions used in qualitative research provided. Research that makes use of these different data types is discussed in more detail in Chapter 9 where quantitative research is compared to qualitative research, and the use of a mixed methods (both quantitative and qualitative) described. The references listed in Chapter 9 will help the reader gain a more in-depth understanding of data in any of the selected categories.

Quantitative Data

Quantitative research is based on data that are numerical, or measureable, in nature. Recall that the basic differences in the two techniques is that strict quantitative research uses numbers and most qualitative research uses text of some kind, although qualitative research may be numerical as well as textual. Most of the time, researchers gather quantitative data via survey research, whereby researchers ask participants to complete a survey instrument that includes Likert scale and/or demographic questions. Other times, researchers choose to analyze data that have previously been collected, including national datasets, institutional, or organizational data. With most numerical data, however, there are differences in the types of data gathered and how they are used in the research.

Strict quantitative analysis of data is focused on *measurement*. Measurement begins with the assignment of numerals or numbers to objects or events in the research according to standardized rules and procedures. Remember that the variables under study must be defined and be measurable. The researcher selects the type of measurement to be used, chooses the appropriate rules for assigning the numerals or values, and carries out the research according to the generally accepted structures for the types and kinds of numbers available in the research. Analysis of numerical data is most often referred to as "statistical" analysis. Two interrelated terms used throughout quantitative measurement are *statistics* and *parameters*. Each term will be discussed briefly here.

A *parameter* is a characteristic or summary value that is considered to be a "true" measurement from an entire population under study. For example, the average age of the world's population at a given point in time is a parameter. The variation in height in the adult population in the United States is a parameter, but since the average or spread of a measurement for an entire population is difficult, if not impossible, to measure, research often estimates these parameters. *Statistics* are used to estimate the values of population parameters, and measurement rules exist for the calculation of statistics. One key distinction between parametric and nonparametric data is the assumption that parametric data follow a predetermined distribution, most often a normal distribution curve or normal curve, also referred to as the bell curve or bell-shaped curve.

The graph of this curve is shown in Figure 2.1. Each number to the right or left of the central position of zero is referred to as a "standard deviation." The assumption is that an equal number of cases are located on each side of the central position, and that those cases diminish as the scale number increases. There are to be 68 percent of cases between –1 and +1, 95 percent of cases between –2 and +2, and over 99 percent between –3 and +3.

In addition, there are numerical collections that may not have a predisposed distribution for the data. These are referred to as "nonparametric" data. Chapter 6 expands on the use of parameters in empirical studies.

A *statistic* is a calculated estimate of what the actual value is for the whole population. Statistics are derived from a research sample that provides estimates of population parameters. Statistics are numbers generated to test research hypotheses. Statistics are

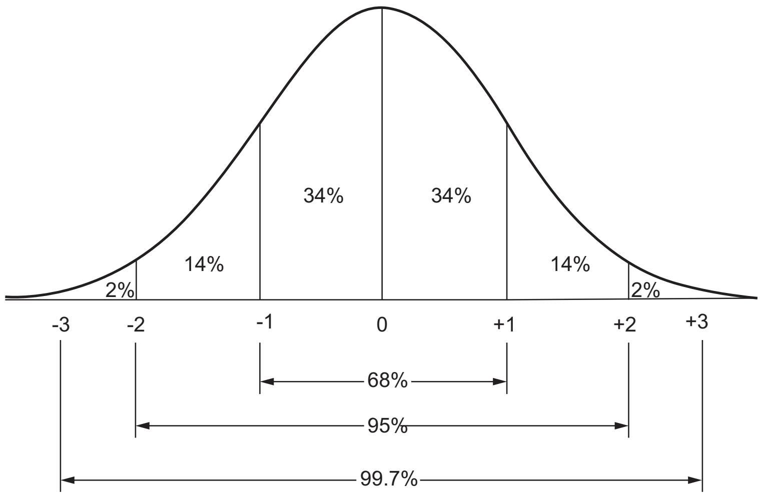

Figure 2.1 The Normal Probability Curve.

numbers that are all derived from the data available in the research project; they are calculated from the data and used to verify decisions about the basic questions, or to test the research hypotheses.

Statistical testing is the use of existing formulae to make judgments about the research data. Both parametric and nonparametric data may be subject to existing statistical tests. Statistical testing is simply using the numbers from the research by putting them into a predetermined formula as a test for significance. Therefore, statistical testing is no more than making use of the numerical data collected in an orderly and proscribed way to make decisions about the basic research questions.

Computing the arithmetic average value is an example of a "statistic" that is a measure of the population "parameter." In the case of an average, the population parameter is called the "mean value" or "population mean." Thus, since a researcher cannot actually measure the average age of the world's population, a sample of individuals from several countries could be selected and the average age from that sample calculated. The average that comes from the sample is the *statistic*, a number that approximates the actual population *parameter* (average age).

A researcher needs to know whether the group under study has summary parameters that can be estimated by using statistics. There are statistical techniques created for the analysis of sample data from both types of data, parametric and nonparametric. When research projects are designed, decisions about using either parametric or nonparametric statistical analysis are made. This decision is based on the kinds of numbers available from the data collected.

For all of the experimental (scientific) and quasi-experimental research methods outlined above, there are statistical formulae that may be used to test the significance of the measurements derived from the data. These statistical tests go hand-in-hand with the confidence that the researcher puts on the results. The different data types lead to the different types of statistical tests that may be used to test significance. In fact, current computer programs ask researchers to identify the type of data in order to select the appropriate tests to be used (see, e.g., SPSS, 2015). While being statistically significant, the test may not provide a substantive significance. That is, the results of these tests may result in a measurement that has statistical significance, but not necessarily an educational or professional significance. The analysis of research provided in Chapter 6 will help the reader determine how significant the results may be for specific circumstances or situations. Not everything that is found to be statistically significant may be operationally valuable to the consumer. Statistics are just a manipulation of the research data to attempt to answer the research questions. Final judgments on the numbers generated are the responsibility of the reader.

In order to use statistics, a researcher must be aware of the kinds of numbers available to be put to the test. The following two sections provide a basic outline of how the numbers collected in a quantitative research project may differ, and how that difference leads to certain types of analysis. This is followed by a brief summary of non-numerical data and its use in qualitative research.

Categorical Data

One type of data that may be collected in research projects is sometimes labeled *categorical* data. Categorical data are divided into two basic types. There are data descriptors that have no real order in numeric values, but are numerals used to label the categories. These are *nominal* data. Nominal means that the numbers represent a name and not a value. These "numbers as names" cannot be ordered in a meaningful way and they cannot be mathematically combined together with any meaning. One common example is a project that might label males as "1" and females as "2." The researcher could just as easily have labeled females as "1" and males as "2" without changing any interpretation or analysis of the data. Another example is to give numerical labels to colors – for example, all blue cars are "1," green cars are "2," black cars are "3," etc. The numbers have no value, but are simply labels for the colors of the cars.

Nominal data rely on nonparametric statistical manipulation, since there is no predetermined distribution of the number collected. Using the above example, there is no meaning to say that the average "gender" for a group that has an equal number of men and women is 1.5. Nominal figures are just names of individuals or groups in the research, mostly created for ease of computer manipulation of data. Nominal data may be used to draw conclusions about the population (consumers prefer black cars) through tallied frequencies.

The second type of categorical data does have a value or order. These are *ordinal* data that express a meaningful order to the category, but where the distances or values between the concepts represented by numbers may not be equal or equivalent. In the mathematical sense "a < b" has meaning for ordinal data, but "a – b" may not. These ordinal numbers that are assigned to objects or groups in a research project may be classified or ranked in a significant way. Numbers assigned to socio-economic status, for instance, have an order (e.g., 1 = low, 2 = middle, 3 = high). Another example of ordinal data is class rank. A student's rank in class has an order, but, while there is a clear order to the rank of students, the distance measured by GPA between, say, students who rank 1st and 2nd may not be the same as the difference between students who rank 3rd and 4th. Thus the rank in class is an ordinal number.

Just because there is an order to these numbers does not mean, however, that the distances between the components of the category are necessarily equal. Grades given in school that are represented by numbers have an order (F = 0, D = 1, C = 2, B = 3, and A = 4); however, it is very difficult to argue that the "distance" between an F (0 points) and a D (1 point) is "equal to" the distance between a B (3 points) and an A (4 points). For example, the difference between, say, 88 (B – 3 grade points) and 90 (A – 4 grade points) is not the same as the distance between 70 (C – 2 grade points) and 80 (B – 3 grade points). In fact, an entire dissertation was focused on the disparity in the grade of "F" alone when compared to other grades (Gerke, 2007).

For nominal and ordinal numbers there are statistical tests used to describe the data referred to as nonparametric statistics. The measurement techniques available to analyze nominal or ordinal data are known as "nonparametric" techniques, since the dataset does not follow a pre-described distribution. Some common tests used are Chi-square to measure the difference of categorical variables or Spearman rho to determine similarities in data using a rank order correlation.

Categorical data, therefore, are either names given to the subgroups in the dataset (nominal data) or numbers used to represent research concepts that do not necessarily reflect equal distances between identified points (ordinal data). The distance between the numeric values in a dataset is an important distinction for the next type of quantitative data.

Scale Data

The next two types of data that are often part of research projects are included in a category often referred to as *scale* data. Scale data have ordinal characteristics, but are more sophisticated. *Interval* data, the first type of scale data, are those that do have a meaningful distance between the data points, so that differences between arbitrary pairs of measurements can be meaningfully compared. Operations such as addition and subtraction are therefore meaningful, but since the zero point on the scale is arbitrary, operations such as multiplication and division cannot be carried out directly using the numbers generated by the study.

Temperature in degrees Fahrenheit is an example of an interval dataset. The concept of "intelligence quotient" (IQ) provides another example of interval data. IQ is described as a "quotient" because, originally, it represented the ratio between a person's "mental age" and actual chronological age, but IQs are not ratio data since there is no real zero point. The year date in a calendar is another example. Important to remember is that the difference between ordinal and interval data is that the distances between the numbers on the scale are equal for interval data. The equal distance concept is not true for ordinal data. In the mathematical sense the concepts of both "a < b" and "b – a" have meaning for interval data, but there is no real "zero" (no one has zero intelligence, or there is no zero date) and multiplicative operations do not apply (2008 is not twice the year 1004).

The second type of scale data is *ratio* data. Ratio data are the highest level of measurement for research. Ratio data are those numbers that have a set order (ordinal), have a meaningful distance defined between data points (interval), and they provide the opportunity for dividing data into smaller increments in a meaningful way. An additional important characteristic for ratio data is that there is an absolute zero point. The zero value in ratio provides is the opportunity to use fractions, or ratios, in the data manipulation. Ratio datasets have not only equal intervals but also have the characteristic of a null or zero point. Students who have no answers correct on an exam get a zero. Students who have 15 questions correct have half the number correct than those who score 30. This characteristic allows for arithmetic, and therefore statistical, operations to be done appropriately on the dataset. In mathematical terms the concept "a/b" (division) has meaning for ratio data.

Ratio data are the numbers that most educated people have experienced in learning about mathematics, but it is important to recognize when ratio data occur in research. This is to substantiate that the use of appropriate statistical techniques is justified. The subdivisions or smaller increments of ratio data are often seen in decimals, fractions, or percentages. An example of ratio data could be the property tax mill rate (the rate of taxation applied to each $1000 of property valuation) and methods of calculating the tax on property. Physical qualities such as mass, length, or energy are measured on ratio scales. Ten pounds is twice as much as 5 pounds, 5 yards is half the distance of 10 yards, and each scale has a zero point. The different data types can be pictured as steps in the process (Figure 2.2).

Survey Data

In education and social science fields *survey research* is often the quantitative method of choice selected by researchers. Although

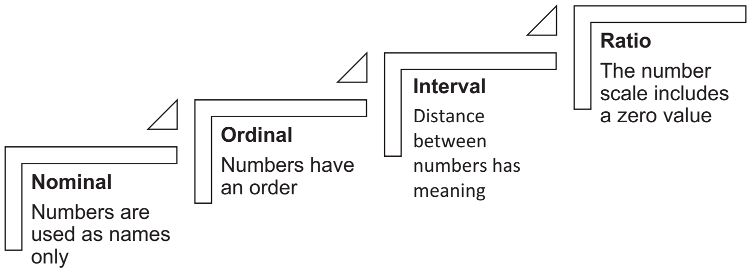

Figure 2.2 Data Number Scales.

some surveys use open-ended questions that allow for textual responses, most use a numerical scale or count specific responses to draw conclusions about the group being studied. An example of the careful use of numbers in research may be found in the use of surveys. There are two basic types of surveys. The first are the polls or status surveys that aim to measure the status quo of a population concerning one or more specified topic or research variable. Polls most often focus on the actual status or facts of a situation. For whom did you vote? Did you purchase an American-made car? The second survey type includes sample surveys aimed to measure the incidence, distribution, or interrelationships of sociological or psychological variables. These surveys focus on the beliefs, motivations, or behaviors of people. The data gathered include facts, opinions, or attitudes.

Surveys are conducted in several ways. The personal interview is a direct contact with the individuals in the research sample using a prepared interview questionnaire or interview schedule. Often factual information like gender, education, income, or age is collected, along with attitudes or opinions. Personal interviews offer the opportunity to ascertain the reasons behind the behavior or opinion. Surveys are also conducted over the telephone, through the mail, and via internet connections.

A specialized survey technique is the panel approach. Often referred to as the Delphi technique, a panel of experts on a subject is asked to respond to an interview or survey and then is re-interviewed or surveyed again following the sharing of the results of the first data collection. The purpose of the second iteration of data collection is to determine whether opinions or attitudes change after the feedback is provided.

When survey results are the research data for any project, it is important to understand the assumptions behind any calculations made from the data. Research that uses surveys to determine attitudes, values, or reactions to situations often includes a numerical rating scale from which respondents select a value that most closely approximates their feeling, attitude, or value. These response items are often called “Likert scales” or “Likert-type scales" after Rensis Likert, the originator of this survey technique (Likert, 1932). The original "Likert scale" had five different points for the response with the middle value being a neutral or zero score. "Likert-type" scales change from this basic design by adding more responses or by eliminating the option for a neutral position on the scale.

A refinement of the Likert scale was created by Osgood et al. (1957). They expanded the scale to seven values, arguing that seven alternatives are used with approximately equal frequency when subjects are asked to respond to a survey or questionnaire. The semantic differential, where seven blank spaces are placed between polar traits and respondents are asked to check the blank that most closely describes their feeling or attitude, is an example of this refinement. Figure 2.3 provides examples of the different Likert-type scales used in current research.

Likert Scale:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Likert-type Scale (After Osgood et al., 1957):

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree

Likert-type Scale (No Zero Term):

1	2	3	4	5	6
Strongly Disagree	Disagree	Mildly Disagree	Mildly Agree	Agree	Strongly Agree

Semantic Differential (Sax, 1968):

Disagree _____: _____: _____: _____: _____: _____: _____ Agree

Figure 2.3 Survey Response Scales.

Statistics that are used to test hypotheses, or to draw conclusions about the data, are directly dependent upon the type of numerical data available from the research. Statistics are, after all, mathematical manipulations of the research data using proscribed formulae. Nominal data are not subject to any of the parametric statistical or quantitative techniques. If the data have order, but not necessarily equal intervals, there are specific measurement formulae that a researcher may use to test the strength of the relationship uncovered. These are often referred to as *nonparametric* statistics.

Recall that a parameter is a true value of a population. It is a value that can be "calculated" from a sample and therefore depends on having the right kinds of numbers (interval at least). Nonparametric measures are used when the information is in the form of nominal or ordinal data – frequency counts, for instance. Examples of data that are subject to the nonparametric approach include things such as tallying the number of responses selected in a certain category of response or counting the number of people in a certain research category. When nominal data take on two different values (e.g., 0 or 1), they are referred to as dichotomous. Dichotomous data are subject to nonparametric statistical testing as well.

Data derived from survey research done as a component of a quantitative study are often assumed to be interval data. While the real distance between words like "highly satisfied" and "satisfied" and words like "unsatisfied" and "neutral" may not be equal, that assumption is made so that parametric statistics (measurements from specific formulae that describe aspects of the research population that can be computed from the research data – the average number, for instance) may be used for the analysis of the data. More will be said regarding assumptions about research populations and samples, the type of data derived from research, and the matching of statistical procedures to the data in Chapter 13 under Step 7.

Qualitative Data

Research traditions consider qualitative data to be any information collected that is not numerical in nature. Textual data are often the basis for qualitative inquiry including interview results, observations and field notes, existing documents, or other sources. As mentioned above, qualitative research may combine data types, and use different research methods, to reach conclusions regarding the phenomenon or issue under study. Each of the different methods of inquiry in qualitative research uses pre-established techniques for collecting empirical data.

These data are sometimes referred to simply as "information" or as "empirical materials" to differentiate the non-numeric, textual data from quantitative data. The techniques include surveys, interviews, observational techniques such as participant observation and fieldwork, archival analysis, and historical record review. Written data sources may include published and unpublished documents, company files, memos, letters, reports, email messages, faxes, newspaper articles, and transcriptions of meetings or interviews.

Interviews and Focus Groups

The primary method of collecting qualitative data among researchers is via interviews and focus groups. Interviews are typically conducted in an individual, face-to-face format, although interviews may also be conducted via telephone or telepresence. Some benefits to conducting one-on-one interviews include the ability of the researcher to control the line of questioning, and the format leads to a deeper level of responses and insightful follow-up. Some of the challenges associated with interviewing include response bias, lack of access to the research participants, and lack of standardized measurement.

Focus groups are another type of interview strategy that involve interviewing multiple people at the same time. Participants in a focus group often share a common characteristic, and the goal is often to identify areas of agreement and disagreement among participants. The benefits of focus groups include the ability of the researcher to gather data from multiple participants in a cost- and time-saving manner. In addition, the interaction that occurs between and among participants in a focus group setting often results in rich and authentic responses. This method is not free of challenges. If group dynamics are negative, or if *group think* occurs, the data may not be reliable. Focus groups are most effective when they are not the only data source, but rather an additional data source that can be triangulated with quantitative or other qualitative data.

Observation

Participant observation is another qualitative tool used by researchers in a variety of fields, particularly education. Through observation, researchers can collect information about people, processes, and cultures. Researchers conducting studies in schools often conduct classroom observations as a means of capturing participants in their natural setting and making observations about their behaviors, interactions, and activities. Observations can be beneficial because they give the researcher inside information about what happens in the natural environment, but it also has drawbacks. In order for observation to be successful, the researcher needs to establish rapport with community members so as to be trusted to observe the environment. Without trust, the data gathered from the observation may be tainted or biased.

Document Review

Document review is a qualitative way of collecting data by reviewing existing documents. Document review is often used in case study methodology, as one point of data collection. Document review is also a helpful tool for researchers or practitioners who conduct program evaluations. Documents are often important to review in case studies and program evaluations because they provide insight into the organization of the case site, and help the researcher understand the history and philosophy of the institution, program, business, etc. Some common documents that are typically included in a document review are organizational handbooks, charters, assessment reports, newsletters, marketing materials, and even human resource files. Prior to conducting a document review, it is important to obtain permission to access and review documents as part of a research study. In addition, it is critical that documents used in a document review are kept secure and confidential.

Many researchers struggle with determining what to observe and what to note when conducting observations. Therefore, many researchers develop observation rubrics to guide the observation period, and to help the researcher capture the important information observed in a systematic way. Observation rubrics are often grounded in the theoretical framework guiding the study, and help the researcher organize observations by topic areas. For example, a simple google search will result in hundreds of classroom observation rubrics, each personalized to the setting being observed, and each grounded in a theoretical or conceptual base.

Qualitative Data Sources

In the collection of qualitative data, it is a common practice to distinguish between primary and secondary sources of materials or information. Generally speaking, primary sources are those that are unpublished and that the researcher has gathered from the people, participants, or organization directly. Secondary sources are materials that have been previously published, including books, referred articles, or other organizational documents. Both sources provide legitimate information for analysis in a research project.

In a case study, for example, the researcher may use field notes, interviews, or documentary materials collected on-site as primary sources. The researcher may or may not be at the site as a participant-observer, who gathers original information, but may rely on others for the primary documentation. Then secondary sources may be published documents that help to describe the case in a larger context, published research of a similar nature, or other manuscripts. The distinguishing feature of most ethnography as a qualitative method, however, is that the researcher spends a significant amount of time in the field. In many cases the researcher is a participant-observer.

The fieldwork notes and the experience of living there as both a participant and an observer become an important addition to any other information or materials that may be used as research data. Good discussions of qualitative techniques for data collection may be found in several of the references listed in the Annotated Bibliography in Chapter 20 under the section on Qualitative Research.

Once materials or information that will become the grist for the research mill are collected, there are specific strategies and tools available for the researcher to use in the analysis phase. Often categories of information are established, and the researcher selects criteria or rules for category membership from the data that are relevant and important. The information or events under scrutiny may be ordered chronologically, or based on frequency of occurrence, or on the importance given to a specified criterion. The researcher should be able to articulate abstract relationships between existing categories of information and compare specific abstract and concrete features of two items from the information.

The organization of qualitative data is used to compare different sources of information for the same topic in terms of basic similarities and differences. The data are used to identify the abstract relationships that form the basis for analogies. This often includes the comparison of multiple items on multiple abstract characteristics. The researcher identifies abstract patterns of similarities and differences between information on the same topic but from different sources and may identify important relationships between seemingly unrelated items. The researcher seeks out traits that may be used to order and classify items. Again, both textual and numerical data are important to the qualitative researcher.

Summary

Inquiry is seeking out information regarding a specific topic. Research is organizing the inquiry in a formal investigation to drawn some conclusions about the topic and to add new ideas or concepts pertinent to the topic. The information derived from the examination or experimentation planned in the research is the research data. Research data comprise, first, two basic types. The data are either numbers or words. The analysis of the data follows pre-designed steps depending on the type of data used. Often numbers are used to depict the words that define the concept or phenomenon being studied. Those numbers are considered nominal if they stand for a name of an object or descriptor. The numbers are ordinal if they follow a distinct order.

Numerical data are interval if the distance between the measurements has an equal value, and the numbers are considered ratio numbers if the dataset has an absolute zero. Statistical manipulations that are applied to all of the different types of data must take into account the type of numbers in the dataset. Chapter 13 provides direction as to the selection of the right measurements for each type of data.

Textual data also need careful analysis. While not statistical, analysis of qualitative data has specific procedures as well.

Chapter 13 also provides direction as to the use of qualitative data in a research project.

Resources

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In-class Exercises

1. In small groups have students create a list of basic population parameters and give statistics that describe or approximate the parameters.
2. Pair students and have them identify a research topic; then name the variables or constructs that may be included in the research design. Discuss possible ways of collecting data to learn more about the research topic.

Discussion Items

1. How could a participant-observer be responsible for bias in a research project?
2. Give examples of nominal variables that are not ordinal, and ordinal variables that are not interval.

Assignments

1. Create additional descriptors for a Likert scale other than agree–disagree. Consider the variation of the scale (e.g., 1–4, 1–7, 1–10) and discuss how variation in scales potentially influences results.
2. Describe the purpose of not having a middle value on a Likert-type scale.
3. Research and discuss the derivation of the normal probability curve. Why is it important to test for normality in a quantitative research study?

3 Common Uses of Research

The basic purposes of research as inquiry are to interpret a theory, describe or explore a phenomenon, evaluate or test an idea, explain a concept or event, or evaluate some circumstance. The research methodologies outlined earlier are often combined in a project that requires different types of data or that leads to different types of interpretations. Three common expressions of this combination of method or use of research are action research, research done for formal theses or dissertations, and research carried out for program assessment and improvement. While none of these is a particular method, program assessment, the direction of an action research project, or the writing of a thesis or dissertation may be mapped by a specific research technique, or more frequently, by a cogent design of mixed methods. Many dissertations, in fact, are now based on an action research model, although many of the descriptions of action research refer to it as a group or collaborative process, not as an individual event.

Action research may be at the base of the third basic use of research, which is the evaluation and improvement of programs. Research for program assessment is planned and carried out in various ways in order to arrive at the desired end. Research for the purpose of assessment helps the researcher and project colleagues make informed, data-based decisions about changes necessary for improvement. Whether it is using existing research or carrying out research on their own, decisions made based on research have the best chance of succeeding. The context of the research is important to consider in the planning and organization stage of the research process. Context refers to the situation or circumstances that form the background or setting of the project. Research contexts may be thought of as historical foundations, social settings, cultural factors, or linguistic interpretations or meanings.

Historical, Social, Cultural, and Linguistic Contexts

Research does not take place in a vacuum. Researchers need to be aware of the circumstances or surroundings of the project, and plan to control those situations, or be able to explain how the context is important to the process and findings. Current dissertation research focuses, for the most part, on historical, social, cultural, or linguistic contexts.

Historical research is an attempt to describe and interpret events from the past in current terms. The context for historical research is the period of time under scrutiny and the behaviors witnessed and recorded during that time. The context of slavery, for example, gives meaning to the study of causes of the civil war in America.

Social research has a firm foundation in the social sciences. The social context of research most often includes a study of the settings and behaviors of individuals or groups. The social context may be further delineated through specific approaches in areas like policy, government, economics, welfare, living conditions, or other human conditions. The prevalence of free and reduced lunches in schools may be a context for the study of poverty, for example.

The cultural context of a research project is a realization that people live their lives uniquely and, in some cases, differently from others based on their background and surroundings. Individual beliefs, customs, ideals, religion, ethnicity, location, or other societal characteristics are components of the cultural context of research. Studying the eating habits of indigenous populations is an example of looking into the cultural context of that population.

The linguistic context for research is focused on the nuances of communication. Both reading and hearing, and understanding what is encoded and transmitted by one individual, and how that transmission is received or interpreted by another, form the context of linguistic research studies that center on second-language acquisition in students are in the linguistic context of research.

Action Research

Action research is inquiry or research that deals with issues or problems that exist in a workplace that need attention. It is research focused on the effort to improve the quality of an individual's performance, or the performance of an agency or organization. Action research has been called "practice-as-inquiry" and it is broadly accepted that there is no singular and unique format for action research. Collectively, projects called action research are those that are designed and carried out by practitioners who identify the problem, collect and analyze data, and use the collected information to make data-driven decisions to improve their own practice or to improve working conditions. Individuals can conduct action research, but it is a term most often applied to work done by teams of colleagues. This team approach is also known as "collaborative inquiry."

Kurt Lewin is generally considered the father of action research. A social and experimental psychologist, he used group processes for addressing issues and problems within organizations. Lewin first coined the term *action research* in 1946. He characterized it as comparative research using a process of steps that included planning, action, and fact-finding. Action research is used in real situations rather than in controlled experimental studies, since its primary focus is on solving real problems or issues in the workplace. As mentioned above, it is in action research that different methods of discovery may be blended.

Blended, or mixed-model research, means that quantitative and qualitative designs, methods, techniques, or other paradigm characteristics may be mixed in one overall research project. There may be a combination of survey responses and interview results. The survey data may be subjected to a quantitative statistical analysis, and the interview data may be analyzed through accepted ethnographic techniques. Then the results are reviewed from both perspectives to determine alignment and to draw conclusions.

The basic steps in an action research project begin with identifying a problem or issue that needs resolution, or selecting an action or behavior that needs testing. Planned change is introduced into the system; that is, *action* is taken, and the researcher carefully monitors the results of that change. Adjustments in the plans may be made – that is, further *action* may be taken – based on an analysis of the progress being made while carrying out the research. Summary judgments are made after the project is completed regarding the success of the project and the potential for further development or implementation. Action research has been recommended to teachers in the classroom setting as a valuable tool to use to experiment with ideas that may lead to better student learning.

Thesis and Dissertation Research

Thesis and dissertation research is the learning-by-doing approach. Students are led through a research project by an academic advisor, or a committee of advisors, and the several stages in the research process are monitored carefully. Typically, students take a sequence of research courses before they begin writing their research proposal. There is no single research method applied to theses or dissertations. When a student identifies an issue area, the theoretical model that provides the foundation for the research most often dictates the research methodology to be used.

Clearly, students doing research in the hard sciences will use the scientific method or some carefully planned variation of that model. Students collecting quantifiable data will look for advice on how to use statistics to help interpret the data. Those who choose questions that lead to narrative data will choose the qualitative approach to analysis. Many students choose to carry out a mixed methods study because they are able to collect both qualitative and quantitative data to help answer their research questions.

Most dissertations use a five-chapter format that includes the basic research stages. The first chapter serves as a roadmap to the entire project and it is usually the introduction to the problem or issue. Chapter 1 in a dissertation provides the reader with a clear sense of what the study hoped to accomplish, the context of the study (where it takes place), and the connection of the study to previous research or theory. It provides a roadmap to the entire dissertation and will include the following:

- An *introduction* that provides background of the problem being investigated which is supported by literature.
- A *contextual orientation* that is a very brief description of the setting of the issue or problem being studied.
- A *problem statement* that clearly describes the problem being investigated in the study, how pervasive the problem is, how the problem has been addressed by previous research, and identifies a gap in the literature that the research study will fill. The problem statement should be grounded in literature, clear, concise, and written in reader-friendly language that is connected to the theory behind the study.
- The *research questions* (hypotheses) designed to frame the study, and that are linked to the theory and to the research problem or issue.
- A *theoretical or conceptual model* that is a description of the interrelationships of the variables or groups being studied, and which may include a graphic representation of this relationship.
- The *significance* of the study that may anticipate some potential findings, which may be practical and/or theoretical in nature.
- *Definitions* of terms used throughout the dissertation that may have a meaning unique to the research being done.
- Any *limitations* that may have an impact upon the use of the literature or upon the methodology should be explained in this chapter.

The second chapter in most traditional dissertations is the review of the literature. In many cases this may be the longest chapter of the five. Part of the responsibility of the researcher is to find, review, cite, and give appropriate credit to previous researchers who published their work. It is the place for the dissertator to deduce the question that will be studied in the research project from earlier work. The literature review should build on the problem or issue that was studied in the research. To write this chapter a researcher must:

- Find and *read* the most salient works in the field of study.
- Develop and present a *literature map* that shows the key areas of literature which will be covered in the literature review, as well as the relationships between and among research concepts.
- *Summarize* the connection to the broader theory and the authors' findings, conclusions, or recommendations.
- Create a *coherent outline* of the several authors connected by the research theme or variables.

- Use *advanced organizers* to help with the organization of the authors by topic or sub-topic.
- Be sure to *treat both sides* of issues if there are opposing views in the literature related to the topic being studied.
- Include a review of *methodological literature* as well to let the reader know that the method used was the best one for the study.
- Identify how the research *expands or confirms* previous work.

The third chapter in a dissertation contains the methodology of the study. While often brief and to the point, the methodology chapter details the design of the research and the plan that the researcher intends to follow in carrying out the project. It is mostly about the data – the sources, the collection strategies, the management, and the analysis. The basic format for the methodology chapter is as follows:

- A review of the formal statement of the research problem or issue, followed by a discussion of the basic questions or hypotheses under study.
- Clear definitions of terms used in the research, especially the terms that label the variables (in quantitative studies) or concepts/constructs/elements (in qualitative studies) examined or explored in the study.
- An orientation to the type of research used, often embedded in a discussion of the research paradigm.
- A rationale for selecting the research method(s) used to collect and analyze data.
- Identification of the data sources, especially the population and sample (participants or subjects) that are the object of the study.
- A description of the strategy used for the collection and management of the data; that is, the protocol for gathering the information needed to answer the research questions. This may include the survey design, interview protocol, document review strategy, observation strategy, etc.
- A description of the procedure used for analysis of the data.
- Any conditions or limitations that may affect the interpretation of the information collected.

The fourth chapter in a dissertation is the display of the data in summary form. Tables, charts, figures, or other devices are used to gather together the information collected and explain it to the reader. Usually data are organized to respond to separate basic questions or hypotheses, which provide an organizational tool for the chapter. Unanticipated or incidental results should also be considered and reported. Data displays should be complete and self-explanatory so that reference to the text is minimal. The usual procedure for data displays in this chapter is to introduce the table, present the table, and then to discuss the salient features of the data in the table.

The final, fifth chapter in a dissertation is the discussion of the information presented in summary form in the fourth chapter, along with conclusions which the researcher may be able to logically draw from the data. These conclusions or implications should consider each of the research questions in an orderly way. There may be the need to discuss the unanticipated results that may not be directly related to the basic questions, but are, nonetheless, an important result of the research. Finally, the researcher may want to make suggestions for further research to carry on what has been started, or to delve into an area only touched on by the dissertation research.

Research for Program Evaluation and Improvement

Program evaluations are common research projects initiated by practitioners. Many dissertators choose to conduct program evaluations as their primary research focus. Program evaluations often call for a mixed-methods approach as a means of gathering a variety of information about the effectiveness of the program. Multiple data sources are used when examining whether or not a program has been successful. Often, funding decisions are made based on the results of program evaluation, so the collection and analysis of the data upon which decisions are made should be organized according to strict research techniques. The same is true for analysis and appraisal done of existing programs for the purpose of change and improvement. Recently the concepts of action research as described above were used in the assessment of program strengths and weaknesses, and the results of those projects are the basis for change decisions.

When doing research for program change or improvement, a researcher often uses the concept of "triangulation" to assure that the results are accurate. In the social sciences, triangulation is often used to indicate that more than one method was used in a study with a view to double-checking results or getting the same result from different viewpoints. This is sometimes referred to as "cross examination." The idea is that one can be more confident with a result if different methods of analysis, or different sets of data, lead to the same result.

When all is said and done, all research comes down to asking the right questions, identifying the proper information or data to respond to those questions, collecting those data, analyzing those data, and drawing conclusions or making recommendations based on the analysis. The brief descriptions of the foundation of research and the different methodologies contained in Chapter 1 were to provide general knowledge for all those interested in reading or doing research. Readers are encouraged to visit some of the references in the Annotated Bibliography if more depth in any one topic is desired.

Summary

In the end, there are a variety of techniques to get a researcher to the end of a research project, but they should all consider the same basic components. Those components include the following:

- Understand and be conversant with a *theory* that invites research; that is, define and understand the theoretical basis for the project.
- Read and digest the *literature* that forms the theory; that is, find out what other researchers have done that provides the opportunity for new research.
- Ask *basic research questions*; that is, state a problem, isolate an issue, or write specific hypotheses to be analyzed.
- Recognize the *research variables*; that is, identify the things in the project that may or will change, or that will cause change to occur (make things *vary*).
- *Operationalize* the theoretical concepts; that is, find a way to empirically measure the variables.
- Identify *data sources* in terms of the research variables; that is, find the location of the information that will allow the researcher to draw conclusions about the project.
- Create a *research design*; that is, structure the project to collect and analyze information that will help solve the problem, answer the questions, or lead to conclusions about the hypotheses.
- *Collect the data*; that is, implement the research plan to gather information that may be used to answer the research questions.
- Ensure the *reliability* and *validity* of the measures.
- *Analyze the data*; that is, apply standard research tests or appraisal methods to the information collected.
- *Draw conclusions* about the data; that is, identify what the data document about the results of the project.
- *Report the research findings*; that is, describe the project in writing using an accepted framework for research reports.

Resources

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In-class Exercises

1. Have students in groups identify a program evaluation need and outline how information could be gathered to do a program evaluation.
2. Using student test scores as a variable in a research project pair students and have them identify ways to triangulate the test data.
3. Break students into groups of three to four and ask them to share practical problems that could be answered by research. In the process, ask each student to identify three dissertation topic ideas and preferences for collecting data (e.g., I like talking with people (qualitative); I would prefer to gather information via a survey (quantitative); I like both methods (mixed)).

Discussion Items

1. Discuss the different ways of finding research literature to provide a background to a new project.
2. Differentiate the several chapters of a dissertation and the reason for each chapter.

Assignments

1. Describe why it is important to read the literature in the conceptual area before you design a specific research question.
2. Create an action research project from your home, school, or job. Define the researchable problem that could be addressed through action research.

4 The Value of Research

As provided as a premise to this book, inquiry as a human endeavor is seeking truth by searching for information through gathering evidence to prove a point, solve a problem, answer a question, or explain a circumstance. Inquiry is important and valuable as a way to increase knowledge and improve personal and professional situations. Research is carefully planned and organized inquiry completed using commonly accepted techniques in a diligent and systematic fashion. The successful practitioner in education or social science settings must be able to visualize, to plan, to conduct, to consume, and to analyze critically research done in many places and completed in a variety of ways. Research concepts and methods that are explored here should be applied to current issues and important problems in local and specific settings.

It is essential that researchers read and critique research articles through the lens of applicability. The rubber meets the road when the theory is applied to practice. Situations that need exploration or issues that need to be resolved should be viewed from a broad range of research perspectives. Not one method fits all circumstances, and not one model fits all phenomena. Research techniques in the broad range should be applied to policies, practices, and problems in the workplace in order for a solid understanding of the value of research to be realized.

This chapter is intended to lay the foundation of research to help readers begin to recognize and understand the value of research and its broad-reaching utility. It begins with the basic philosophical designs and constructs that serve as a foundation for research endeavors. Often the philosophical is overlooked and the practical is emphasized. It is important that readers recognize not only their own philosophy as it applies to their life and life's work, but also that of the writers whose work is being consumed. Researchers do not often delineate their philosophical basis used in their investigations when they do their publications, but a careful reading of those reports can often put the research into one of the basic philosophical traditions: Is it scientific? Is it pragmatic? Does the humanism show? Then the reader must determine whether or not the philosophy fits the situation or circumstance where the research may be applied.

It is crucial that consumers find the right sources of research to both help understand a concept and to make judgments about program improvement, then judge the value of the research results and apply the research findings to their own situation, and, finally, to have confidence that any changes recommended or implemented would be data-driven and research-based, resulting in true program improvement. Using database sources, reading research abstracts to glean necessary and important information, understanding the design or structure of the research, judging the reliability and validity of the research process, and determining research significance are the components that consumers need to know and are the major subjects of this chapter.

Research Theories and Philosophies

What is research? The word *research* derives from French, and its literal meaning is "to investigate thoroughly." Research is often described as an active, studious, and systematic process of inquiry or examination aimed at discovering, interpreting, and revising facts. It is an investigation that results in a greater understanding of phenomena in the world, such as events, behaviors, or theory. The American Educational Research Association (AERA) defines research in education as follows:

> Education research is the scientific field of study that examines education and learning processes and the human attributes, interactions, organizations, and institutions that shape educational outcomes. Scholarship in the field seeks to describe, understand, and explain how learning takes place throughout a person's life and how formal and informal contexts of education affect all forms of learning. Education research embraces the full spectrum of rigorous methods appropriate to the questions being asked and also drives the development of new tools and methods.
>
> (AERA, 2015)

The intent of doing or consuming research in many cases is to make informed or wise decisions for practical applications of the research results. While it is usually associated with science and the scientific method, the term *research* is also used to describe the studious collection of information about a particular subject. To understand research as a human endeavor, a reader must first have an understanding of the philosophical bases of inquiry, and the research types that fit each of those bases.

Philosophy is a basic mental exercise that creates and organizes theories. Philosophical theories are aimed at some kind of understanding, knowledge, or wisdom. Descartes (1637) is famous for his meditations on the human mind. His Latin phrase "*dubito, ergo cognito, ergo sum*" roughly translated as "I doubt, therefore I think, therefore I am" provides a basis for philosophical thinking. Current philosophical thinking as represented by the work of Jürgen Habermas (2003, 2008) has a focus on a rational understanding of human nature based on describing new knowledge about the world. According to Habermas, "Philosophy can enlighten us regarding an illusory self-conception by making us aware of the meaning that an increase in knowledge about the world has for us . . . thinking is dependent on scientific progress and new, culturally available perspectives on the world" (Foessel, 2015).

Philosophy is thinking – it is meditation that focuses on foundational concepts of human cognitive activity such as reality, value, meaning, existence, causality, or truth. All cultures have their own unique schools, or theories, of philosophy and these theories have grown from widely different propositions and approaches. Some of the basic theories of the different philosophical foundations include the rational or logical approach, empiricism, leaps of faith or hope, or the inheritance of philosophical customs. The study of philosophy is most often separated into five to eight or more unique categories. Metaphysics, for example, is the study of existence and ethics is the study of action. Philosophical foundations in research begin with the component that is devoted to the study of knowledge itself: epistemology.

Epistemology is a branch of philosophy that is the study of knowledge. It is devoted to the investigation of the nature, origin, basic foundations, validity, and scope of knowledge. Historically, epistemology has been one of the most investigated and debated of all philosophical subjects, and the debate has focused on analyzing the nature and variety of knowledge and how it relates to similar notions such as truth and belief. Much of this discussion concerns justification. Justification is an explanation that includes sharing facts or circumstances that demonstrate the accuracy or reasonableness of a concept being questioned. For example, "the students' behavior was justification for the imposition of specific sanctions." The concept of justification is often viewed with a focus on propositional knowledge. In logic a proposition is a statement which expresses an opinion that can either be affirmed or denied. "All children can learn" is an example of a proposition. Research propositions are stated clearly, and then analyzed to determine whether the knowledge stated is accurate. Specifically, epistemology analyzes the grounds on which one can claim to know a particular fact.

Not surprisingly, the way in which knowledge claims are justified depends on the general approach to the philosophy one selects. Thus, philosophers have developed a range of epistemological theories to accompany their general philosophical positions. Some of these epistemological theories that are well known to the general public, for the most part, include rationalism, realism, idealism, pragmatism, and relativism. Each of these theories is built upon a set of propositions or premises that must be accepted as "true" in order for the knowledge in that theory to be built. In brief, these epistemological theories are broadly defined as follows:

- *Rationalism* is the school of thought in philosophy that appeals to reason as a source of knowledge. In more technical terms it is a deductive method where the criterion of the truth is not sensory but intellectual. It is a feeling that reason has precedence over other ways of acquiring knowledge. Epistemological, and therefore philosophical, arguments in rationalism are often stated as syllogisms. One famous example of a syllogism from Aristotle is "All men are mortal. Socrates is a man. Therefore, Socrates is mortal."
- *Realism* in philosophy is the study of existence or being that is considered independent of conceptual schemes, linguistic patterns, or beliefs. Realists tend to believe that current thinking is only an approximation of reality and that every new observation brings one closer to understanding reality. Concepts such as numbers or shapes in the abstract are universal examples of realist thinking. The number "two "exists as an abstraction to a realist, as does a sphere. They become concrete when applied to real objects – two fish or twins; the globe or a soccer ball.
- *Idealism* is the doctrine that thought (a person's ideas) makes up any complete reality. There is a skepticism of actually "knowing" anything that is independent of the human mind. Therefore, a world of material objects containing no thought either could not exist as it is experienced, or it would not be fully "real." Idealism asserts that minds are aware of or perceive only their own ideas, and not external objects. Idealism has a spiritual context where external objects are considered abstractions; that is, things in themselves cannot be known since they are only a mental image. For example, justice as an ideal concept may be thought of as an abstraction (ideal) of the real behavior of people.
- *Relativism* is the idea that some element or aspect of experience is not permanently fixed, but rather dependent on or related to some other element or aspect. It is a conviction that humans can understand and evaluate beliefs and behaviors only in terms of context since there are no absolute truths. Rewards or sanctions for children, for example, may be relative to age. What is a positive reward for an undergraduate student may not be seen in the same light by a graduate student. A sanction for students in primary school may not have the same effect for high schoolers.
- *Empiricism* is another of the many epistemological theories that exist in the broad range of philosophical thought. For

> research, empiricism is the philosophical doctrine of observation and experience. In recent iterations it has taken on the more specific meaning that all human knowledge ultimately comes from the senses and from experience. Empiricism is generally regarded as the heart of the modern scientific method. It requires that theories should be created based on testing and observation of the world, rather than on intuition or faith. Empirical research based on inductive reasoning, rather than on pure deductive logic, is the path to truth in this category of philosophy.

The logical chain here is that there must be a philosophical base to the research design. The basis for research is derived from the epistemological branch of philosophy, the one that studies the nature of knowledge. Within the epistemological branch of philosophy, most of the work that is deemed "research" is completed under the rubric of the empirical theory – emphasizing testing, or observation and analysis.

Empirical Research

The term *empiricism* is used to describe a number of distinct philosophical attitudes, practices, and propositions. Empiricism refers to an emphasis on those aspects of scientific knowledge that are closely related to experience, especially as formed through deliberate experimental arrangements. Empirical research may then be further divided within the empirical theory into several camps that support their own techniques or methods. The major camps in this regard include positivism, post-positivism, phenomenology, and constructivism. Each of these may be subject to subdivision as well. Constructivism philosophy, for example, has been separated into the areas of social, cultural, radical, or critical constructivism.

Nearly every modern discussion of the theory and philosophy of research, at least in education if not in other fields, begins with the work of John Dewey (1929, 1938), among others. Philosophies that influence research have grown since the time of Dewey and basic theories have been subdivided into more precise and focused subcategories of the traditional philosophies. The discussion that follows is an attempt to scratch the surface only of the basic schools of thought regarding research, and to provide a foundation for researchers and consumers of research as to the philosophical bases for what is written in research reports and articles. The next several sections provide a basic outline of the *empirical* philosophies that helped form the different theories of research, followed by a discussion of the different basic types of research. Once again, the reader is reminded that this is a brief overview of the philosophies and theories. Further reading is encouraged to gain a broader understanding of one or more of the theories, and the texts selected for the Annotated Bibliography in Chapter 20 will help in this process.

Positivism

At one time the strict scientific method of research ruled the day, and the scientific tradition as outlined in Chapter 1 was the only accepted method of research. All research flowed from a process that was rational and scientific. The researcher was a neutral observer and recorder of the process and results. This was referred to as the "positivist" way of thinking, meaning that the conditions and results of the research had to be "absolute" in the accuracy of the findings (e.g., the question "Are you sure that's right?" and the response "I've done the research and I'm positive!").

The goal of research from the positivist philosophy is to generate knowledge from research that may be used to describe experiences and phenomena, or to create new theories out of the research results. Positivism holds that the purpose of science is simply to stick to what may be observed and measured. Knowledge of anything beyond that, a positivist would hold, is impossible. In a positivist view of the world, science was seen as the way to get at truth, to understand the world well enough so that it might be predicted and controlled. The adherence to the scientific method by the federal government for programs in education represents the positivist viewpoint.

Post-positivism

John Dewey, among others, helped move forward a new approach to research that questioned the cumulative growth of scientific knowledge. These critics of the positivist philosophy felt that knowledge could not be value-free, or neutral, which was the basis of the positivist approach. This train of thought was labeled the "post-positivist" movement. Still part of the empirical theory, post-positivism is, as the prefix indicates, a theoretical position that followed and more or less grew out of the positivist approach. Some would argue that post-positivism was created as a drastic rejection of the positivistic, scientific approach. But in reality, post-positivists recognized the impossibility of ensuring laboratory conditions for research in the real world, and especially research with humans and human endeavors. So it is more of an extension of the controlled and objective scientific way of doing research rather than an argument against science as research.

In the social sciences, post-positivism is used to refer to scholars who do not believe it is possible for researchers to view life from an objective point of view. Post-positivist scholars recognize the importance of context, including language and culture, when dealing with research decisions. Post-positivism is a belief that theory both shapes reality and follows it. For the post-positivist, the truth of science pertains to the study and description of phenomena as they are found in the real world.

Since the tenets of post positivist thought suggest that different types of error may be present in the study of any observed occurrence, researchers use multiple measures and recognize the need for triangulation from different sources to substantiate findings. Research methods vary based on how the research question is posed.

Phenomenology

At the extreme of thought, there are those researchers who look only at what is presented to them in conscious experience as a way to the truth. Phenomena are studied in their context, and sometimes the researcher is part of that context. This theory is called "phenomenology." It is a branch of empirical philosophy and a method of inquiry that takes the intuitive experience of phenomena and tries to extract the essence of that subjective experience. Sense experiences – what the researcher heard, saw, or felt – become an important part of the "data" for phenomenology, and these experiences are reported along with the results of interviews or questionnaires used to make observations or gather attitudes. Phenomenologists tend to hold that inquiry should focus on what may be called "encountering" as it is directed at objects and upon "objects as they are encountered" (Center for Advanced Research in Phenomenology, 2006). While some would argue that all of qualitative research is phenomenological in nature (e.g., Imel et al., 2002), the commonly accepted research behavior for phenomenology is to understand and explain an experience without reference to the question of whether that which has been experienced is objectively "real" or "true."

Constructivism

Constructivism is a research theory at the opposite end of phenomenology. It originated in sociology under the term "social constructionism" and has been given the name "constructivism" when referring to it as a philosophy or research type. Constructivists view all knowledge as "constructed," because it does not reflect any external realities, but rather is contingent upon convention, human perception, and social experience. Individuals construct their own understanding of the world through experience and reflection. It is believed by constructivists that representations of physical and biological reality, including race, sexuality, and gender, are socially designed and developed. The common thread for all forms of constructivism is that they focus on the constructed reality rather than merely the nature of being or existence as the phenomenologists do. A special focus of constructivism theory is the study of how people learn, grounded in observation and experimentation.

Pragmatism

Pragmatism is a philosophic school that considers the practical point of view and consequences, or real effects, of thinking to be vital components of both truth and meaning. It is more concerned with common sense and practical results than with theories and principles. Perhaps the best example of pragmatism in education comes from the work of John Dewey (1916). The purpose of education for Dewey was to improve the quality of life by modifying experience based on human needs. Pragmatism in education has a focus on improving classroom practice by making learning meaningful, and it inspires experimentation to provide a sense of reality for students.

Advocacy/Participatory

An advocacy/participatory research worldview posits that research should be intertwined with politics or a political agenda, and that the aim of research is to promote change for groups who are underrepresented, oppressed, or voiceless. Researchers who pursue topics related to feminism, race, disability, and sexual orientation focus on marginalization and power structures. Qualitative methods are primarily embraced by researchers who embrace an advocacy/participatory worldview because participants are actively involved as collaborators in the research process. Advocacy in education has a focus of critically examining the environment, leadership practices, classroom climate, and culture of the school to be inclusive of community members of all backgrounds.

Figure 4.1 traces the conceptualization of thought from the broad realm of philosophy through that portion of philosophy devoted to the study of knowledge, studied through observation or experiment with one of four possible viewpoints: positivism, post-positive, constructivist, or phenomenological.

Summary

Philosophy is the discipline of thought. When the thought process is focused on new and existing knowledge the term used to describe that philosophical tradition is epistemology. Epistemology is studying knowledge. When that study of knowledge uses observation or experience to describe the topic or phenomenon being studied it is called empirical study. Empirical studies are structured to test theory or verify ideas. Finally, there are different schools of thought under the empirical banner that provide direction as to how to do the research.

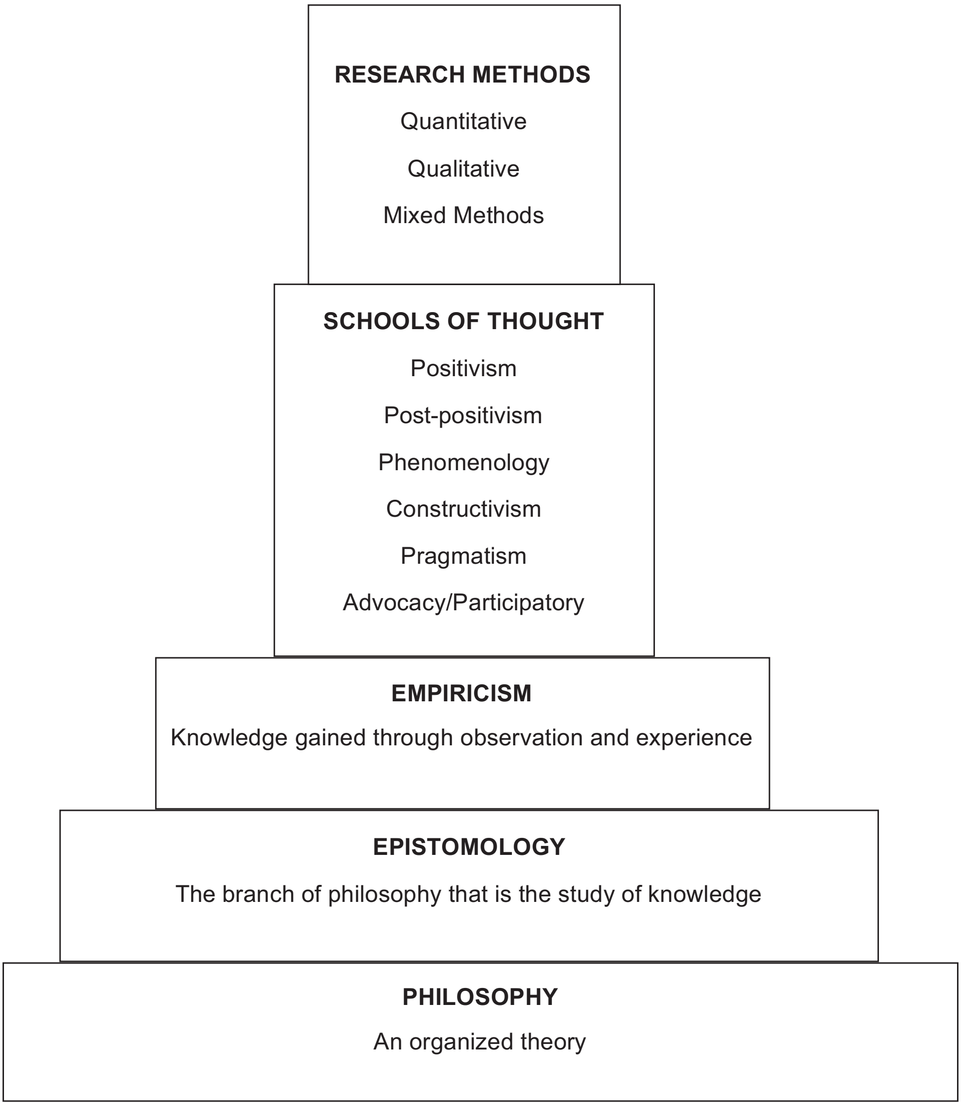

Figure 4.1 Organized Inquiry: From Philosophy to Research in Education.

As mentioned at the beginning of this chapter, most published research does not go into a deep philosophical discussion regarding whether the research has a positivistic or constructionist point of view, but readers should be comfortable with their own sense of the world and their own beliefs as to how research can contribute to their work and lives. Another basis for reviewing research works is to know about the different types of research, how they are organized, and how they are carried out in an appropriate way. The next chapter covers some of those structural elements for research, including qualitative, quantitative, and a combination of the two called mixed methods.

Resources

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In-class Exercises

1. Pair two of the basic philosophies (e.g., idealism and realism, or pragmatism and rationalism), Create student groups and ask students to compare and contrast and give examples.

2. Pair students and ask them to describe something they may have witnessed as a phenomenological experience. What did you see and how can you explain it? Report to the class.

Discussion Items

1. How did post-positivism grow out of the positivist tradition?
2. What professional literature do you read? Is it research-based?
3. What is empirical research and why is it important?

Assignments

1. Write two logical syllogisms.
2. Write a paragraph that describes your own professional philosophy.

5 The Structure of Research

While research reports may not speak to the philosophical undertones of the work, they often do include a reference to the type of research or research genre that has been used. There are separate categories or distinct divisions regarding how the research is classified, or how it is organized and moved forward. Readers need a basic understanding of where a particular piece of research fits into the broader context of all research in order to begin to understand and accept the conclusions derived. The words most often used to describe different types of research that are discussed here include empirical research, qualitative research, quantitative research, and mixed methods.

Empirical Research

The framework of thought from the previous chapter is that there is a specific branch of philosophy that provides the foundation of thought for research: epistemology. Then there are various schools of thought that may be represented in the structure of the research project, with phenomenological structures being used quite often in the social sciences. Much of the research conducted – phenomenological as well as other approaches – is empirical research, which is based on observation and experiment. Therefore, most research published in the social sciences is *empirical* research.

Empirical research is any activity that uses direct or indirect observation as its test of reality. Empirical research may be theory-based and use deductive reasoning to reach conclusions, or it may not be based on theory and, therefore, follow the route of inductive reasoning. Deductive reasoning has its logic move from the general to the specific in a "top-down" fashion. A hypothesis is stated, general observations are made, and specific conclusions are drawn from the observations. The syllogism is a common form of deductive reasoning. For example: All oceans have saline water. The Pacific is an ocean. Therefore, the Pacific has saline water. The "top" is an inclusive statement: all oceans; the "down" is the specific Pacific.

Inductive reasoning has the logic move from the specific to the general. General principles are derived from specific observations in a "bottom-up" fashion. In inductive arguments the hypothesis comes after the observations are reviewed and analyzed, and the potential for error in any conclusions drawn is recognized. For example, if you observe individuals in a market and see that if they buy radishes they also buy onions, you might conclude that most shoppers buy both at other markets as well. This is a set of specific observations leading to a general conclusion.

Researchers use both inductive and deductive reasoning. The empirical researcher attempts to describe accurately the interaction between an observation or results from a measuring device and the entity or phenomenon being observed. The researcher is expected to calibrate the device or measurement tool by applying it to known standard objects and documenting the results before applying it to unknown objects.

For theoretical empirical studies, the accumulation of evidence for or against any particular theory involves planned research designs for the collection of empirical data. Two basic categories of empirical research that may be referenced in research reports are fundamental research and applied research. Within these two categories much of the research in the social sciences has been divided into two types, one based on numerical data, or quantitative research, and the other based on textual data, or qualitative research. Both quantitative and qualitative research may be either fundamental or applied, and are often combined in a mixed-methods design.

Fundamental or basic research (sometimes referred to as "pure" research) has as its primary objective the advancement of knowledge and the theoretical understanding of the relations among or between selected phenomena. It is exploratory or explanatory in nature and often driven by the researcher's curiosity, interest, or intuition. Fundamental research may not have any practical end in mind, but it often has unanticipated results that may lead to practical applications. Basic research helps theory grow and provides the foundation for further research.

Applied research, unlike basic research, is not done to produce knowledge for knowledge's sake. The aim of applied research is to solve specific, practical questions. It can be exploratory, but applied research is usually descriptive or evaluative in nature attempting to make clear the salient features of the phenomenon under study. Applied research often takes its direction from the results of basic research. Common areas of applied research include electronics, informatics, computer science, process engineering, and drug design. One current direction for applied research is the mixed-methods approach of action research as outlined in Chapter 3. In consuming research reports the reader may experience references to the concepts of empirical, or fundamental or applied research, and in order to make sense of the research the reader should have a grasp of what the author means if those references are used in the study under scrutiny.

Under the banner of empirical research there are three basic traditions. The first method discussed is qualitative research, where the data are more textual than numerical. The second is quantitative research where the data are more numerical than textual. The third, most often used in social sciences where appropriate, is a combination of the two: mixed-methods research.

Qualitative Research

The term "qualitative research" has different meanings in different fields, with the social science usage being the most well-known. While there may not be a consensus among researchers as to what the qualitative approach is, there are general characteristics and techniques that may be described as qualitative research. These are described next.

Often used in the context of phenomenology, qualitative research covers a broad spectrum of inquiry that focuses on how individuals and groups view and understand the world, and how they construct meaning out of their experiences; it is essentially narrative-oriented. Other researchers consider it simply to be research whose goal is not to estimate statistical parameters but to generate hypotheses to be tested quantitatively. There are types of qualitative analysis that do use numbers. In statistics, for example, qualitative analysis consists of procedures that may use only dichotomous data; that is, data that can take only the values 0 (zero) and 1 (one). These techniques are suitable where events or entities can only be counted or classified rather than measured. The techniques themselves are, of course, numerically based.

Qualitative research methods are sometimes used together with quantitative research methods to gain a deeper understanding of the causes of social phenomena, or to help generate questions for further research. Unlike quantitative methods, qualitative research methods place little importance on developing statistically valid samples, or on searching for conclusive proof of hypotheses. Instead, qualitative research focuses on the understanding of research phenomena within their naturally occurring context or contexts. One aim of the qualitative researcher is to determine specific meanings that the phenomena may have for the participants.

Generally, qualitative research studies rely on three basic data-gathering techniques: participant or non-participant observation, interview, and document or artifact analysis. Each of these techniques represents a continuum that may gravitate from spontaneity to more ordered and controlled. Specific studies or particular techniques may rely more heavily on one data-gathering technique or another.

Ethnography or ethnographic studies, as one example of qualitative work, refers to the qualitative description of human social phenomena, most often based on fieldwork. Ethnography is a holistic research method founded in the idea that the interconnected nature of a social system's properties cannot necessarily be accurately understood independently of each other. Several academic traditions, in particular the constructivist and relativist paradigms, claim ethnography as a valid research method.

Qualitative research is often thought of as the non-numerical examination and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships. Qualitative research is generally considered to be exploratory and inductive in nature. It is used to get a general sense of what is happening and it is also used to form theories that can be tested using further qualitative or quantitative research. One criticism of the approach to qualitative research is that the definitions offered of it do not distinguish it adequately from quantitative research. One reason for this problem is that many research projects use what is called a "mixed-methods" technique where qualitative and quantitative methods are combined. An example would be a project using a numerical survey (quantitative) that is followed by interviews (qualitative). A consumer of research will see research that is either qualitative or quantitative, but very often it is a blended approach using both numbers and textual data to reach conclusions.

Quantitative Research

Quantitative research is most often aligned with the positivist philosophy and the scientific method of empirical research. Measurement is a key. The data collected in a quantitative study are applied to a numerical scale that allows for enumeration and measurement. Quantitative studies, however, may also observe phenomena in a natural context and address issues of meaning much like qualitative studies do. Quantitative research is based on the numerical representation of observations for the purpose of describing and explaining the phenomena. The primary focus in quantitative research is to determine the relationship between one entity, referred to as an independent variable, and another, known in research terms as a dependent or outcome variable.

Quantitative research designs can be descriptive where subjects are measured for a specific purpose and may be measured with planned iterations over time, or experimental where subjects may be measured before and after, or immediately after some kind of experiment or treatment. Some researchers include a fourth type of design known as a correlational or *ex post facto* (after the fact) study as a quantitative approach to research. A descriptive study establishes only associations between variables. An experiment or correlational study may establish causality depending on the statistical analysis done.

Quantitative research includes the description or the quantifying, analyzing, and measuring of relationships between variables. Quantitative research is, therefore, empirical research that is used in both natural sciences like physics, biology, or geology and social sciences like psychology, sociology, or education. Opinion surveys using a numerical scale are widely used in research. Subjects are asked to rate an item "on a scale of 1 to 10," for example. In opinion surveys, respondents are asked a set of structured questions and their responses may be assigned numeric values, as discussed in Chapter 2, and then tabulated.

Basically, experimental studies are designed to examine cause and effect. These studies are usually conducted to substantiate the differences in dependent variables that may be attributed to independent variables or treatments. Descriptive and correlational studies examine variables in their natural environments and do not include treatments imposed by the researcher.

Mixed Methods

The mixed-methods technique has become the third basic paradigm of empirical research – a combination of qualitative and quantitative techniques. More and more research endeavors in the social sciences – and education in particular – rely on a combination of data types to complete the study. The design of a mixed-methods study is used when either the quantitative or qualitative approach alone is not adequate to the research purpose. The strength of each method becomes part of the mixed-methods design in order to provide a solid purview of the phenomenon under study. Mixed methods allows for mixed philosophical positions as well. Greene (2007) refers to mixed methods as research that allows for viewpoints that bridge post-positivist and constructivist views, but with an emphasis on pragmatic perspectives.

Mixed-methods research is also valuable when there is a need to triangulate data. Triangulation is the use of more than one method in a study to double-check the results derived from one aspect of the project. Often researchers who use a survey approach with a quantitative, numerical response pattern will triangulate the data by doing selective interviews to generate textual affirmation of the survey results. Follow-up interviews are also used in a mixed-methods design to generate cogent extrapolations from the base data. Used together, the different techniques can provide validity to the results drawn from the study, and may help discover bias in one approach or the other.

There is no universal standard for defining and categorizing different research paradigms. Often researchers may combine design characteristics in a mixed-methods approach, they may create a subcategory of a proven design, or they may change names of designs in their discussions of them. This lack of strict categorization may cause problems when reading research since, as mentioned above, in many cases published studies do not identify the philosophy behind the research or the design used.

Selecting Research Literature

The rapid growth and expansion of the internet as a resource for information has monumentally changed the landscape for finding research literature. The search engines available for any kind of research have ample data literally at one's fingertips. Professionals, of course, are still are able to, and do, subscribe to the scholarly journals and other publications in their field in a hard copy format. In fact, the jury review of papers submitted to professional publications is one very important reason to continue receiving printed publications, although more and more professional associations are combining online publications with paper copy. The professional journals that have articles peer reviewed are referred to as refereed journals, either in hard copy or online. Peer review consists of having a panel of experts on a particular topic review the research to determine its accuracy. Reviewers are also called referees, and the journals or other publications, therefore, are refereed journals.

Sometimes internet sources that are not from trusted providers of research suffer from two ethical circumstances. First, when the essential peer review outlined above has not been completed there is a tendency for premature publication. Peer review of research reports is an essential requirement for warranted and ethical results. A second caution is that reports may have been created and carried out in order to arrive at a desired conclusion, which in the end may be unwarranted. There is a plethora of research, especially in the social sciences, that is structured to validate a presupposed conclusion. In some cases, it is important to identify the funding source for the report. That may give rise to the question of research accuracy and dependability of results when the results consistently align with the funding agency's philosophy.

Of course, libraries continue to be an excellent source for finding publications around any topic. City, county, school, college, or university libraries have always been, and continue to be, a nuclear resource for research. Most libraries are also linked to electronic search engines that allow for obtaining research reports from a wide range of sources. Most libraries are not only a source for the original documents necessary for a research project, but they are also a storehouse for the tools needed to acquire the reference materials. Software, computer programs, data retrieval sources, and other routines necessary to carry out online research are often housed in local libraries.

It has become more of a challenge to determine which of the resources a person needs to read rather than actually finding a long list of potential sources. The first step in the "finding" process is to know the literature of the field of study. Who publishes the research in the field? In some professions it is easier than in others. Fields like medicine, law, architecture, or engineering have well-known and established peer-reviewed journals that have passed the test of time for providing the most up-to-date and relevant research in the profession. Many of these journals have added an online edition so that professionals can have electronic access to the articles as well.

These fields, and others, have specialty publications in addition to covering the broad aspects of the profession in the major journals.

Those who practice in a specialty subfield in the profession – surgeons in medicine, safety experts in engineering, or corporate specialists in law, for example – know the more focused publications in their field as well. These too may be available online as well as in hard copy. Organizational bulletins or conference proceedings are another source of information, although they may not be referenced and refereed to the same extent as published articles.

Occasionally a consumer needs to go beyond the well-known publications or common library database searches to investigate a topic that may not have the broad appeal needed for general distribution. That is where an independent or individual internet search may be helpful.

Searching the Web

Internet searches must be done with caution. Internet publications are not regulated, seldom edited, and not subject to monitoring for accuracy. Sometimes a well-organized, general search through one or more of the well-accepted search engines is all that a consumer needs (e.g., Google: www.google.com/, Yahoo: www.yahoo.com/ or Bing: www.bing.com/). Google has a scholar tab search function that facilitates a search of scholarly literature across many disciplines and sources, including theses, books, abstracts, and articles from academic journals or .edu sites (see http://scholar.google.com/). Another rich resource is a website known as *Wikipedia* (http://en.wikipedia.org/wiki/Wikipedia), which is a free online encyclopedia that allows for constant update. This site is an open-entry database that encourages researchers to add to the knowledge base to keep it alive and growing. Databases of this type are subject to criticism regarding accuracy, so the reader should always remember to verify the source and the information by checking other sources.

Often it is necessary to dig a little deeper into the resources available. Research embedded in government sites, for example, may need a little more work to uncover. The consumer is well advised to use the topical search option that most sites provide to do this digging. Keywords need to be carefully selected so that the search results are in the category being used by the information seeker. Most libraries have also become automated so that the same technology that a person would use on a home or office computer to find research reports is used in the library to search on-site stacks or other electronic databases available through the public or school library.

Report titles, recognizing the names of the report authors or the principal investigators as leaders in the field, and the source of the publication are the best beginning items for selecting reports to read. Looking through the Web of Science, formerly known as the Web of Knowledge (http://wokinfo.com/), or some other type of citations index appropriate to the discipline under study may result in a list of peer-reviewed journals on the topic. Questions the reader should ask include: Does the title contain the keywords that help in identifying the topic under consideration? Are the authors well known in the field of study? Are the journals well established and refereed? Lunsford (2010) provides a source map for assessing the value and accuracy of web resources. Her steps for evaluating web sources are as follows:

- Determine the credibility of the sponsoring organization.
- Determine the credibility of the author.
- Determine the currency of the web source.
- Determine the accuracy of the information.

Web surfing for the purpose of finding research in the field can be both fascinating and frustrating. The fascination comes when one realizes the vast assortment and the incredible number of sources that exist for some topics. The frustration is sorting through the chaff to find the kernel of grain that will help the reader to the knowledge sought. Web searches can be additionally frustrating in that sources disappear from the web on a regular basis, and some sources have little or no attribution that gives the reader confidence in the reliability and validity of the study.

While libraries and professional associations as gatekeepers of knowledge in a profession are counted on to sift through the literature and keep or publish only those found to be of significance, the resources on the web do not flow through the same screens. Since anyone can establish a website and publish anything they want, it is very difficult to separate the good from the misleading. That is where the questions listed above are important to any search.

The Abstract

Internet searches use keywords that pertain to the subjects or phenomena under scrutiny. Reports are summarized by the authors by identifying those keywords that support searches for literature in the area. Consumers should carefully identify the two, three, or four words that best reflect the content of studies desired, and either enter the terms individually or in an appropriate combination in order to focus the search. Once appropriate research reports are identified and selected for review, the first thing to check is the abstract, if one is written. Most research that is published begins with a paragraph that, in a very brief way, describes the purpose of the study, the variables under study, the type of research used, and the major findings in the study. This is the abstract of the study and it is generally at the very beginning of the publication right after the title and author. In some cases, the abstract may be the only piece of information the consumer has depending on the resource used for selection. Many of the internet sources use titles and abstracts only as the first level of providing information about research.

The intent of the abstract is to provide a very brief summary of the research topic, the methods used in the research, including data sources and structure, and the basic conclusions drawn from the data. It offers the consumer an opportunity for an efficient review of the article contents and it should contain many of the keywords that describe the research variables and components.

Quantitative studies have abstracts that identify the problem under study, the pertinent aspects of the subjects, the methods used, the statistical findings, any major conclusions drawn, and any implications made. A qualitative study abstract may not have the statistical component, but will still describe the relevant characteristics of the object under consideration, the nature of the problem or issue being studied, and the basic research findings or questions posed for further research.

Most professional publications require a specific method of writing, following a generally accepted writing style or format. One such format often used in research is that published by the American Psychological Association (APA). The *APA manual* (VandenBos, 2010) is an excellent source for further investigation of the purpose for and writing of abstracts for research publications. If well written, the abstract of an article or report will tell the reader immediately whether or not the complete text is worth reading.

Putting Research to Work

Consumers of research reports consume them for a purpose. They want to put the research to good use in their personal or professional lives. In order to put research findings to use the reader must make some basic judgments about applicability. Questions to consider include the following:

1. Were the participants similar to the people at the home site?
2. Do the findings make sense for the field as a whole?
3. Does the measurement support the findings?
4. Can the findings be extended successfully to other situations?
5. Does the research fit the current location (the “not in my backyard” syndrome)?
6. Are there research implications that may cloud the use of the findings?
7. Does the research extend the accepted theory beyond common sense?

In the final analysis, the consumer must answer the question “What is it worth?” If the impediments discussed in this chapter are encountered in the reading and review of research reports and literature, then the consumer must decide whether to embark on a project to remediate the errors, or to simply discard the text as unusable. Chapter 6 provides a summary of the significant components of a basic research report and how they may be used.

Resources

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In-class Exercises

1. Create small groups of students and ask them to create examples of a fundamental research project and an applied research project.
2. Create small groups of students and ask them to create examples of an inductive and deductive syllogism.

Discussion Items

1. What is empirical research, and why is it important?
2. How did post-positivism grow out of the positivist philosophy?
3. Differentiate fundamental and applied research.
4. How is quantitative research different from qualitative research? How are they the same?

Assignments

1. Have students provide keywords and do an internet search for research using the students' suggestions.
2. Provide sample article abstracts and have students identify whether the basic information is included (purpose, variables, design, basic findings).

6 The Research Report

One of the most challenging parts of the research process is writing the report in a systematic and organized way. In this chapter, the six basic benchmarks for research as stated by the National Research Council of the National Academies (Shavelson and Towne, 2002) are introduced and shown why they should be applied to any research report that is selected for review. These benchmarks are that the research must:

- pose significant questions that can be investigated empirically;
- link research to relevant theory;
- use methods that permit direct investigation of the question;
- provide a coherent and explicit chain of reasoning;
- replicate and generalize across studies; and
- disclose research to encourage professional scrutiny and critique.

The benchmarks are applicable for research journal articles and dissertations. There are some differences between writing an article for publication in a journal and writing a dissertation. Typically, the main differences are the length of the submission and the criteria used for evaluation of the document. Many doctoral students use their dissertation as a foundation for publishing one or more research articles, but for most students submitting an entire dissertation to a journal for publication is not feasible.

In this chapter, we introduce a structure for writing a general research report. Each of the research report components is important to include in all types of research reports. In Chapter 18, we include a template that is specific to dissertators as they write a dissertation. In that chapter, we also present a template that may be used for organizing a research article. It is important to keep in mind that the research benchmarks are identical, but the structure for completing each type of research report is a little different.

Elements of a Research Report

The body that makes up the content of most research articles is separated into seven main components: the abstract, an introduction grounded in a review of pertinent literature, a clear statement of the problem and research question(s), the design of the research, the presentation of the findings, a discussion of the significance of the results, and conclusions that lead to recommendations for an intended audience. A title page, acknowledgments, references, and a list of tables and figures are also critical elements, but they vary based on the type of research being conducted.

The Abstract

A primary task of a researcher who is preparing a paper to submit for publication is identifying the audience for whom the results and conclusions are of interest. Manuscripts submitted for journal publication include an abstract that is placed at the beginning of the article and which summarizes each of the parts of the article. The abstract is the basic tool used to determine whether the report is worth reading. While this outline is not followed in every research publication, the component parts represented are very often included in one or another way. Each will be treated separately here.

The Introduction

Well-written reports start with the background literature that gives a foundation for the study. New research is based on existing theory, and the theoretical aspects of the problem or issue being studied need to be made clear at the beginning of the report. Other research that has been completed in the topical area should be identified and summarized. Researchers should pay careful attention to the literature selected and referenced by the research author. Questions to keep in mind while reading the report include: Is the theoretical basis of the research well founded? Are the authors selected by the researcher well known in the field? Is there variety in the research literature selected for inclusion? Are both or all sides of the argument included in the researcher's introduction? Does the author lean heavily on her or his own previous work, to the exclusion of others? These are some questions that the reader should keep in mind as the literature review is consumed. The reader is well advised to grant more legitimacy to top-tier journals in the field, which are often the trade publications of the major professional associations.

The introduction to the research should give the reader the confidence that there will be a systematic look at relationships or a careful explanation of observed phenomena if the report is not an empirical testing of theory or a controlled experiment. Remember that one of the basic principles for research provided by the National Research Council was to link research to relevant theory. In addition, a careful review of existing literature on a subject may point out gaps in a theory or in the literature describing or explaining that theory. The literature section of a report should do both for a reader: link the research to theory, and point to gaps that may exist. See Step 1 in Chapter 7 for more on the literature review in research reports.

The Problem Statement

The second component of most written research is a carefully designed statement of what the research is all about: the problem statement or basic research question. The first principle from the National Research Council's six benchmarks for inquiry was to pose significant questions that may be investigated empirically. This principle or benchmark also needs careful examination by the reader. The problem statement, basic question(s), the research hypothesis, or the conceptual issue under consideration should have been outlined in the abstract. In fact, that problem statement should have been one of the more important criteria for selecting the report to read. The text of the report should go into greater detail about the question(s), hypothesis, issue, or problem under consideration by the researcher.

The first part of the problem analysis for the consumer is to ensure that the issue is logically linked to the literature cited. Then the reader should look at the problem statement and question whether the problem described is going to be helpful to the reader's understanding of the issue. The research participants, the conceptual issues, or the organizational structures of the group or agency under study may or may not fit the reader's actual situation. The variables used in the research may not be relevant to the reader. If not, then the research may not be helpful and the reader may decide to discontinue the review of that particular piece of research literature.

If the problem statement seems to fit the reader's needs, then the next question to ask is whether the problem under study in the research is applicable, or replicable, in the consumer's own circumstance. The reader needs to be convinced that the results of the study will be valuable information to her or his own situation. This begins by accepting that the theory behind the problem is closely related to the reality of the situation the reader faces.

Another important consideration for the consumer of research at this juncture is to determine whether the problem posed is realistic. Once again, the report may be discarded if the problem seems too trivial, or too optimistic, to help with a real-world situation. If reading the problem statement gives the consumer confidence that these threshold questions can be answered appropriately, digesting the report should continue. The next part of the report is most often a description of the methods used in the research. The reader must determine whether the techniques used by the author match the issue outlined and are appropriate for the question under consideration. Step 2 in Chapter 8 provides a further exploration of the issue of research topics and problem statements.

The Literature Review

By selecting the right titles and reading the abstracts of the studies, a researcher may be able to identify research reports that will be helpful to the problem or issue under study. The next step is to read the entire report or article. Reading research, like reading different genre in literature, has its own peculiarities. Research reports are not creative literature. They cannot be read like a novel. Speed reading or skimming is not an option for research articles. Once a research report is identified for further study, and the abstract has been digested, the reader needs to carefully read the entire product.

Areas of caution when consuming the research literature component of a research report start with recognizing the theoretical basis for the research. If the theoretical structures are easily identified, recognizable as accepted in the profession, and controlled in their construction rather than loosely tied together, the report is on the right track. If the author provides evidence that preconceived notions about the topic are guarded against, the research is on the right track. If the variables under consideration lend themselves to appropriate testing, and the literature provides examples of previous research using the study variables, then the report is on the right track.

The Research Design

The reason for a research design begins with the foundations of the philosophic paradigm of knowing. The design is the structure, plan, and strategy of investigation put together to answer the research questions. Research design and research method are often used synonymously. Most research can be divided into two camps. There is the static view of science as knowledge accumulation where new facts are derived from old. Then there is the dynamic, or heuristic, approach that is a discovery method, or a theory-building and testing approach. Research design is a guard against preconceived notions leading to erroneous conclusions. A third principle from the National Research Council was to use methods that permit direct investigation of the question.

Quantitative empirical studies most often aim to do one of two different things. They either attempt to compare constructs or they try to contrast them. A research construct is the result of systematic thought about a subject where a complex theory or subjective notion has been created and systematically put together. A study of contrast is a study that looks for significant differences between research variables. A conjectural statement about the relationship between variables (e.g., the problem statement) is tested. One crucial aspect of a scientific research design is the control of what is called *variance*. Variance is a term used to describe the variability of research outcomes. One basic purpose of research is to maximize explained variance and to minimize variance caused by outside factors or error.

Consumers of research reports should be able to distinguish between the three basic sources of variance in research. First, readers should think of variance as change. Then *experimental variance* is that change due to the treatment used in the research. Researchers want this type of change to be the greatest. That is, experimental variance (the change due to the applied research conditions) should be maximized. The second important type of variance in research is the change due to outside influence. Researchers must work hard to control this *extraneous variance* and often laboratory conditions are necessary to do this. The third type of variance readers should recognize is that which is called *error variance*. Error variance (e.g., change due to chance) must be minimized.

The scientific approach to research design is one of control and repeated measures. Probably the purest research is the laboratory experiment using the scientific method where the variance of all extraneous variables is kept to a minimum. The research is isolated in a physical situation apart from the routine of ordinary living and one or more independent (or experimental) variables are manipulated (treatment given) under carefully controlled conditions. Outside of the scientific approach, most research is done as a field experiment where the situation is more realistic, but the control of extraneous variables is difficult.

In order to test hypotheses, and to measure the different types of change, statistical tests are planned into the research design. Remember that *statistics* are numbers generated from the research data to test the hypotheses or to answer the basic questions. They are data generated from the research project. These data are manipulated through the use of generally accepted formulae and used to verify decisions about the problem statement.

There are statistical tests that researchers calculate to measure those differences or to test those statements. In the basic scientific method, for instance, two groups are contrasted to determine whether the treatment applied or attempted had a significant impact upon the experimental group. The statistical formula used most often explains the change that may be due to chance (the "error" variance).

Readers of research reports do not have to be experts in the several statistical techniques used to measure the significance of the research findings. It is enough to know when a test proposed or used is appropriate, and whether the conclusions drawn based on the techniques used are warranted.

The keywords for the reader to look for in the abstract and in the research design section are *compare, contrast, differences, significant difference, correlation, commonalities, similarities, statistical significance*, or terms that describe the statistical test to be used. Readers should be concerned that the methodology used realistically matches the problem being studied; that is, does the type of analysis planned or used actually fit the situation and the data?

A comparative study is an evaluation of two or more phenomena or objects (variables) with an aim to determine something about the things being compared. Comparative research looks for similarities rather than differences in the data. Two or more groups may be studied and the similarity of characteristics or of responses may be compared in order to make judgments about the research topic. There are also statistical procedures to use when measuring similarities (covered in Chapter13).

Chapter 2 outlined the different data types derived from or used in a quantitative study. One thing a reader can do when reading a study is to check that the data type is adequate for the research methods being used. Is the right statistical test being used? If the research is a correlation study, for instance, the researcher should not be testing the differences between mean values from a survey utilizing a t-test. Are the data appropriate for the analysis technique selected? Or, for example, are ordinal data being forced into parametric statistical tests when they are not at least interval numbers? Parameters in measurement are summary values for a dataset such as the average. Nonparametric values are a statistical category of datasets that have no specific summary values possible. For example, if no = 0 and yes = 1 in a dataset, the average of *yes* and *no* responses has no meaning. It is a nonparametric frequency count.

Some of the basic statistical tests used in quantitative studies, their data needs, and their meaning are listed below.

Nonparametric values use summary statistics that do not have a defined distribution. They include the following:

- *Frequency counts (nominal data)*. The number of instances or objects in a data category.
- *Percentages (nominal data)*. Used to summarize a sample by using a comparative ratio of 100 (e.g., 45 percent male and 55 percent female).
- *Chi-square (nominal data)*. Used to test whether the data are in a different pattern than expected (are the observed patterns different from a normal pattern?).
- *Rank order correlation (ordinal data)*. Using a ranking of frequencies in categories to compare the relationship between two variables without making assumptions about the frequency distribution.

Parametric calculations from the research sample used to describe the population:

- *Measures of central tendency such as mean, medium, mode (ordinal data)*. Used to make summary statements about how scores or values cluster or collect around one score or value.

The mean or mean value is the arithmetic average of a set of scores; the median is the midpoint of a distribution; and the mode is the most frequently occurring score in a dataset.

- *Measures of dispersion such as range, quartiles, variance, standard deviation (interval data)*. Used to measure the spread of data across the entire sample. The range is the lowest to the highest scores in a dataset; the quartile is dividing the dataset into four equal parts; the variance is the mean square dispersion about the arithmetic average, or mean value (e.g., each score is subtracted from the mean, that number is squared, and the results are added together and averaged); the standard deviation is the root mean square of the sample (e.g., how much different the sample average may be from the "real" population mean), which is the square root of the variance. These same tests are appropriate for ratio data as well.
- *t-test (interval data)*. Tests differences of average score from a selected scale score value; or to compare two samples' averages; or to compare a sample group to itself looking for discrepancies.
- *Analysis of Variance (ANOVA) (interval data)*. Compares group means using dispersion or variation *within* three or more groups in the sample to the dispersion *between* the groups; groups may be compared across items.
- *Correlation (interval data)*. Used to measure the similarity of the data derived from different variables.
- *Factor analysis (interval data)*. Used to separate data into like or similar categories.
- *Regression analysis (ratio data)*. Used to make predictions about the relationships between variables.

The statistical tests listed above are used when numerical or quantitative data are present. Qualitative studies also have a methodology that should be described in the research article. Whether it is a review of existing documents or the compilation of new data through interviews, surveys, or other means, the data type and the source of the data must match the questions posed by the research. Do you interview police officers to answer a question about firefighters' perceptions? Do you review financial data to measure the adequacy of storm shelters? The method of research must be directly related to the questions asked.

Qualitative field studies are an appropriate method to study complex circumstances, but they must be realistic, significant, and theory-oriented. The variables under study must be isolated in the design, and the interactions being observed need to be made clear. The problems identified for resolution should be practical and the methods used to study the problems carefully outlined.

The careful consumer of research may find a mismatch of method and problem. This should lead one to discard that particular piece of research from consideration. If the methodology does seem appropriate, the next step in reading research is to digest the findings that the author selects to report. In reviewing the findings, the reader should pay careful attention to how the data are displayed and whether the numbers used or the texts selected are significant to the reader's own circumstance. Whatever the technique, the reader should keep in mind yet another principle of the National Research Council, namely that the report should provide a coherent and explicit chain of reasoning. To further the discussion of research design or methodology, the reader should review Steps 3, 4, and 5 provided in Chapters 9, 10, and 11.

Research Findings

Quantitative data in research reports are usually displayed in the form of tables or figures. The numbers generated by the research study are combined and displayed to help the description of the information collected and to lead to summary responses to the basic questions posed in the research. Displays usually include raw data, frequency counts, measures of central tendency, measures of dispersion, and the results of statistical tests that are used to determine the significance of the research data. Readers should be sure that the promise made in the methodology section is met in the findings section.

Other components of the findings that a reader should review include the scope of the data displayed. Are there enough participants to legitimately draw conclusions about the topic? Are the groups being compared approximately the same size, or do they represent roughly the equivalent proportion of the home group? Are there too many participants? Statistical tests, for the most part, rely on the number of data points in the study, and the more participants included, the more likely statistical significance can be generated.

The consumer should also look at the characteristics of the data. If data from a limited geographic area, for instance, are used exclusively in the project, the results may not be applicable to the reader's home location. What is true in Maine may not be true in New Mexico. If the participants represent organizations or agencies that are quite different from the consumer's, that too may be an issue for using the results. The attitudes of a heavily female sample may not hold true for males.

These characteristics should be easily read from the tables, figures, or charts which the author of the research report provides in the text. If, for example, the author only offers percentages of respondents and not the actual number of participants or respondents in a category, it may be difficult to determine the real value of the data. This could be an obvious reason for the reader to dismiss the results. Another reason for dismissing the results of a report is if it combines categories of respondents or participants in an illogical way that confuses the ability to draw conclusions.

Tables and charts in the document should be reviewed for these or other abnormalities.

Readers of research need to do an insightful analysis of the data displays while keeping in mind the setting and structure that is to be informed or shaped by the research. If the two are too disparate, the research may not be helpful to the consumer's purpose. If the data seem to fit the circumstance, the next construct for the reader to analyze is the use of the statistical tests selected to prove the point or describe the data. Authors of quantitative research usually include these tests in an analysis or treatment section of the report. They may be integrated into the findings section as well. In either case the reader should ask some basic questions about the measurement used in the analysis of the data.

Some of the most common statistical techniques were listed previously. There are many variations on the basic types listed, but in each case the tests are simply manipulations of the data derived in the research project. If the research has poor data, no statistical test in the world will help make the research more valid or reliable, two concepts that should be a part of every published research. The research concepts of reliability and validity are explained more fully in Chapter 12 under Step 6, but a brief discussion of these two essential characteristics is provided here.

Qualitative data should also be presented in a systematic, organized way. Qualitative data is often reported in themes, trends, or narrative text. Themes are often identified as a result of systematic coding. The process of coding data is the method of identifying topics, issues, similarities, and differences that emerge in the data, and leads to a greater understanding of the topic from the perspective of the participants. To support qualitative data analysis, quotes from participants are often included in the text. Organizing the data around general themes is the first step in reporting qualitative data. Each theme should be stated in a way that captures the essence of the concept being conveyed, and supported with evidence from the data. For example, if a researcher identifies "hostile campus climate" as a theme in a qualitative study about the experiences of students of color at a predominantly White institution, the general theme of "hostile campus climate" should be supported by evidence from interviews conducted with students of color who shared their experiences with a hostile campus racial climate. It is acceptable to integrate a mix of direct quotes and paraphrases, but it is imperative that if the theme is identified, there is ample evidence included that supports the theme.

After themes are introduced and supported with evidence, the themes should be interpreted through the lens of the theoretical or conceptual framework that grounds the study. In other words, it is important for qualitative researchers to discuss the integration and significance of the themes within the context of the literature foundation. Theming and synthesizing are critical steps in the data analysis and reporting process because the result is interpretation of the themes that authentically represent the experiences of participants, and illuminate the significance of the findings.

Each type of qualitative research calls for a unique way to present results. For example, in narrative inquiry, data should be reported in rich text, using many quotes from participants about their lived experiences with a particular phenomenon. Narrative inquiry preserves the stories of individuals and those stories form the foundation for the formation of themes. In ethnography, culture is emphasized, and the data report should synthesize the personal experiences of participants and the culture in which they have those experiences. In qualitative case studies, multiple sources of data may be included in the report, including interviews from multiple sources, document reviews, field notes, and observations; thus synthesizing multiple sources of information into coherent and integrated themes is very important. Regardless of the type of qualitative study conducted, emphasizing authenticity and establishing trust with the reader is critical. Likewise, when reporting quantitative data, it is critical to report the validity, reliability, and trustworthiness of the data being reported.

Validity

The concept of scientific validity was introduced in Chapter 1. Validity in research, simply put, means that the research method and the techniques used to collect data actually measure what they purported to measure. It means that the conclusions or descriptions of the subject or topic under consideration which are found or drawn by the researcher are accurate. Two types of validity are usually discussed in research reports. The first is *internal validity*. For experimental designs this means that the treatment did, in fact, cause the result. For qualitative designs internal validity means that the control, analysis, and procedures used in the study are appropriate to make the results interpretable – that the research is creditable. Member checking, which is having research subjects review their responses or input, is a tool used by qualitative researchers to do an internal validity check. Since the purpose of qualitative research is to offer insights from the research group's perspective, the members of the research sample form the basic group to judge the credibility of the research project.

The second type of validity usually used in research is *external validity*. External validity means that, in the quantitative sense, the results may be generalized to a larger group outside of the research group. Statistical tests are used to substantiate the external validity and to provide a confidence level for any generalizations made from the research data. External validity allows the qualitative researcher to generalize across factors in the population under study – evidence that the research is transferable. Here the research design and the theoretical assumptions upon which the design is built allow the researcher to make statements about other settings based on the research done. External validity for qualitative research relies heavily on the common-sense approach to the research, as findings are argued to be transferable.

Readers of research reports will see several other varieties of validity referenced in studies. Some of the more common include the following:

- *Face validity*. The measurement or analysis proposed is in agreement with commonly held beliefs about the subject or topic (e.g., "on the face of it" it seems logical).
- *Content validity*. The questions asked are the right questions for the research and they accurately represent the subject or topic being studied (e.g., they deal with the content being studied).
- *Criterion validity*. There is an external principle or characteristic that is the standard for the topic or subject, and the measurements being done or questions being asked in the research compare well with that principle. Criterion validity is also known as *predictive validity*, since the known standard predicts the research results. A device has criterion validity if it provides an alternative measure of the same concept as another, well-accepted device (e.g., high school GPA and scores on the SAT have criterion or predictive validity, since they both measure potential success in college).
- *Construct validity*. The measurement device relates well to the appropriate theoretical concepts that define the study, and not to other concepts for which it was not intended. A measurement device has construct validity if it provides support for the intended interpretation of the variables. Construct validity refers to the totality of evidence about whether a particular use of a device adequately represents what is intended by a theoretical account of the thing being measured (e.g., a measure of IQ may not be the best device to determine the construct of socioeconomic status. There may be more, or better, measurements to determine the construct).
- *Substantive validity*. Also known as educational or professional validity, this answers the question of whether or not the size of the research group (the sample) is adequate to the purpose of the study (e.g., is the group substantial enough to warrant conclusions?).

Reliability

Reliability in research is the dependability or accuracy of the results. It includes the stability, consistency, and predictability of the analysis. If the project were to be replicated, reliability would indicate that the same or very similar results would be found. In quantitative research, most tests of reliability are applied to the instrument being used to collect data. Survey forms or questionnaires are subjected to a reliability analysis (most often a statistical test) so that their accuracy may be substantiated.

The basic quantitative technique to determining reliability uses accepted statistical analyses. The object is to keep the variance in the measured results due to chance (error variance) to a minimum. Statistical tests used to determine the stability of a measuring device need, at a minimum, interval data. Most tests of statistical reliability include the calculation of a correlation coefficient. A correlation coefficient is a measure of similar or dissimilar trends in data. The relationship between or within datasets is subjected to an established statistical formula and the results are used to determine the strength of the data-collection tool in measuring the topic under scrutiny. Tests that are often used and may be referenced in research reports include the following:

- *Test-retest reliability*. A correlation coefficient is calculated based on two iterations of the same test or instrument. Correlation coefficients most often vary from 0 to 1, and the closer the value is to 1, the more reliable the measurement device.
- *Split-half reliability*. When successive iterations of the same measurement are not possible, the device may be split into two parts matching items that measure the same or similar constructs. Then a reliability coefficient is generated from using the two halves of the device.
- *Internal consistency computed using Cronbach's coefficient alpha*. All of the possible split-half comparisons are made and the coefficient is an average of all split-half calculations.
- *Rank order correlations*. Results measured at different times or from different groups are ranked and then used to analyze data and compare for consistency, often used with nonparametric data.

Reliability in the qualitative tradition has the same meaning as in the quantitative methodology. Reliability assures that the results from the research are accurate and they represent the topic or subject under consideration. That is, the research is dependable. Qualitative researchers must describe accurately the setting of the research, and pay close attention to changes that occur during the research process. It is by cataloging and explaining these changes that the qualitative researcher provides for the reliability of the study.

Consumers of research work must be knowledgeable about the concepts of validity and reliability. If a report does not speak to either concept, or if the treatment of one or the other, or both, seems superficial, the reader may want to think twice before implementing a program or replicating a study using the report's results. There needs to be a confidence that the research is accurate (valid) and dependable (reliable) if it is to be usable. If the research seems to be valid and reliable, the next question the consumer needs to ask is: "Is it significant?"

Research Significance

The true significance of a research project depends on the care taken in the structuring and implementation of the project. As was mentioned in Chapter 1, classical scientific research includes hypothesis testing, which is a determination of confidence over rejecting the stated hypothesis. Hypothesis testing in scientific research does not directly "prove" anything. So readers must look at the references provided by the researcher that summarize similar studies, or to the replications that may exist in the research report before conclusions may be drawn for the reader's own situation.

Significance in quantitative research goes back to the discussion of confidence and to the statistical tests used to verify confidence. Readers will see researchers use levels of significance to substantiate the importance of the research results. Most commonly, the researcher chooses "1 out of 100" or "5 out of 100" as the probability level for the significance of the study. The level of significance is selected to minimize the possibility that the results are due to chance. Researchers will choose the 1 percent chance level and report significant results represented by p<. 01 or they may choose the 5 percent chance level and report a significance of p<. 05; where *p* is defined as the probability. If significant at one of these levels the reader may have confidence that the treatment in the research most likely caused the results reported by the researcher.

Special caution needs to be taken with a researcher's claim in the published work that the research had a resulting effect on the group or organization or agency being studied (e.g., when the researcher attributed causation of variables or events by or through other variables in the research). Too often, correlation studies lead the author to attribute one variable being the cause of another when in fact the measure is just one of similar trends in the data. While there are statistics that do provide for the explanation of variance between things being studied (e.g., regression analysis), it is still risky to indicate that one thing actually caused another to happen in a research project.

Resources

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In-class Exercises

1. Have students identify groups (gender, culture, class) that may be compared or contrasted and follow up with the design of a research question that measures similarity within or between groups and one that measures differences within or between groups.
2. Provide students with examples of number usages and have them determine the category and whether any statistical test for the category should be parametric or nonparametric (e.g., gender (0,1) = nominal/nonparametric; count off by 2 (1,2) = nominal/nonparametric; physician's 1–10 pain scale = ordinal/nonparametric; grade in school = ordinal/nonparametric; calendar dates = interval/parametric; temperature = interval/parametric; height = ratio/parametric; weight = ratio/parametric).

Discussion Items

1. Design a research project for the variables in 1. Include the following:

   a. Your problem statement.
   b. How you would conduct a literature search.
   c. Your research design.
   d. Anticipated findings.

2. What is meant by "variance" in research?
3. Give some examples of different measures of dispersion (e.g., the range of salaries on a teacher contract salary index is $26,000 to $80,000).

Assignments

1. Write a problem statement, a basic question, and a hypothesis for the variables *income* and *level of education*.
2. Describe how validity is different from reliability for measuring devices in research.

Part II

The Steps in the Process

The chapters in Part II of this text illuminate ten basic steps for research that must be considered whenever research is conducted in a formal sense. These research process steps are independent of the subject of the research or the method used. Each step is described in a general sense, and references at the end of each chapter along with references in the Annotated Bibliography (Chapter 20) are there to help the reader identify additional resources to expand her or his knowledge regarding the specific topic of the various steps. Taken individually, these steps provide an opportunity to understand the particular part of the process. Taken as a whole, the steps provide a mosaic of the pieces necessary to understand the process of inquiry that leads to the growth of knowledge.

7 The Theoretical Basis of Research

Step 1 READ: Review and Summarize the Literature Pertinent to the Topic

As mentioned in earlier chapters, there are principles of inquiry that transcend the topic or subject, or the methodology used in the research endeavor. These principles, or steps, need to be understood if research is to be done, or if research results are to be used for program improvement. While not all inquiry is carried out in the same fashion, or with the same techniques, the foundation standards or principles apply in all circumstances.

Nothing in life happens in a vacuum. For every action there is a reaction, and for every invention there is a precedent. Research-based inquiry, as a human endeavor, is a theory-building approach to knowledge that is used to explain, understand, predict, or control people, events, or other phenomena. Research adds a discovery or dynamic approach to knowing that can assure confidence that the resultant knowledge is true and accurate. In order for the growth of knowledge to occur, there must be an agreed-upon foundation of prior knowledge upon which to build the new. Any researcher must understand and be able to use the prior knowledge base of the research topic. It is the researcher's selection and reporting of pieces of that prior knowledge that becomes the research literature component of the research report. Obviously a topical area for research has been identified, but the actual focus of the research may not be clear until after the literature on that topic has been consumed.

The Literature Search

A literature search is a thorough examination of published works on the topic of the research. It is a systematic review and careful selection of pertinent information from multiple sources of professional publications, and other written work. It is a systematic process of evaluating the work of researchers, scholars, and practitioners in a particular field. The three-fold purpose of a literature review is to identify what has already been written about in the field, to illuminate emerging issues, and to help the researcher identify gaps in the knowledge that require further investigation.

Both the breadth and depth of existing sources should be identified and appraised. When knowledge from the past is reviewed for a research project, it means reading, or having read, as much of the published literature in the field of study as possible. The more extensive and exhaustive the review of the literature, the more accurate the researcher will be in designing her or his own project. How does the researcher know whether the planned project has been completed in the past unless that researcher reads all of the past works in the field?

Review of past knowledge must be based on an accepted theory – a set of assumptions, axioms, propositions, or definitions that form a coherent and unified description of a circumstance, situation, or phenomenon. Theory-building begins with concepts. A concept is most often seen as some sort of abstraction that is formed as a generalization drawn from the observation of particular instances. Theories are sets of interrelated "constructs," and constructs are theoretical concepts that are carefully defined for the research purpose.

Thus the observation of singular events may be built into a concept, which in turn may be described in theoretical terms – as *constructs* – and by logically putting these constructs together a theory is born. One may observe that there are individuals who seem to hold the interest and attention of others, and who are able to have others act on their behalf. In order to describe this phenomenon, the concept of leadership is born. One may observe that some individuals seem to be able to finish tasks more quickly and with better results than others. From this phenomenon the concept of efficiency is born. Many theories on leadership or efficiency have been constructed and then tested through empirical research.

If a researcher wants to study these concepts, that is, if a research project is to be designed, then the researcher *constructs* a way of looking at these concepts. The concept of leadership may be looked at in construct categories of autocratic, democratic, or laissez faire. The concept of efficiency may be looked at through the construct of intelligence and measured through the intelligence quotient (IQ). A theory relating leadership to efficiency may result in the comparison or contrast of the two constructs. A hypothesis would be created to test the theory, and research designed to test the hypothesis could result in conclusions of findings about the theorized relationship.

Constructs are putting concepts into measurable research terms. Constructs are also known as *variables* in the research tradition, especially when the construct is put in a context that makes it describable or measurable. A variable in research is a construct that can change. It can take on different values. A variable is something that can be described or that can take on a numerical value. In most research the variables are the basic elements of information and comparison.

These terms – concepts, constructs, variables, and theories – are the foundation of the literature review. The researcher must do an exhaustive review of the literature which deals with the concept or construct that she or he is planning to study, capture the pertinent features of that literature, arrange that selected literature into a coherent order to make the case for the research that will follow, and describe the theory upon which the research will be based. Once the sources of previous research are identified and consumed it is time to draw the pieces together into a coherent summary of the status of inquiry on the subject.

Writing the Literature Review

The literature selected from the search should provide a firm basis to previous studies regarding the concept under review. The sources selected to be used in the literature review should be organized from the most current and connected by a logical chain of theory to the earlier studies. The general rule is to include sources that are within five years old whenever possible. Sources that are ten years old or older should be used sparingly, unless they are foundational works that ground the theory or the topic of the study. Literature sources should be organized according to some logic created by the reader. Often a literature map can be helpful in this organizing. Instructions for creating a literature map, and examples of well-designed literature maps, are included toward the end of this chapter.

The literature selected for review should come from a variety of sources, should include differing opinions of the theory if they exist, and should make the case for the research that is planned. It does not need to be a complete and extensive historical review of the topic. Each time a piece of research work is read, there should be a list of references or a bibliography. By referring to that bibliography and selecting pertinent references to search out in the original, the author will add immeasurably to the literature review.

When writing a literature review, it is important to provide a synthesized review, rather than a list of studies that resembles an annotated bibliography. Each paragraph included in a literature review should begin with a topic sentence that does not include quotations. The topic sentence is written in the researcher's own words, and states the main idea of the paragraph. The three to four sentences following each topic sentence should include evidence that supports the topic. In most cases, the body of each paragraph should include evidence from more than one study. Occasionally, the writer will spend one or more paragraphs discussing the results of one study, but this practice should not be the norm. To that end, a good literature review is not a list summarizing one piece of literature after another, but rather a synthesized, discursive work that provides a solid foundation for the significance of the research being conducted.

The writer should recognize that the future readers of the report do have expertise in the area of study, so only those reference works that are pertinent to the specific issue or topic need to be included in the search. Logical reference links need to be made from the past work to any recent additions to the theory, and, finally, to the proposed research. Citation of the work of others is crucial in a literature review. There are a variety of accepted stylistic forms that may be used in citations, and the writer should select one form and follow it for referencing the work of others. Proper citations both acknowledge the important work of others and help avoid the problem of plagiarism.

Another part of the literature that needs treatment in the introduction to a research report is the literature on research method. While the method of the study should be treated in detail in another section of the report following the literature section, the writer should put in place a confidence that the method to be used has its foundation in the methodological literature as well. Often the literature in the review will not only provide ample foundational studies, but may also give direction to appropriate methodological considerations. The literature in the field of study should provide the cornerstone for the research, and the methodological literature should provide the blueprint of the structure to be anchored by this cornerstone.

The best advice for authors of research reports is to begin with an outline. List the authors who will be referenced or quoted, and use advanced organizers to assure that the citations selected are on target. Outlining or diagramming the literature review in a literature map prior to writing it will help organize the references around the research construct and will assist the writer in making connections between the previous work and the proposed study. Researchers should identify a method to organize references that is both comfortable and effective. While computer programs exist to support the organization of literature, note cards are still appropriate for coding and coordinating the literature.

Consumers and producers of research reports must follow a similar thought process as they digest previous research and prepare new projects. It is incumbent upon both the consumer and the producer to read the background literature – the previous research – as a foundation for reading the new or designing the future. The first basic step is to read and understand what has happened in the field prior to the attempt to advance that field. That is, the first step, in short, is to *read*. Special attention should be given to the selection and evaluation of the literature selected. Keyword searches that use the basic, accepted words or terms in the theoretical area being considered, that describe the variables or tools being sought or studied, and that define the phenomena under scrutiny from the beginning of finding the things to read, should be used.

A graduate student in education often comes to a research course with a problem or issue area in mind. Such was the case for a student in the Doctoral Program at Edgewood College. This student studied the prevalence of minority superintendents in the Midwest, and the issues that both sitting and prospective administrators of color faced in achieving their jobs and aspiring to higher levels of administration. Since there was a dearth of research on the specific topic, he needed to outline a literature search that would provide a foundation around the topic. His outline included literature from the broad category of leadership, including an empirical section on traditional styles and another on non-traditional leadership. Added to this foundation were publications focused directly on the topic of African-American school superintendents.

The author of this study reviewed the theoretical and empirical literature foundation on three interrelated variables associated with the chief school officer position as a basis for a conceptual framework. Those three variables were as follows:

- Leadership Theory.
- Non-traditional Leadership Theory.
- African-American Sitting and Aspiring Superintendents.

His review of the literature was developed from a systemic search for books, studies, and articles concerning the broad topic of traditional and non-traditional leadership theories, the specific role of the superintendent, and the plight of African-American superintendents. He located books, studies, and articles using World Cat, ERIC, ProQuest Information and Learning Education Journals, Academic Search Premier, Inter-library Loans, and other databases and online catalog files about the selected topics. Keywords used in the search included underrepresentation, unrealistic expectations, unequal treatment, cultural congruence, and the particular needs of African-American sitting and aspiring superintendents (Bates, 2006).

Cautions

Judging the veracity of research in some reports can be challenging. As mentioned in Chapter 5, some published research may not be true or accurate. Two considerations to keep in mind when reading research were mentioned. The first was the importance of peer review for research validation. Reputable journals convene a jury of experts in the different areas of research and use those experts to provide feedback before publication of manuscripts. In most cases the name of the author or authors of the paper are removed, making it a blind review. The reviewers themselves are also anonymous, which provides for impartial and honest reviews.

Peer Review

Peer review is having the published results of a research project analyzed and appraised by a jury of experts. It is submitting the results of the project to professional colleagues with expertise in the area under study to look for flaws in the research. Professional journals are often referred to as "peer-reviewed" journals. This means that results of research projects when written up in the classical fashion for research are sent to a jury of experts for a blind review. Jurors reply to the publication editors whether or not the article is acceptable for publication.

A problem with peer review, however, is that it is only as good as the individuals selected to do the review. They too may suffer from a bias about the treatment under consideration and may not be able to provide an objective review. A reader needs to ask the question about the potential for bias in a reviewer's analysis of any research. As mentioned above, bias in a peer review may be the result of the selection of reviewers who exhibit a predetermined view that is consistent with the funding source for the research.

In fact, in recent years the opportunity for peer review of research, both quantitative and qualitative, has been placed in jeopardy. With the increasing use of the internet as a tool for dissemination, and the immediate demand for results of research to support a position or an issue, or to respond to a policy direction, this very important step in the process has been ignored. Unbiased and blind peer reviews are essential to the continued validity and reliability of professional research.

Outside of professional journals that do peer review, many research reports come from independent sources and are contracted by those sources to create and carry out the research. Readers must beware of the ethical issues associated with reports that are structured to reach a foregone conclusion. Usually referred to as think tanks, these organizations are advocacy groups for specific topics in social policy or political influence. Think tanks occur across the political spectrum, from ultra conservative to progressive to liberal. Funding sources and the audience to be influenced provide direction to the research done by or through these think tanks. The authors of think tank documents are depicted as neutral researchers, but they are often directed to support a particular political or social perspective.

Resources

Consumers of research in education have many tools available to find the resources that lead to literature in research. The three most widely used search engines for all areas of study were mentioned in Chapter 5. They are Google (http://google.com/), including Google Scholar (https://scholar.google.com/), Bing (www.bing.com/), and Yahoo! (www.yahoo.com/). Two additional sites that may be added to the previous two for overall web searches are the Library of Congress (www.loc.gov/) and Ask (www.ask.com/). Many other web search engines do exist for information or literature searches that are focused on specific topics or genres.

A popular internet-based site that provides a researcher with both information about topics and tools of discovery is Wikipedia (http://en.wikipedia.org/wiki/Main_Page). Wikipedia is an online encyclopedia that relies on experts publishing on topics, and the entries are subject to open editing by users. Another source that has been a traditional resource for research in education for education consumers or researchers is an online database provided by the

U.S. Department of Education through the Education Resources Information Center known as ERIC (http://eric.ed.gov/).

The Institute of Education Sciences (IES) of the U.S. Department of Education sponsors ERIC, and it is considered to be the world's premier database of journal and non-journal education literature. The ERIC online system provides the public with a centralized ERIC website for searching the ERIC bibliographic database of more than 1.1 million citations going back to 1966. More than 107,000 full-text, non-journal documents previously available through fee-based services only are now available for free. ERIC is moving forward with its modernization program, and has begun adding additional materials and sources to the database.

An example of the use of the ERIC system would be to enter the website uniform resource locator (URL) provided above into an internet access site and type in the search box something like "research literature." The result of this search (as of this writing) is references to 56,031 separate citations. Once in this main section of over 49,000 entries, the system allows a searcher to narrow the field by selecting additional descriptors or by limiting the sources to journals or other types of publications. The main page has choices for publication date, publication type, education level, authors, audience, sources, or specific descriptors. In this example the search descriptor selected was literature reviews. This narrowing produced 16,179 citations and one of the first was a reference to the book *Beyond synthesis: A re-presenting heterogeneous research literature* (Sylvester et al., 2013). A link to the book's publisher is provided on the screen. Other citations resulting from this search are full-text manuscripts or peer-reviewed-only texts that can be accessed directly on the screen.

This example of a search for research literature from the ERIC database resulted in both topical and methodological citations. Suppose the visitor is interested in research in the area of teaching reading. By selecting the ERIC provided descriptor "reading instruction" to narrow the search, the result is 768 citations that deal with this topic. Thus the search was narrowed from over 56,000 entries in the broad area of research literature, to nearly 16,000 citations in the narrower area of literature reviews, to the specific inquiry for reading instruction articles from the *Reading Teacher* journal yielding 53 entries. A further step in this example may be to select the publication type "Reports – Research." The result is 20 articles that are research reports on the topic of reading instruction.

A typical entry from the ERIC resource provides the title of the publication, the author's name, date of publication, the journal or other collection where the article was published, whether or not it was peer reviewed, and whether or not it is available in full text on the ERIC system. Most valuable is the abstract for each entry provided in the synopsis, and the keywords that describe the work. These keywords may be used in further searches to find additional citations that may not be in the original group.

Bias in Reviews

Reference was made in Chapter 5 regarding the need to proceed with caution in the selection of literature. Two areas were mentioned: the lack of peer review and the ability to edit results for one's own purposes. When preparing a literature review for a research project there are two additional concerns to consider. The first is publication bias. Publication bias is the tendency of journal editors to systematically select manuscripts that match either their own professional bias or that of the journal. Research reports with differing or conflicting results from the desired findings are summarily ignored and not published. In addition, research papers where there is no significance derived in a replication of studies are often ignored as well. Thus the reader is led to believe that the chain of research is unblemished by disagreeing results when in fact it is the bias of the editor or publisher that makes it seem so.

Literature bias is the selection of research that supports only the writer's point of view. Articles or reports that offer a differing result from the writer's preconceived conceptualization of the topic are ignored and not included in the background literature review. It is essential for the writer to both seek out and then present conflicting findings in the research. Having a balanced view alleviates the image of the researcher having a potential conflict of interest on the topic, and makes any argument resulting from the study that much stronger.

Literature Maps

In this chapter we have described what a literature review is. Regardless of whether you are a graduate student writing a thesis or a dissertation, or a professional writing a research paper, you will need to include a synthesized review of the literature that supports your research topic. We introduced outlining as a strategy for organizing a literature review. Another helpful tool is the literature map. Literature mapping is a scoping technique used at the very beginning of the literature review that is very similar to brainstorming. A literature map is a graphic representation of ideas, topics, and concepts, and the relationships between those ideas, topics, and concepts, that support the topic of the study being reviewed in the literature. Literature mapping is useful for organizing the topics presented in the review and for clarifying key arguments presented in the literature. The process of literature mapping is similar to mind mapping or concept mapping, and includes: (1) writing down the main idea (which could also be the research question) enclosed in a shape (circle or rectangle) in the middle of the page; (2) brainstorming ideas that support the main idea in shapes surrounding the central main idea; (3) reading articles, books, and working papers that are germane to each of the supporting ideas, and writing down the authors and dates of the supporting articles (making sure to include the full citations in the reference list); you can also create hyperlinks to relevant articles; (4) connecting supporting ideas with relationship connector lines; connector lines can show one-way or two-way relationships by using one or two arrows; (5) adding additional concepts as you read articles and identify new key ideas; (6) presenting the map is an organized, visual representation that, ideally, fits on one page.

To offer a practical application and example of literature mapping, one of our graduate students presented his literature map in graphic form (Casper, 2015). Casper studied the factors that affect student persistence to complete a two-year program of study. He identified authors of previous research under each of his factors and used the diagram to write his literature review. Figure 7.1 shows the structure of the literature map created and used by Casper (2015).

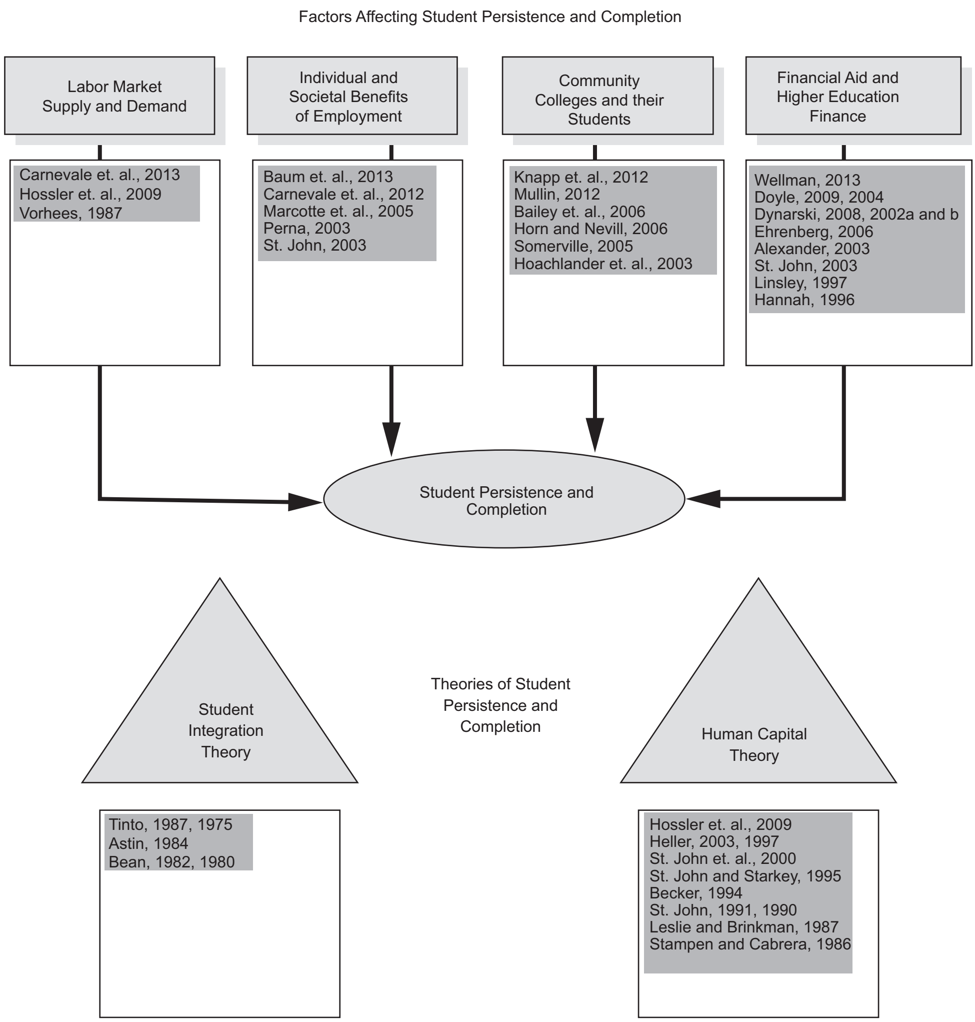

Figure 7.1 Literature Map.

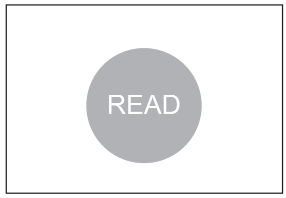

Figure 7.2 Read.

Summary

The search for and the reporting of relevant literature is the foundation of any research project. In order for the project to be stable and reliable, the foundation needs to be firm. While there are numerous avenues of finding literature online, sometimes nothing beats a trip to the library as part of a search for literature on a subject or topic of interest. Resources not yet available online may be found in hard cover texts in library collections. While Google Scholar provides access to numerous citations available in a library, having a human resource in the person of a librarian is often quite helpful. Bibliographic citations in items selected may lead to additional literature for the reader to consume. When looking for research literature, the search should have a narrowing rather than an expanding goal so that the help desired is realized.

Each of the steps of research may be summarized and referenced with one word. This first step may be thought of as the need to *read* before starting any other part of a research project (Figure 7.2).

Resources

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In-class Exercises

Introduce literature mapping exercise in class. Ask students to brainstorm literature review topics that align with their research topic of interest.

Assignments

Literature mapping assignment (outlined below).

Literature Mapping Activity

Mapping is a very useful graphical technique that helps you visualize connections and relative relationships between things. In the case of literature, these associations are between literatures, and mapping can help identify issues such as proximity and connections in terms of ideas and findings. Once you have analyzed a paper using critical techniques, you need to decide how it fits in with other literature you have already analyzed. You can achieve this by literature mapping, which involves broadly identifying the key concepts across the literature and how each paper or piece of material fits into this overall conceptual map.

You should start by answering the following questions in relation to your reading:

1. Write down the major themes from the literature that are relevant to your research.
2. Write down any areas of consensus between different authors.
3. Write down any areas of dispute or disagreement between particular authors.
4. State if there are any special reasons which may account for the different views held by different authors. For example, have they conducted their research at different times or using different techniques?
5. Note the implications which both the cases of consensus and the disagreements have for your own research if applicable.
6. Every time you read new literature ask yourself: Where does this paper fit in and does it alter any of my answers to the previous five questions?

Literature mapping practice

a. Select an article that is germane to your research topic. Review the literature review for the article that you chose.
b. Indicate places where the literature is used to do the following:
   i. Introduce a problem.
   ii. Introduce a theory.
   iii. Provide direction to the research questions.
   iv. Compare results with existing literature or predictions.
c. Map the literature as you think the author may have mapped it before writing the review of the literature.

8 The Purpose of the Study

Step 2 THINK: Analyze Existing Research and Specify the Research Topic

One of the most difficult challenges in the research process is selecting and narrowing or focusing on an appropriate research topic. Theories abound. Theoretical underpinnings of research are derived from the philosophical thought on the phenomenon under study: the beginning of the *think* process for inquiry. Structures or patterns that pull together different theories or ideas about a topic are referred to as a *paradigm*. Research paradigms provide a framework for the researcher to organize the thinking into a structured project.

It is true that the general topical area must be selected in order for the original literature review to take shape, but it is after consuming the literature that the precise focus of the project is generated. As explained in Chapter 7, the first step of the research process is to identify a gap in the literature, which in turn establishes the need for research to fill the gap. It is crucial that the researcher have a very specific topic, about which meaningful questions may be asked and answered. Too often the theory behind a research project is broad and overarching, not nearly focused enough for delineating tangible research efforts.

The prospective researcher may have some vague notions about what to study, and these general notions must be sifted and winnowed until there are specific ideas for the research. The topic needs to be well defined and narrow so that the data collected may be linked directly to the questions and answers posed. There must be unanswered questions about the problem. For the researcher, it is essential to identify a basic question to be answered at the core of any research project. Not just any question, but a question that flows from the literature, that is grounded in the theoretical constructs discussed in the literature, and to which an answer may be found through observation, interaction, or experimentation.

One way to view the consolidation of research literature into a workable project is to think of a funnel: a device that is wide at the top and narrow at the bottom. The funnel analogy in research is to combine the ingredients of the literature and the results of previous studies, along with the concepts for the intended research, at

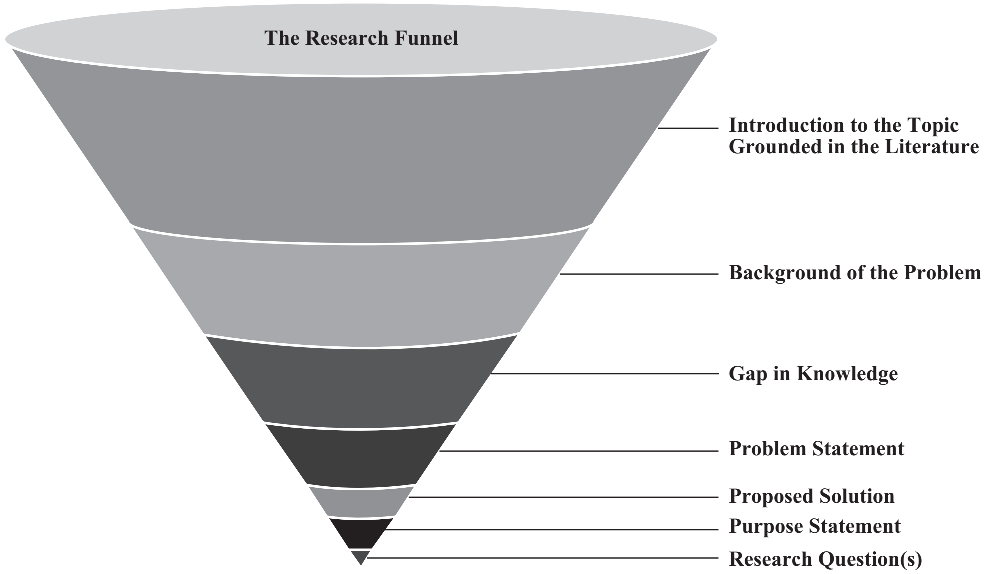

Figure 8.1 The Research Funnel.

the top or wide end of the funnel. Then, through careful analysis, to use the funnel function to synthesize the mixture to result in a more focused topic or question for research. That is, to begin with a wide array of research information and literature, then narrow that background information into questions that relate directly to the research topic under consideration (Figure 8.1).

When defining a research topic there are two operative terms: *change* and *description*. To do research is to observe and describe phenomena or measure change that occurs for reasons that may be described. Once the researcher has a solid handle on the theory and the literature surrounding the issue area, then a reasonable description of what the research is all about needs to be done. It starts with a problem area that may surface either in the literature or in the real-life situation of the researcher. One reason to read the research literature is to get to the bottom of the identified problem, which may have been solved by other researchers. If it has not been solved sufficiently for the researcher, then a structure to solve that problem, a research paradigm, needs to be organized. The first step in this problem-solving is to conceptualize the topic.

The research topic must be analyzed according to its constituent parts that become the subject or object of the research. A clear and concise question must be posed regarding the theory. The researcher needs to arrive at a generalization that results from a perception of things read or experienced, and that generalization is the researcher's conceptualization of the problem. Research moves from conceptualization through operationalization by analyzing, studying, and eventually answering the question. Categories for researchers to consider include the research concepts, the constructs or variables, and the hypothetical interaction of the variables. Think of the funnel analogy as a method for this analysis.

Research Concepts

Often, the theory that forms the basis of the research has well-identified and acceptable theoretical concepts that may be used to identify the research topic and its components. Sometimes it is up to the researcher to create these concepts from existing or newly defined ideas or suppositions from the theoretical area. In many cases the concepts are already provided through previous research or existing definitions. A research concept is an idea or an abstraction from an idea. Taking concepts and providing definitions, especially definitions meaningful to a research project, is the beginning of the conceptualization phase.

Conceptualization takes the ideas and creates a reasoned structure that gives further meaning to the concepts, or interprets either the individual concepts or the interaction of concepts. Bringing concepts together in a meaningful way is the second *think* stage of inquiry. For example, *literacy* and *learning* are theoretical concepts. Each may be defined, and may be defined specifically in research terms. *Learning to read* is a conceptualization that develops or clarifies the two concepts. These are concepts and a conceptualization that have been the subject of much research in education.

Research Constructs

Research constructs are the next consideration in the think stage. The thoughtful structuring of concepts or conceptual elements of the research includes the creation of research variables for the study. A variable, based on its root word stem, is something that can change or vary. Variables have differences. It is important to note that the research constructs – the variables – need concise and measureable descriptions. Using learning to read as the conceptualization, the research construct or variable could be reading *comprehension* as measured by standardized tests. Comprehension is a research construct derived from the concepts of learning and literacy.

Whatever method is used, the researcher must make it very clear what she or he plans to do with the constructs in the research project. This is the beginning of the transition from concept to operation. By defining the variables that are to be part of the study, the researcher has a start in the operational aspects of the project. The next step in the think stage is to imagine an interaction within, between, or among variables; for example, the question "How does time on task effect reading comprehension?" Basic research questions or research hypotheses are the tools used in this step, and the research paradigm is the structure or model.

Well-defined variables are also an essential component of stating the research topic in hypothesis form. The hypothesis is a more sophisticated version of the research topic than the basic question. Most often the hypothesis is a statement of expected outcomes in addition to being a question to be answered in the research. Most good hypotheses and basic research questions can be alternate forms of one another. They both flow from a problem or issue that the researcher needs to know more about, and they both define exactly what will be done to quantify this knowledge. Since change is the operative concept in research, the questions or hypotheses must be measureable in order for the research to be made operational.

Hypothesis Generation

The hypothesis lays out the expected relationship between or among the variables that are based on the theory or the previous research. Hypotheses, like the basic questions, are formulated in order to guide and direct the development of a research design. One typical form for writing hypotheses is to use an "If [.] then [.]" syllogism. A syllogism compares an action to a reaction, or uses a basic proposition to predict a conclusion. The "if" part is the proposition or action; the "then" part is the conclusion or reaction. For example, a research hypothesis may be, "If students are provided with more direct instruction in mathematics, then their math scores will improve." The variables here are time in direct instruction and mathematics test scores. The relationship is one of looking for a positive correlation. The presumption is that as instruction increases, mathematics test scores will increase.

Another form of hypothesis writing is to use a null and alternate form. First, a null hypothesis is written. The null hypothesis is set up to be refuted, or "nullified" by the results of the research in order to accept or support an "alternate" or "alternative" hypothesis. For example, a null hypothesis might state: "There will be no change in reading scores if class size is reduced." Then the *contrapositive* of the null hypothesis is stated as an alternative hypothesis: "Reducing class size will improve reading comprehension." Once again there are two variables, reading comprehension and class size, and the relationship to be studied is correlational as well.

In qualitative studies, hypotheses are not tested in the same way that they are tested quantitatively. However, qualitative researchers offer theories about phenomena that are grounded in scholarship, or in experiences, or both. Qualitative studies often focus on theory-building rather than theory-testing, but it is feasible for researchers conducting qualitative studies to start with a theory in mind. Qualitative approaches like grounded theory aim to detect patterns in their observations or in interview transcripts and then to create working hypotheses that ultimately direct the progression of the inquiry, rather than test hypotheses.

Whether it is the use of basic questions, problem statements, or hypotheses, the design for the research, or the research paradigm, is the model or pattern to be followed when carrying out the research project. In selecting and defining an area to be researched, the investigator should:

- Be knowledgeable of the *theory* that defines the area of study.
- Review the relevant *literature* in the area of study.
- Visualize a *problem* or *issue* that is connected to the theory.
- Identify and define the *concepts* to be studied.
- Develop or clarify (*conceptualize*) relationships within, between, or among defined concepts.
- Identify research *constructs* (or *variables*) from the conceptualization.
- *Describe* the constructs (variables) in operational (measurable) terms.
- Ask a *basic question* or state a research *hypothesis* to be tested.
- Project how information can be collected to answer the question or test the hypothesis (the research *paradigm*).

When taken together, the above items may be considered the basic steps in the *think* process of doing research.

Problem Statement

A problem statement is a clear description of a problem or issue that may be addressed through research. It is the focus of the research. The problem statement in any research study provides the context for investigation, and helps frame the research questions. The problem statement represents what is known about the particular issue, what is not known about the particular issue, and the gap that the research study aims to address.

A problem statement is not developed in a vacuum. Rather, it emerges only after a thorough review of the literature. Whereas a problem statement is often aligned with the researcher's experiences, it cannot be grounded solely in experience. For example, if a researcher identifies a challenge in a work setting that he or she plans to investigate through a research study, it is important for the researcher to situate the problem in the broader context of the literature.

Writing a problem statement can be challenging, but there are useful strategies for writing a concise and meaningful problem statement that aligns with the research question(s) and leads the reader to know the purpose of the study. A problem statement should be no more than one paragraph, and ideally includes three parts: (1) the ideal or desired situation or condition; (2) the reality of the situation, the problem, which calls for a solution. This part describes the gap in the literature that the research study will attempt to address; and (3) the consequences or recommendations for solving the problem. Here is an example.

(Part 1) Midwestern College seeks to increase its African-American, Latino/a, Asian, and Native American (ALANA) faculty by 30 percent because research shows that a diverse faculty helps diversify the curriculum and nurture an inclusive classroom and institutional culture (cite). Research also shows that despite institutional mission statements that boast valuing diversity, the hiring practices at many universities fail to be intentional about recruiting a diverse candidate pool (cite). (Part 2) Currently, 90 percent of faculty who work at Midwestern College are White; however, the student body enrolls 60 percent ALANA students. On the campus climate survey, ALANA students reported a hostile racial climate, particularly in the classroom. Moreover, first- to second-year retention rates for White students is 90 percent, whereas retention rates for ALANA students is 65 percent (cite). (Part 3) In response to this problem, the present study examines the hiring practices employed by Midwestern College to determine their intentionality of increasing the representation of ALANA faculty. By interviewing department chairs, current faculty, and human resources professionals employed at the College, this qualitative case study seeks to understand the barriers to creating a more inclusive campus climate.

Going back to the funnel analogy, the statement of the problem typically ends with a statement of purpose and the research questions being posed in the study. After the research presents the problem and identifies the gap in the literature that the study aims to address, the logical next step is to state the purpose of the study. The purpose statement can also state the study methodology being used to carry out the research. The purpose statement is often followed by the statement of specific research questions and hypotheses.

Most research papers begin with an introduction that introduces the topic being investigated, provides a summary of literature that supports the topic, and discusses the background and/or context of the study. The first few pages of a research paper typically include the introduction, problem statement, statement of the purpose, and research questions. Literature is cited throughout these first few pages to establish evidence that the research study will make a significant contribution to the field. After the researcher communicates these important elements in the introduction, the theory or framework guiding the work is introduced and described. The theoretical or conceptual framework is arguably the most important part of the research paper because it serves as the foundation for the study, for the formulation of the data-collection instrument, for the organization of the literature review, and even for organizing and reporting results. The theoretical or conceptual framework is grounded in the literature, and illustrates the predicted relationship(s) between and among variables (in quantitative studies) and/or concepts or ideas (in qualitative studies). The following section delineates the main differences between a theoretical model and a conceptual framework. The topic being investigated, the research questions being examined, and the nature of the study will determine whether a researcher uses a theoretical or conceptual framework, but regardless of the type, a research paper is incomplete without a guiding framework.

Theoretical/Conceptual Frameworking

Theoretical Modeling

A theoretical model is an established model that flows from existing theories and either attempts to add to the theory or is intended to test all or part of the existing theory. The literature that is the work of previous researchers is used to build the framework for the current project. Competing theories from different sources may be used to structure the new argument. The theoretical model is a useful tool to identify the boundaries of the project and to make clear the problem or hypothesis being studied. By using a diagram of the interaction of the theories or concepts that form the constructs for the project, the researcher is able to provide a conspectus of the intended project. In a theoretical model the researcher links existing theory with the constructs selected for her or his research and the basic questions or hypotheses being considered.

An example of the use of a theoretical model was a student's use of Erikson's Psychosocial Theory (1968) in designing a research project to measure the impact of advance placement (AP) courses on the time students take to complete a post-secondary degree. Erikson posited eight stages of development, including an adolescent stage with a developmental task of vocational choices. In this research the author used that piece of the Erickson theoretical model – Identity vs. Role Confusion – and built a study to determine the value of AP courses in students' decision-making regarding post-secondary education (Turgeson, 2015). Her basic question was based on the foundational theory of Erikson (1968), and was therefore a theoretical model.

A conceptual framework is also grounded in the literature, but is not an established theory. A conceptual framework shows the relationship between variables or constructs from the perspective of the researcher based on practical experiences. A conceptual model may also be an adaptation of a model presented in a previous study that helps to explain a particular phenomenon. Often a diagram is helpful in fulfilling the hypothesis-building

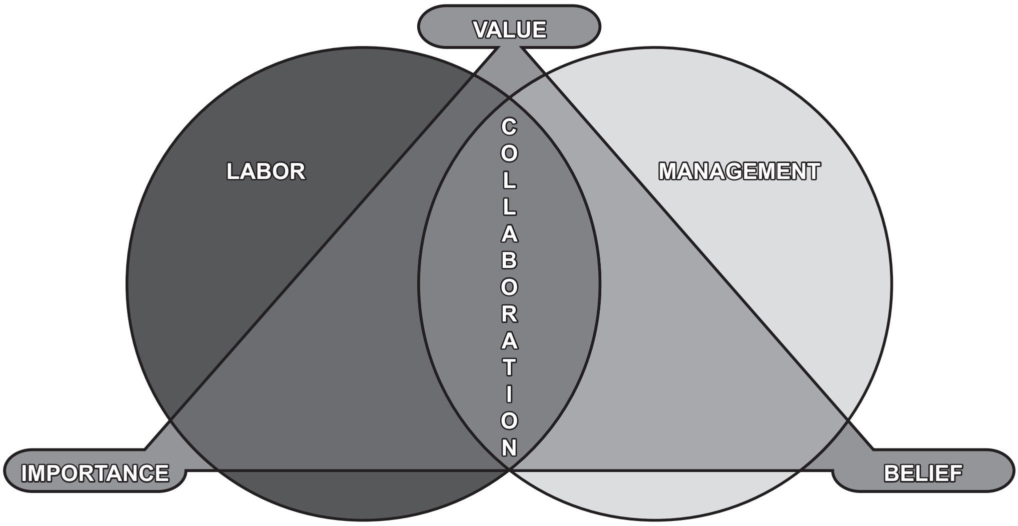

Figure 8.2 A Labor/Management Collaboration Conceptual Model.

stage of research. When the researcher combines specific concepts to create the research question rather than drawing directly from existing theory, a conceptual model may be used to describe the interaction of the selected concepts. Two examples of depicting a research project in a conceptual model follow. In the first example a research project that used the concepts of collaboration between labor and management is depicted in Figure 8.2.

In this case the researcher reviewed the literature based on the concept of collaboration between labor and management and designed a study to determine beliefs of management and managers' attitudes regarding the value and importance of collaboration (Elworthy, 2012).

In the second example, the student studied the use of technology in teaching. The graduate student used the existing research on the diffusion of innovations to help synthesize research questions and designed a framework for the analysis. Figure 8.3 shows that framework (Diedrick, 2014).

The purpose of showing the diagram in Figure 8.3 was to specify concepts to be studied under the basic research questions, which were as follows:

1. What demographic characteristics of faculty members are associated with their current status of using digital content?
2. What skills do faculty members perceive as needed to increase the likelihood of faculty use of digital content as a teaching or learning strategy?

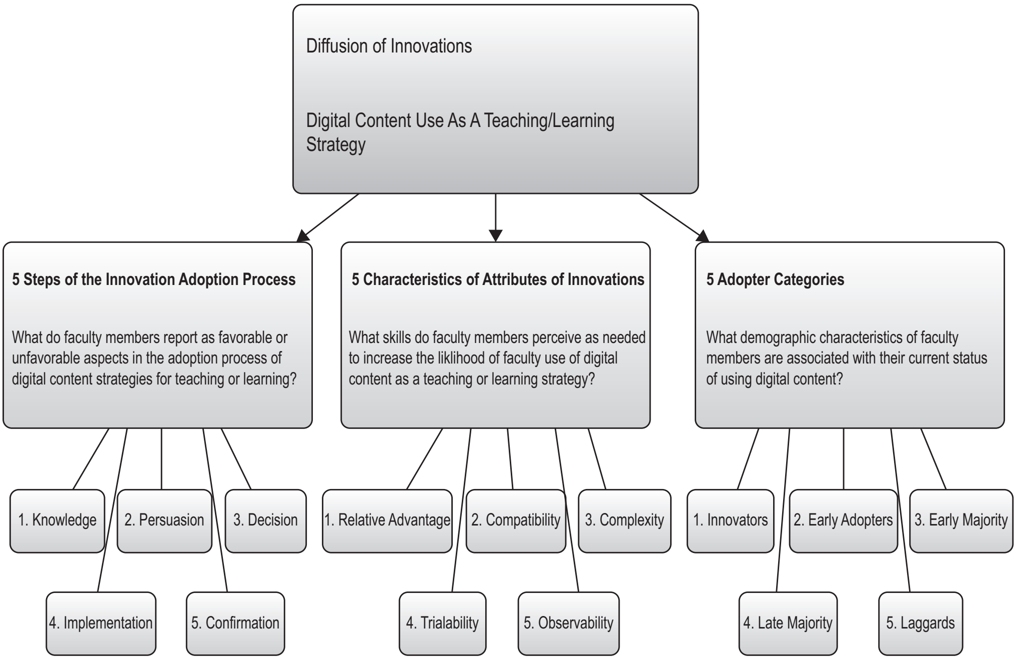

Figure 8.3 Diffusion of Innovations Conceptual Model.

3. What do faculty members report as favorable or unfavorable aspects in the adoption process of digital content strategies for teaching or learning?

Linkages

Just as the behavior behind the first step was to *read*, the inquiry behavior behind this second step, easily enough, is to *think*. Actually it is not a separate behavior, but one inextricably bound up with the first (to *read*), and one that should result in some note-taking to capture the thought process for future review and use. All of the time spent reading should be "think time" as well. Whether the reader is looking to answer a question, or to solve a problem, or to design a research project, the time reading the literature is the time to start posing the question that the literature may help to answer or may lead to a potential research design. Once the researcher or reader has consumed what is possible or available from previous research, cognitive processes must take over to recognize connections, to question spurious conclusions, or to design a model for future work. This thought process must make direct and logical linkages to the literature, or between research studies, and must provide the next level of growth for the profession or for the workplace.

Using the example begun in Chapter 7, the reader may see in the ERIC search a reference to a study of reading instruction in the first grade. One such entry was "A comparison of first graders' reading with little books or literature-based basal anthologies" written by S. Menon and E.H. Hiebert in 2005. The ERIC citation identifies the source of the article to be a journal called *Reading Research Quarterly*. The abstract provided states:

> This study examined the effectiveness of a little book curriculum in facilitating the independent word-solving skills of first-grade readers. The curriculum was based on a theoretical model that identified two critical dimensions of text-based support for beginning readers: linguistic content and cognitive load.

This entire document is available online through the website of the journal, which is provided by ERIC. Thus the reader can review the complete manuscript in two clicks of the mouse, can focus on one or more areas of direct interest, can refer to the bibliography provided in this document, perhaps follow up on one or more of the references, and draw a logical conclusion about the next step in the process.

To help the reader's or researcher's thought process within this topic, the additional citations in the first text may be sought out in the original, or the references and summaries provided in the text may move the thought process forward to a logical conclusion. Attention should be paid not only to the definitions of the issues under study but also to the way in which the study is conducted. This provides a roadmap for new research. In addition, the references within the citations may provide a deeper understanding of the issue and, therefore, help the thinking component of the research design process. The reader of the literature cited above may wonder, "How would the linguistic content technique work in my classroom?" This question would lead to the design of a research project.

Basic Questions

While helpful, it is not required that a theoretical model or a conceptual framework be pictured in a figure. The logical steps in moving from theory to research project may be outlined in prose as well. An example of thought processing following digesting of research materials may be drawn from a research student who began her study with two issues. She read what emerged for researchers and policy shapers regarding the supply and demand of teachers, especially hiring a sufficient quantity of teachers for every classroom, and then ensuring maintenance of the quality of teachers in every classroom. An added variable was that the focus of the research would be high-poverty, urban schools. Thinking about these concepts, this researcher decided to focus on the teacher retention component, and to isolate one aspect of a retention program in an urban school district: mentoring.

The hypothesis of the study was that a mentoring program would increase teacher retention in high-poverty, urban schools since the literature pointed out that mentoring programs should decrease teacher attrition. Three basic questions were designed and proposed for the study:

- Do beginning teachers perceive that a teacher mentoring program increases their desire to remain in a high-poverty school in an urban school district?
- What factors are seen as significant by beginning teachers in determining the effectiveness of a teacher mentoring program to assist with their preparation to become a quality teacher?
- Do beginning teachers perceive that a teacher mentoring program increases their desire to remain in the teaching profession?

(Florian, 2005)

These basic research questions provide the direction for not only the data collection for the project but also for the analysis and subsequent reporting of the results. It is important to ask questions that are not in the "yes" or "no" style, so that discussion and debate can occur with the reported results and conclusions drawn. These are the mechanisms for knowledge to grow through research.

Summary

The first two steps of research, linked together, tell a researcher to first *read* about the subject, especially the existing research already completed, and then to *think* about what she or he wants to do in a research project. These two activities, taken together, form a solid foundation for the individual embarking on a research project (Figure 8.4).

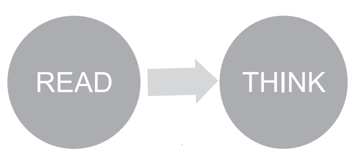

Figure 8.4 Read – Think.

Resources

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In-class Exercises

1. From your experience identify concepts and then variables and state a relationship between or among the variables.
2. Using teachers and administrators as subject groups, state a relationship that represents a difference between the groups. State a relationship that represents a similarity.

Discussion Items

1. State a research hypothesis in an "If [.] then [.]" syllogism. How could this be stated as a research question?
2. Create null and alternate hypotheses for the relationship between the variables "teacher salary" and "job satisfaction."

Assignments

1. Why are operational definitions important for research?
2. Search out a research paradigm and explain its use.

9 The Design of the Study

Step 3 DESIGN: Select a Research Methodology

The basic types of research were a topic of discussion in Chapter 5. Quantitative research was differentiated from qualitative research by distinguishing the types of data used. Quantitative research needs numerical data; and qualitative research most often, and sometimes exclusively, relies on text – or words – for data. Each of these basic types has specific sub-methods that are selected for use based on the different types of information collected, and from whom or from where it is gathered. The type of data that will be collected determines the way the researcher designs the study. The design, or research paradigm, is the structure or framework for carrying out the work. It is the pattern the researcher uses to complete the project.

The scientific research method relies on the experimental approach to design. It is a quantitative methodology that analyzes numerical data. Theories, or new propositions regarding the theory, are built and then tested under controlled conditions. The research design is established to plan the strategy of investigation that will either answer the research questions or will be used to test the research hypotheses. Control of the variables, classically referred to as control of the "variance," is the cornerstone of the scientific/experimental approach. Variance is a measure of dispersion or the spread of data around either a measure of central tendency or an expected result. The tighter the spread of data (controlled variance) the more accurate the research results.

As mentioned earlier, treatments may be applied to one or more of the groups in the research, or certain conditions may be manipulated while others are held constant. Then the influence of the manipulation that results in changed conditions is measured and evaluated. Thus if a researcher knows that she or he is planning to change or manipulate a condition in the research project, and feels confident that other (extraneous) variables can be held constant, then the design of the project should follow the experimental or scientific approach.

If the researcher does not change or attempt to change conditions or influence the variables in any way, the research design may be non-experimental. As mentioned in Chapter 1, the research that is in between these two types – quasi-experimental research – is the manipulation of conditions when there is no potential for control of outside influences. Thus in designing the research the researcher must:

- Know the type of data that will be collected.
- Determine whether or not change will be introduced into the system.
- Recognize whether or not outside influences can be controlled.

Experimental Design

Experimental design, which is most often the structure used in scientific research, is based on random selection of subjects and quantifiable, numerical data. If there is change introduced with the guarantee that external influence can be controlled, then the research method is an experimental design and can also be considered scientific research. If change is introduced and the data are quantitative, but no control is possible for outside variables, then the quasi-experimental method is the design of choice.

Several research designs or paradigms that are in common use in research today are outlined below. Once again, the reader is encouraged to refer to the main texts listed at the end of this chapter to expand on the introduction provided here.

One-group Designs

Symbolically, experiments often use an "E" to stand for the *experimental* group, "C" to represent the *control* group, an "O" to stand for an *observation* or measurement of variables under study, and an "X" to represent a *treatment* done, or the introduction of a stimulus for change. The treatment (the "X") is often referred to as an "independent variable," which is an antecedent to change or a presumed cause of the expected change in the dependent variable. In the examples that follow, the subscripts represent the successive iterations of observations or treatments. Thus O_2 is a second observation on the same phenomenon and X_2 is a second, or different, treatment.

Research designs that use only one group for analysis do not have a control and experimental group used in comparison. This is sometimes referred to as a pre-experimental design, since it is only one group involved in the measurement and no control group is included in the study. One-group designs for research include the following:

Pre-test-post-test design
O_1 X O_2

An observation is taken at the beginning of the research, a treatment or intervention is introduced, and then a second observation or measurement is taken. Conclusions are drawn based on the differences between the two observations. Usually some measure of central tendency or a comparison of dispersion is used to test the strength of the relationship. For example, a teacher may be interested in how much students learn following an instructional unit. The teacher may do a pre-test that includes the information to be taught (O_1), then teach the lesson (X), and then do a post-test on the material (O_2). Comparing the results would allow conclusions to be drawn regarding the instruction. If a pre-test is not part of the design and the observation is taken after the treatment, it is considered a single measure case study:

$X\ O_2$.
Correlational designs
$O_1\ O_2$

Two observations or more are taken on the same phenomena and those observations are compared for similarities or differences either between groups or within the same group. The correlational design is non-experimental, since no manipulation or treatment takes place with the subject group. A teacher may want to compare students' reading scores with mathematics scores. The two observations are the individual student scores, and the comparison is a correlation of scores for all students. A positive correlation would mean that students who do well in reading do well in mathematics. A negative correlation would indicate that students who do well in one subject do not do well in the other.

Cross-sectional and longitudinal designs
O_1 or $O_1\ O_2\ O_3$, etc.

Cross-sectional designs are the most frequently used in pre-experimental (where there is no treatment or manipulation) or in quasi-experimental research. One observation is taken without treatment. A one-time survey of a select sample is an example. The sample under observation may have predefined groups, such as females and males, that may be compared.

Longitudinal designs extend the correlational design over several observations. It allows for a longitudinal look at the circumstance or phenomenon. The first observation provides the baseline data for the analysis and subsequent observations are used to indicate change over time. Following the income level of college graduates, for instance, would be a longitudinal design. Lock-step comparisons may be made at each stage, or the sum total of the measurements may be used for the final analysis:

Time series or interrupted time series
$O_1\ O_2\ O_3\ O_4$, etc.
$O_1\ O_2\ O_3\ X\ O_4\ O_5$, etc.

Time series analysis is the process of doing observations at specified intervals of time. Analyses of the observations are done to understand change in the variables, and in some cases to predict a future observation. In interrupted time series observations are taken to determine trends over time before any manipulation or treatment is introduced. Then a series of observations are completed following the treatment to determine change over time. An example of a time series may be an individual monitoring the monthly cost of home utilities to predict what the cost for a certain month in the future may be. An interrupted time series analysis would be if the consumer changes the heat setting in the house (treatment) and then observes any differences following the change. Sophisticated statistical techniques exist for the analysis of time series data such as log-linear models or regression analyses. These may be used to test the strength of the relationships and to predict future outcomes.

Multiple Group Designs

Multiple group designs are used when there is both a control group ("C") and an experimental group ("E") being observed. When the researcher wants to compare the results of an intervention or treatment to a group that has not had such change introduced, the multiple group design is used. The different design paradigms using multiple groups include:

Experimental/control groups design.
E: $\mathbf{X}$ O_1
C: __ O_1

The subjects of the research must be part of the same research population. Subjects are assigned randomly to the two groups. One group is given the treatment, and the other is not. Both are subject to the same measurement following the treatment of the experimental group, and the results of those observations are compared to make a judgment about the value or strength of the treatment. When each member of the control group is matched randomly with a member of the experimental group to provide a one-to-one correspondence, the research method is referred to as a "matched subjects" design.

Pre/post-experimental/control groups design
E: O_1 $\mathbf{X}$ O_2
C: O_1 __ O_2

Two observations of both the randomly assigned experimental and control groups are taken, one before the treatment that is given only to the experimental group, and one following the intervention. Comparisons of the first observation (O_1) between the

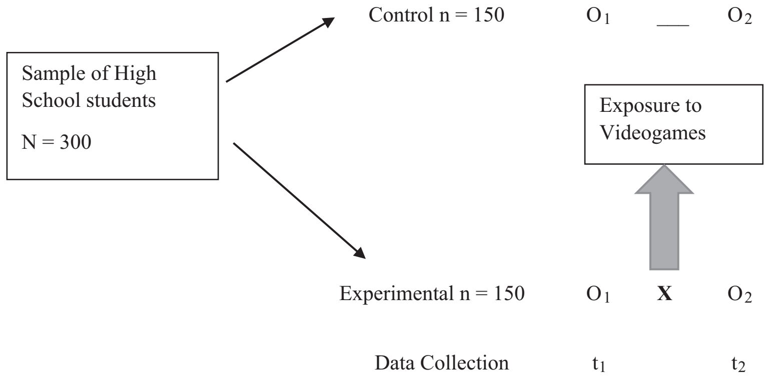

Figure 9.1 A Pre/Post Experimental/Control Research Design.

two groups allow for an assessment of group equivalency. This is done to assure that the groups are roughly similar in the trait being studied. The second observations (O_2) are compared to determine the difference introduced by the treatment.

Since this is a very common design, an example might help. A research hypothesis may be that exposure to violent videogames does not increase the aggression level of high school students (null hypothesis). The alternate hypothesis would be that exposure to violent videogames increases the aggression level. The experiment (research) would be to separate a group of high school students into a control and experimental group, and to do a pre-test on aggression (O_1). Then only the experimental group would play violent videogames (X), and the aggression level of both groups measured again (O_2). This research design, in diagram form, is shown in Figure 9.1.

Three group pre/post-design
E: O_1 **X** O_2
C_1: O_1 — O_2
C_2: — — O_2

Sometimes in the pre-observation of a control group there may be the introduction of change not attributed to the experimental condition. Participants could become test-wise by way of taking the pre-test, or completing the first survey. To help measure whether or not this is occurring, a second control group is established and not subjected to the first observation. This is a three-group pre/post-design.

Solomon four group
E: O_1 **X** O_2
C_1: O_1 — O_2
C_2: — **X** O_2
C_3: — — O_2

One classical control/experimental design for research is referred to as the Solomon four-group design. There are four samples taken from the research population, or one sample is randomly assigned to four groups. The experimental group is measured, given the treatment, and then measured again. The three control groups are set up to once again assure that the differences found following the treatment are not due to spurious events. One group is subjected to both observations, one group is given the treatment and subjected only to the second measurement, and one group is only subjected to the second observation. Comparisons are made between the four groups to determine the strength of the intervention given to only one group.

Ex post facto
$\mathbf{X}_1$: O_1
$\mathbf{X}_2$: O_1

Latin for "after the fact," ex post facto designs include observations or measurements that are taken only after either a single or two separate treatments with differing effects are applied or experienced. Measuring the level of contamination following a breach in a nuclear facility is an example. Separating a sample between smokers and non-smokers and then measuring health effects is another. Ex post facto research is sometimes put in the same category as pre- or quasi-experimental research since direct control is not possible, there is no manipulation by the researcher, and random assignment of research subjects is not feasible. The thinking behind random assignment is that by randomizing treatment assignment, then the group attributes for the different treatments will be roughly equivalent and therefore any effect observed between treatment groups can be linked to the treatment effect and is not a characteristic of the individuals in the group. Usually applied to an intact group, the researcher does not have control of the preconditions of the sample, but is able to define the manipulation and measure the consequence.

Factorial designs
E_1: $\mathbf{X}_1$ O_1
E_2: $\mathbf{X}_2$ O_1

Factorial designs, which use cross-breaks of the sample, are structured when separate categories within a group are to be compared along with the overall effect of the manipulation done. Factorial designs allow the researcher to judge the "main" effect of the treatment, while also assessing the "interactive" effect of the defined subgroups. The most used of the factorial designs is the "Latin square" design which is a two-by-two cross-break of the research sample. Figure 9.2 provides an example of the Latin square approach with the sample divided by gender. In a typical

Treatment	Female	Male
X_1	E_1	E_1
X_2 or Placebo	E_2	E_2

Figure 9.2 A Latin Square Research Design.

research project, either the two groups are subjected to two different treatments, or a single treatment and a placebo, and the treatment results can be determined for each group and between the two groups.

Quasi-experimental Design

If the data are not numerical, or if the researcher introduces no change, then the research design clearly falls under the quasi-experimental or non-experimental methodology, and it is not considered a randomized experiment. It is important to remember, however, that numerical data, as well as textual data, are very much a part of quasi-experimental and non-experimental research. Good research is most often the product of mixed methods, where some quantitative analyses are embedded into a textual review of the issue or basic question.

The quasi-experimental design is used when laboratory conditions that are usually used to control variables extraneous to the research cannot be identified or managed. That is, situations or circumstances other than the experimental treatment exist, and they cannot be organized, explained, or otherwise eliminated. One example of a quasi-experimental design is a one-group pre-test-post-test, which is a before-and-after treatment comparison of one group. In a pre-test-post-test design, the researcher has a hypothesis about what the effect of some treatment will be on a single group, say, a behavior modification technique with a group of unruly students, and the researcher measures the behavior, such as the number of students who need discipline, before the modification and then after. However, there may very well be some other variable at work regarding the behavior, one not measured, that may have an influence on the measured results as well. Sometimes the measurements or observations are done more than once, creating a second quasi-experimental design. When repeated, this methodology is referred to as a time series, or interrupted time series design.

Quasi-experimentation may be part of “ex post facto” research, when the researcher does not have direct control over extraneous independent variables either because they have already occurred or because they cannot be manipulated. In addition, other basic tenets of strict scientific research may be missing as well. These could include a lack of random selection or assignment of subjects that may be necessary for certain statistical tests to be valid, or the ability to replicate the conditions of the study. A precondition for quasi-experimental research, just like with the scientific method, is that there are carefully defined research variables which are measurable. It is in the use of these measurements that conclusions may be drawn regarding the research.

Other examples of quasi-experimental research include such things as doing treatments on a regular schedule, known as equivalent time series design; separating groups based on a precondition and then applying different treatments to the different groups, known as regression-discontinuity design or the nonequivalent control group design; and a design whereby controls are implemented when the design is determined to be inadequate during the research, known as the recurrent institutional cycle design. In addition to these basic quasi-experimental designs there are combinations of each, and there are different problems that arise for each as well. These problems, often referred to as threats to validity (that is, whether the conclusions are reasonable or justifiable), are the subject of specific research texts that are annotated in Chapter 20 (see especially Campbell and Stanley, 1963; Mathison, 2005).

The scientific and quasi-experimental methods are often the means by which researchers are able to make conclusive statements about their studies at a prescribed level of confidence and with a minimum of bias. The level of confidence is selected by the researcher and is subject to statistical testing. Influences such as the confidence level selected, the size of the research groups, and the type of measurement used all contribute to the strength of the conclusions drawn.

The interpretation of quantitative data, especially, is very much subject to bias. For example, the researcher may have a personal stake in the results. In fact, a huge concern in current "scientific" research is the source of external funding for research. Scientists are very concerned that funding sources may bias reported results. In order to minimize the influence of personal stakes and biased opinions, a standard method of testing a hypothesis is expected to be used by all members of the scientific community.

Non-experimental Design

Not all research has an experiment performed as part of the design. There are non-experimental research projects that are just as valid and as meaningful as strictly scientific or quasi-experimental designs. Non-experimental research, and the methods that define this type, form another basic fundamental of the research process. Data come in many forms and are found in various ways. The formal analysis and appraisal of research determines whether these data that are not the result of experiments set up and carried out by the researcher are still valid measures of the concept, phenomena, or construct under study.

Much of social science research is of a non-experimental nature. Terms such as "qualitative research" and "ethnography" are used to describe the work in anthropology, sociology, or other social sciences. Both numerical and verbal data are retrieved from different sources, studied, and conclusions drawn to help understand a phenomenon, solve a problem, answer a question, explain a process, or otherwise elucidate physical or emotional circumstances. Just like the scientific method, however, the non-experimental research project needs careful planning and professional implementation in order to communicate valid and reliable results.

The final research fundamental to be discussed here is the process of validating research projects through the peer-review process. No matter what research design is used in a research project, the results of the project, along with the methods implemented, need the scrutiny of an unbiased but informed public. That is the purpose of peer review, as discussed in Chapter 7.

Other Non-experimental Designs

Chapter 5 contained much information about qualitative research and the types of research designs used in this methodology. Most qualitative research is non-experimental, and the data collected are textual rather than numerical. That does not mean, however, that a solid research design is not possible. Field studies include research that focuses on the relationships among values, attitudes, perceptions, or behaviors of individuals or groups. Field studies are an appropriate method to research complex situations, and they may result in a stronger variable effect, since they are conducted in a realistic setting (the *variable* is a measurable factor, characteristic, or attribute of an individual or a system and the *effect* is the result of a treatment or observation of that individual or system). They are often the structure used to test different methods of doing things, or to determine solutions to practical problems.

Field studies have specific requirements for structuring a research project too. Research designs that do not include experimentation as part of the structure include the following:

- *Historical*. Historical or archival research is concerned with determining, selecting, analyzing, appraising, and understanding events of the past for the purpose of understanding current events, or for predicting events in the future. Historical research answers the question "What was?"
- *Descriptive*. Descriptive research, most often done in a "case study" approach, is used to determine the nature and degree of existing conditions, and to explain those circumstances

from a data-driven viewpoint. Descriptive research answers the question "What is?"

- *Correlational*. Correlational research takes the descriptive one step further and attempts to uncover the degree of the relationship between two or more phenomena in the research project. It looks at the basic similarities or differences of groups or structures, and is often done for making predictions about the relationship. It is an attempt to answer the question "How are they alike (or different)?"
- *Causal-comparative*. One step beyond the correlational, the causal-comparative design is an attempt to describe cause-and-effect relationships between or among observed phenomena. The question asked is "How did (a) influence (b)?"
- *Scholarly personal narrative*. Occasionally one's own person is the subject of the research. Scholarly research may be done using personal anecdotes or reflections, and aligning those data to a thematic structure or research construct. The premise is "What happened and why?"

Mixed Methods

Mixed methods research combines textual (qualitative) and numerical (quantitative) data. It may be used to focus more clearly on the research questions, or to provide reliability of responses. A mixed methods design was used to conduct a study of alternatively certified teachers. The research design employed a quantitative survey followed by a qualitative interview. The two methods were conducted sequentially, first using a deductive instrument and analysis, followed by an inductive process and analysis. The intent was to describe the experiences and perceptions of teachers who received their training through different alternative certification programs. A survey that included first-year teachers' perceptions of essential teacher competencies was created and used to gather base-line data. Each participant selected ten essential behaviors they believed were the most critical for them to perform as beginning teachers. Then a semi-structured interview was individually scheduled with each of the ten participants. Interviewing to find out about the experiences of a particular group was the essence of the research design.

During the interview, the beginning educators rated their preparation in terms of how well their program prepared them to perform the ten competencies they rated as the most important. More specifically, this study was an in-depth phenomenological-based survey and interview process. The rationale for doing a study using the tradition of phenomenology was that the intent of the study was to describe the experiences and perceptions of educators who received their teaching license through an alternative program. The survey provided the essential components of the interview through the participants' quantitative rating of competencies. The interview process guided the research throughout the course of the study as the group of participants reflected on their journey through an alternative certification program. Thus the mixed-methods approach provided a quantitative foundation for the qualitative collection of textual data used to answer the research question (Wade, 2005).

Action Research

As mentioned in Chapter 3, a note needs to be added regarding the concept of "action research." Action research is not, in and of itself, a separate research methodology. It is a combination of several accepted techniques, or the field-based implementation of one or more of the techniques described above. Professions are informed by a knowledge base, and practitioners are expected not only to make use of that knowledge but also to contribute to the development of their knowledge base. Action research is a structure of disciplined inquiry to help working professionals use and create work-based knowledge for the purpose of problem-solving or process improvement.

Action research has three interrelated stages of implementation:

- Initiating action (an intervention).
- Monitoring and adjusting action.
- Evaluating action.

Action research is usually described as a five-step process:

- Problem formulation.
- Data collection.
- Data analysis.
- Reporting of results.
- Action planning.

Action research uses several techniques to provide data for reflection and action:

- Diaries, logs, journals.
- Checklists.
- Surveys.
- Interview schedules.
- Tests.
- Disaggregation by subpopulations.

Most action research falls into the qualitative category of research, but may include field experiments as a technique. Most data are textual, but there may be numerical data such as test scores or survey results that can be quantified. To say that one is doing action research is to say that one or more of the several research methods are being employed to solve a work-site problem.

Considerations

The thought process regarding a research project should result in the researcher fine-tuning the concepts, topics, variables, or phenomena that are to be the research subject. This thought process leads to the third step in the process, the *design* phase. Obviously, if the reader is not interested in designing a research project but only in finding data-based substantiation for program development or change, then the design stage is not essential.

Part of the attention paid to reading other research should be on the use of design. Chapter 7 includes an example using reading instruction as a research topic. The example selected from the literature was a study that compared two different techniques in the teaching of reading, one using basal readers for two first-grade classrooms and the other using little books leveled according to features of linguistic content and cognitive load for two other classrooms. This design is a typical Solomon four-group design with two different treatments being compared between two sets of data. If put in a null-alternate hypothesis structure, the null hypothesis would be that "there is no difference between types of reading instruction," and the alternate would be "using little books as an instructional method in reading will produce better comprehension on the part of the students."

When considering how to design a research project, the reader should ask her or himself:

- What hypotheses can be tested?
- What basic questions need to be answered?
- How can the tests be carried out?
- How can information be gathered to answer the questions?
- What research design works best?
- What has been used in the past?
- What will work in the future?

The researcher who read the research citations used in the example provided earlier, and who has asked her or himself a question about the success of one type of reading instruction compared to another, now needs to design the research project. References have been read about methods of research and results of studies in other fields of work have been consumed, so these background manuscripts may be used to design a research project to study this issue. Concepts from the earlier work could be translated to the current situation. In this example the researcher may take the two techniques and create a survey for teacher colleagues with a numerical agree–disagree continuum of response. Then the researcher may decide to send a survey to a select sample of teachers in the field to determine whether or not an opinion exists that supports one technique over the other. The design then becomes one of survey research.

Another design technique might be the interview. The questions asked may be put in the form of interview questions for teachers such as "Have you used the little books approach to teaching reading? If so, did you use them according to features of linguistic content? Did you consider cognitive load? How would you compare the little books approach to the basal reader technique?" The researcher would then make individual appointments with the research participants to collect the data and the results could be captured on audiotape.

Beyond this example, the researcher has a plethora of potential research designs to use, some of which are outlined in this text. Others are available in the references provided in the Annotated Bibliography (Chapter 20). *Replication* is a customary and very well-accepted approach to designing a research project. Perhaps the teacher interested in the two approaches to reading has a colleague who is teaching at the same level and would be willing to participate in a research project. The two approaches could be used in the two classrooms, modeled after the work published in the research journal. The teachers could then compare their own results to those in the literature, and make a decision about the techniques in their own environment.

Three steps, or three basic steps of doing the research, or understanding what has been read, have been covered. The person doing the inquiry must read the literature, think about what was consumed, and create a plan of action to move forward to the next step in knowing.

Therefore, the third step in the process is to *design* the project (Figure 9.3).

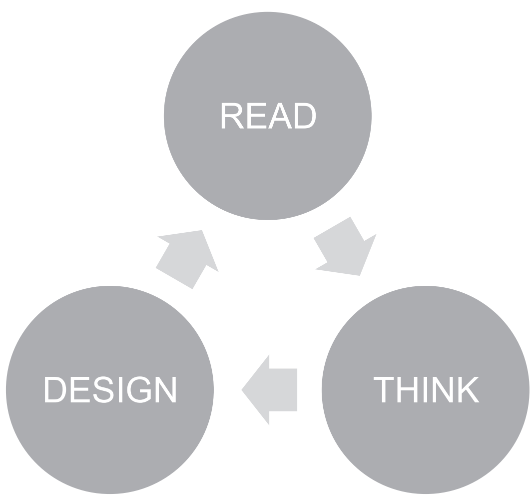

Figure 9.3 Read – Think – Design.

Resources

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In-class Exercises

1. Pair students and have them construct a one-group research design on the topic of behavior.
2. Pair students and have them construct a two-group research design using teachers and students on a topic of students' behavior.

Discussion Items

1. How would a researcher structure a case study on the pupil services available to students in a high school?
2. How would you structure a historical study regarding special education policies?

Assignments

1. State a cause-and-effect relationship (causal-comparative) using teachers and students as participants and learning and behavior as variables.
2. What research design would allow you to make confident statements about the difference in performance in mathematics and science between English-speaking students and English-language learners?

10 Know the Evidence

Step 4 ASSESS: Identify the Data Sources

Chapter 9 introduced the two main types of research design: experimental and non-experimental. Once the theory grounding the research has been established and the topic and methodology have been selected, the researcher needs to identify the source or sources of the information that will be used to determine the results of the research. The research problem and research questions posed call for data collection from sources that can provide evidence for a solution. Researchers must determine from whom, or from what, they will gather data that they will analyze to answer the research question(s). In some cases human participants are not required, and researchers can analyze existing data and/or review documents as evidence. For example, historical research often relies on archival textual data. However, for many researchers, human participants are the primary data source. Selecting the appropriate participant pool is a critical part of research that relies on human subjects. Two terms that represent research constructs common to most if not all research are *population* and *sample*.

Population and Sample

The research *population* is the universe of all subjects or objects that could be included in the study. All individuals or objects within a research population typically share a common characteristic or trait. For example, if you wanted to know how first-year college students experienced academic advising in a state public university system, the population would be all of the freshman students in the system. The research *sample* is a portion of the population selected by the researcher for scrutiny in the research project. In the previous example, the research sample would be a representative group of freshmen students from each of the universities in the state system. Also called a probability sample in experimental research, the sample is usually selected without replacement. That is, once a subject or object is drawn from the population it is in the sample and not returned to the universe for selection.

The theory that forms the foundation of the research study should define the population. Sometimes the population defined for a study is quite large (all people over the age of 18, for instance), or it may be quite small (all people who have won a Nobel prize who live in Rhode Island). When small, the researcher is often able to work with the entire population and sampling is not an issue. Results from using an entire population for the research do not need to be inferred, since the results do represent the population parameters. One example of drawing information from an entire population is a census. All members of the population are counted, and specific parameters are measured. When a population is large, and drawing a sample is necessary, there are different kinds of samples defined for researchers.

Sampling Strategies

It is important that samples represent the basic characteristics of the research population. Samples must be typical in make-up to the population if the researcher wants to make generalizations about that population. If parametric statistics are to be used, then it is important that the sample is a random sample (also known as a probability sample). Simply put, a random sample is one in which all elements of the population have an equal chance of being selected for the sample. If different groups are to be used, say, a control and an experimental group, then those randomly selected participants are randomly assigned to the different research groups to help with the internal validity of the research. Remember that a "parameter" is a common characteristic or value of the entire population – like average age or average height – that can be calculated or estimated by the sample. Sometimes the sample involved in an experimental research project is selected according to one of the non-probability, non-random techniques described below. The researcher needs to recognize the difficulty of making generalizations to a larger population, and to ensure that both random selection and random assignment of subjects be done in experimental research to avoid bias and to ensure internal consistency or validity.

Statistical formulae used to answer questions or test hypotheses in a quantitative study require that a representative sample be randomly selected, and most often from what is considered to be a "normal" population. For a population to be considered "normal" the distribution of the elements or members of the populations must be grouped according to the normal probability curve, or bell-shaped curve (see Figure 2.1).

Once again, the research method will have a lot to do with predicting what kind of a sample is selected. The sampling strategy is the plan the researcher sets forth to ensure that the sample selected represents the population from which the sample is drawn. Some common sampling strategies include the following:

- *Simple random sample*. The researcher has access to all members of a defined population and makes a selection of subjects using a manner that allows each member of the population to become a member of the sample. When subjects are in a numerical order a table of random numbers is often used to make the sample selection to assure a random sample.

- *Stratified sample*. The researcher creates different categories or partitions of the population – different strata – and randomly selects subjects from each stratum in either a proportionate or disproportionate way. Gender, age, height, race, or income levels are examples of strata often used to separate a research population.
- *Cluster sample*. The researcher randomly selects predetermined groups from the population as clusters. Students in a classroom, teachers in a school, and administrators in a state all serve as a cluster for sampling purposes.
- *Purposive sample*. One of the non-probability samples, the sample is selected with a purpose in mind and the researcher makes a deliberate attempt to include specific subjects to provide guaranteed representatives from identified groups in the sample. Purposive sampling is used when one category of subjects (e.g., women superintendents) is small and the researcher wants to guarantee an adequate response. There may be one or more predetermined groups that are selected on purpose as the subjects of the research.
- *Accidental sample*. Also known as "haphazard" or "convenience" sampling, the sample is limited to subjects at hand and available for the researcher, also a non-probability sample. Much of what is termed action research uses accidental samples, since the subjects are limited to the workplace where the action is taking place.
- *Quota sample*. The researcher selects a specified number of subjects that is a quota from defined groups or strata in the population. Quota sampling is most often a non-random method of sampling widely used in opinion polling and market research. Interviewers may be given a quota of subjects in specified categories to attempt to recruit; for example, an interviewer may be directed to select ten adult men and ten adult women for interviews.
- *Snowball sample*. In some cases, in order to accumulate an adequate number of respondents or subjects, those subjects selected are asked or encouraged to provide the contact information for additional potential sample members. This is snowball or referral sampling. Snowball sampling may be accomplished through a chain reaction of responses, such as using social media to contact initial subjects who, through a chain reaction, provide the request to their connections.
- *Systematic sample*. Also known as interval sampling, the researcher randomly chooses a starting point and uses a rotating method to select the sample – randomly taking the first subject and then taking every other, or every tenth subject,

for instance. Systematic sampling is to be used only if the given population is standardized, with the interval units distributed uniformly over the population.

Just as the research method predicts the kind of sample to be used, the kind of sample selected directs the researcher to the actual data subjects. In scientific research, the data subjects must be selected randomly, with each data element having the same chance of being selected as any other one. In addition, the sample must be large enough to guarantee that it is representative of the population being studied. Most qualitative research often does not attempt to derive representative samples, but rather seeks to include people or situations within a project that will prove the most pertinent information, given the nature of the research question; this is known as a purposive sample as listed above.

Stratification

Stratification of the research population is a technique often used to separate and distinguish the categories that may naturally exist in the population, or that are meaningful to the research questions. Potential evidence sources are divided into groups for the collection and analysis of data. Comparisons or contrasts are made between the groups rather than between individuals. Researchers may use already established stratification of populations (e.g., race, gender, income, or living location), or they may create their own for the purpose of the research.

An example of one common subdivision for the purpose of analysis deals with the size of a community. A coding scheme for a rural–urban continuum was structured by the United States Census Bureau, and is updated following each census. In 2013 the Office of Management and Budget defined the urban–rural continuum as follows:

1. Urbanized areas are densely settled urban entities with 50,000 or more people.
2. Urban clusters have at least 2500 and fewer than 50,000 people.
3. Rural areas encompass all population, housing, and territory not included in an urban area.

(US Census Bureau, 2015)

This coding is often used when researchers are interested in the data from one or more specific size of community, especially when comparing urban to rural populations. Obviously many researchers use the school size, number of teachers, or pupil enrollment as a determining factor in stratifying a research sample as well. Education researchers also use per-pupil expenditures and test scores as other distinguishing factors in establishing strata for a research project. The key element to keep in mind is that the evidence source must match the questions asked.

Whatever sampling method is used, it must be compatible with the research method. In the end, the researcher should feel confident that the data cells have authentic evidence that will help unravel the research quandary. Once different strata of the population are identified, the sampling method within every stratum must be the same if comparisons are planned from the resulting research.

Research Decisions

Unless the research is limited to the group of individuals on hand, or to data that exist already, the concern over sampling is ever present. Questions about how large is too large, or how small is too small for a legitimate sample are often asked. There is no one good answer to the sample size question for all different types of research, and most research in education is limited to the students or educators who are available, or willing, to participate in the project.

Often the question of sample size is asked. There are websites available to calculate an appropriate sample size if certain aspects of the data are known (see, e.g., Creative Research Systems, 2015, www.surveysystem.com/sscalc.htm). If statistical tests are to be used, and if the researcher knows the anticipated spread of the data and the precision level selected, then an estimate of the sample size needed to complete the project with a measure of validity can be made. The precision level, also known as the standard error, is the percent of confidence that the measurement from the sample approximates the population value. Reports from sample surveys, for example, often say, "with a margin of error of 5 percent," or "with a 95 percent confidence level."

Statistical formulae are, after all, algebraic relationships, and as such may be used to determine target figures such as sample size. This is done by calculating the statistical formula as an algebraic problem where the number figure ("n") which is the sample size is the unknown. In order to use this calculation, some basic statistics are needed. The formula uses Z scores, which are standard or normal scores provided in a normal probability curve (see Figure 2.1). The Z score indicates how many standard deviations an individual observation is found either above or below the mean. A measure of precision, also called the alpha level or level of significance, is a probability number which determines the probability that the research results are due to chance.

The basic formula that may be used to determine a sample size is:

$$n = [(\text{Z score})\ (\text{standard deviation}) / \text{precision}]^2$$

An example of the use of this formula would be to know that the Z score for precision at the 0.05 level is 1.96. Then estimate the standard deviation for the sample; for instance, a 0.5 standard deviation in the responses from a survey with a 7-point Likert-type scale. Then that estimated standard deviation (0.5) is multiplied by the Z-score (1.96), and the result is 0.98. This number is then divided by the selected precision level (0.05) and the product, 19.6, is squared, resulting in the figure 384.16, which is the figure for "n." This tells the researcher that in order to have confidence in the statistical results the sample size for the research should include approximately 385 participants. The formula to aid in determining the number of elements in a sample for a research project from the example above is:

$$n = [(1.96)\ (0.5) / 0.05]^2 = [0.98 / .05]^2 = 19.6^2 = 384.16$$

Significance

Sample size can be directly connected to the statistical tests used on data. The larger the sample the more likely the data from a sample measures the actual value of the research population. The fact that a measurement is statistically significant does not always mean that it is important. Statistical significance does not always mean professional, or educational, significance. When doing group comparisons, a statistically significant finding from a calculation on a set of data values may provide no insight into the actual difference within the population under scrutiny. That is, while there may be statistical significance, there may not be practical significance within or between the actual measures being compared. For example, a t-test, which is a statistical comparison of two mean values, may be calculated on the average response to a survey item between male and female respondents. One average may be 3.2 on a 5-point scale, and another 3.7, each with a small standard deviation. While the test statistic may be significant, the real result is that both men and women have an average score of between 3 and 4 on the scale, which may offer no real educational or practical significance. The reference listed below and in the Annotated Bibliography by George E.P. Box (2005) and his colleagues is an excellent source for further discussion on the difference of statistical significance and data-based decision-making.

Qualitative Data Sources

Data for qualitative research may come from a variety of sources. Researchers use observation, individual interviews, focus groups, transcripts from proceedings, meeting minutes, historical documents, web sources, field notes, diaries, and even photographic or video sources. Just like selecting a sample for a quantitative study, the data source selected for a qualitative research project needs careful scrutiny. Clearly the documents used to substantiate a hypothesis or to answer a research question need to be directly linked to the topic. The data sources must be current and validated as accurate. The same tests used to validate literature in the literature search process outlined in Chapter 7 may be used to validate the data for the project.

When the primary data source comes from interviews, focus groups, or observation of people, the selection of the participants must also be done with care. The group selected to observe or interview should have knowledge of or a stake in the topic being studied. The researcher must have confidence that the participants are willing to provide information and that the information is accurate. Sample size is important for qualitative research, but often the access to participants and the length of time needed to conduct proper interviews forces a limit on the number of individuals selected. For this reason, it is crucial that the researcher identify the best people possible for the topic to be studied, and to make a decision whether the number of sources is adequate, or whether additional subjects need to be included to substantiate the data.

A recent study of the combination of two rural school districts into one consolidated district is an excellent example of the use of a variety of qualitative research techniques. The researcher used grounded theory to, first, conduct a historical analysis of the documentation surrounding the case study of rural district consolidation. The consolidation had occurred ten years previous to the research. As a first step, she selected residents who had a stake in combining the two districts for interview. The traditions and culture of the two schools, and of the new consolidated district, were analyzed. Several emergent themes were isolated in this beginning analysis. Things like personnel, curriculum, proximity, finance, enrollment, facilities, transportation, and school board relations were all themes that were given consideration.

The next step for this researcher was to invite a select group of individuals who had state-wide influence on schools to a focus, or affinity, group meeting. A representative of the state department of public instruction agreed to moderate the panel to guard against researcher bias. Members of the 15-member group were carefully selected and invited to the meeting. Members who attended included the executive director of the state school board association, the president of the state taxpayer association, a leader of the state parent-teacher association, the president of the state teachers' association (union), the chair of the state senate education committee, superintendents, and school board members. A purposive sample, the individuals represented in this focus group were exactly the right members for the planned conversation.

The data gathered in the preliminary component of the research were used as a foundation for the affinity group. The results of the research provided a well-defined response to the basic research question which sought a description of the trends affecting rural school districts, and what those trends indicated for the future of rural schools (Ballin, 2007).

Summary

Careful sampling is a critical step in conducting a valid and reliabile research project. In the end, there may be other practical conditions that dictate samples and sample sizes. Things such as budget, time, cooperation or permission, and availability may all have an influence on drawing an appropriate sample for a research project. It is also important to remember that using sample size as a factor to determine significance is not proportional to the size of the population. While there is a feeling that the larger the sample the more potential there is for a significant finding, there is a point of diminishing return. An example is that national election polls can make a rather accurate prediction of outcome based on a small sample, and increasing the sample size has little impact upon reducing the confidence of the finding.

The fourth piece of the inquiry puzzle may be described in one word: *assess*. A researcher needs to assess the available sources of information, and then choose the right one for the project. Linked together at this juncture, the pieces are shown in Figure 10.1.

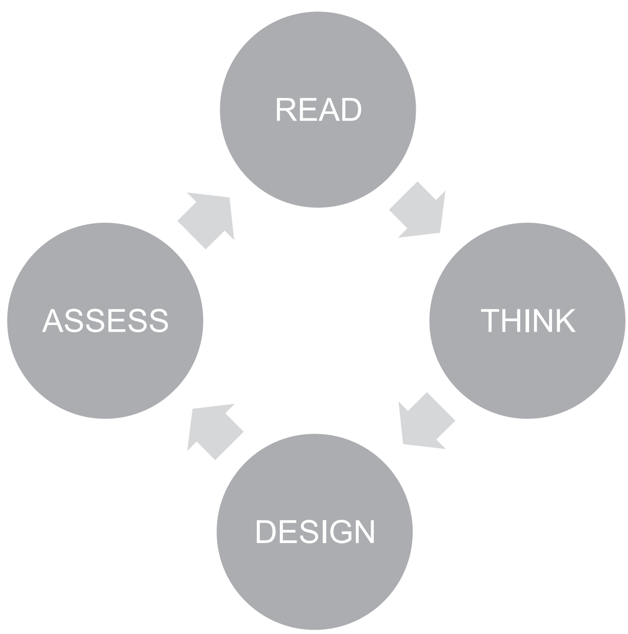

Figure 10.1 Read – Think – Design – Assess.

Resources

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In-class Exercises

1. Pair students and have each group select a particular sampling strategy and describe how the sampling strategy could be used in educational research.
2. Create student groups and have them determine a stratification of high school teachers or college faculty for the purpose of a research project.

Discussion Items

1. How would you categorize poll watching at an election site as a sampling technique?

2. What does it mean for a sample to be "random"?
3. What may be said about results from a research project that uses an entire population as the data source?

Assignments

Write an example of the following sampling techniques:

1. Cluster sample.
2. Purposive sample.
3. Quota sample.
4. Systematic sample.

Describe the sample that could be selected to do interviews for a research project on climate change or environmental issues.

11 Know the Evidence Source

Step 5 SELECT: Identify the Data Subjects or Research Participants

Part of the research design or paradigm should be the outline of what kind of evidence will be used to satisfy the research conditions and help make statements about the research hypotheses or answer the basic questions. Research data sources include measurements, objects, or subjects. There are both primary and secondary sources for research data. Once the researcher has determined the population and sampling technique to be used, then the actual subjects for the research need to be assessed. Potential data sources must be identified, analyzed or measured, and appraised in light of what the research plan requires.

In the controlled laboratory conditions of experimental research, the data come from observations and measurements. The data source being measured must be a random and representative sample of the research population, and that sample is then carefully organized, randomly separated into control and experimental groups, treatments or interventions may be implemented, and measurements taken. Conclusions depend on the results of the measurements as compared through classical statistical methods.

Careful identification and description of the sources of information is crucial. The population under study should be defined in research terms and the techniques used to select from that population outlined. If a researcher is testing an instructional technique in secondary mathematics, for example, the data source will be high school students. The actual research data may be test scores, or responses to an attitudinal survey completed by the students, or a combination of both. In order to substantiate the effectiveness of the technique, the researcher may need to collect data from other students who did not experience the new technique. The data source is the same, namely high school students, and the data are generated in the same way. Ancillary data may be collected from the adults who are directly involved (teachers) or tangentially touched (counselors, parents, or guardians) by the instruction. Data sources need to be identified, categorized, and integrated into the research design for a project to be successful.

Research Categories

Many research projects, both quantitative and qualitative, use predetermined groups within a research sample to test hypotheses or answer the basic questions. Referred to as research categories, or partitions of the data source, these categories have a specific set of rules to follow when research populations are subdivided. The rules are that categories must be:

- Set up according to the research questions using one level of discourse (based on a sample drawn from a single population).
- Exhaustive (all subjects or objects in the sample are used up).
- Mutually exclusive (each data element is in only one category).
- Independent (being in one group is not dependent on being in a second group).
- Derived from one classification principle (e.g., just age, or just gender, not both).

While these categories must be independent, exhaustive, and mutually exclusive, much research is done on the cross-partitions or cross-breaks of two or more of the categories. The researcher must be sure that the individual categories used in the measurements meet the requirements listed above before combining categories for analysis.

Separating groups by gender is one example of partitioning a dataset. Another example of partitioning a dataset would be to divide the United States by individual states as partitions, or using postal zip codes to separate the country. Elementary schools could be partitioned by grade level for analysis purposes. Whatever method is used to create categories for the research, those categories must have meaning for the research project.

Field Research

In field experiments and field studies, the data come from observations and measurements in the field. Once again a research population is identified and, in many cases, a sample is selected to represent that population. There are those occasions when the researcher may use the entire population defined for the study due to its small size, proximity, or ease of access. If the research question deals with principal effectiveness, for example, the data sources may be teachers, students, parents, or textual information in the principal's communication or budget decisions. The researcher must select the appropriate source for the data to answer the research questions posed.

A field experiment is structured much like a laboratory experiment, except that it is conducted in a more realistic setting: in the field and not in a laboratory. While extraneous influences may not be controlled in a field experiment, the results from the selected data sources may be stronger, since they may rise above the outside influences. Field experiments under the banner of action research are often used to determine solutions to practical problems, and they offer an appropriate medium for studying more complex circumstances. The data sources for field experiments may be limited, and may not have the characteristics of classical samples (random and representative). Many times the sample is a volunteer group, or is drawn from limited subpopulations of the entire population.

Field studies include the analysis of relationships among values, attitudes, perceptions, and behaviors of individuals and groups. They are realistic, significant, theory-oriented, and heuristic. Field studies may be exploratory or include hypothesis testing. Exploratory field studies are often used to probe an existing situation in the field in order to discover relationships within the population, or between population subgroups, that might generate concepts for future study. Before going into the field, the researcher needs to identify clearly the anticipated sources of information. If the question deals with an organizational structure within a school such as the existence of a professional learning community, the researcher needs to define the traits that, when observed, confirm or deny the basic question. The researcher must then assess the potential sources of data, and select the source that will provide a clear and measureable dataset upon which a decision may be made or a conclusion drawn.

Hypothesis Testing

Hypothesis testing in field studies amounts to an in-depth analysis of the relationship between defined variables in the sample to determine how accurate conjectural statements made about the research population may be. The researcher watches the selected component of real life that is the basis of the research as it plays out in the sample selected, and then either formulates new concepts regarding the population, or draws conclusions regarding the interactions observed. You make an educated guess about how things fit together, or how one thing influences another, and then you gather information to see if your guess is accurate.

Data sources for qualitative research come from many locations and are identified through a variety of means. A researcher needs to carefully identify the absolutely best location from which to gather information (collect data) and then select those sources that will provide the best documentation for the issue being studied. You can squeeze all of the turnips in the world, but you won't make orange juice. That is, the data sources must be the right sources for the research that is designed for the results to be meaningful and helpful.

Evidence Sources

A classical design for research in education is to compare students when different methods of instruction are employed. A study by Menon and Hiebert (2005) examined the effectiveness of a little books curriculum in facilitating the independent word-solving skills of first-grade readers. The research design compared two sets of classrooms. The research participants, or subjects, in this study were first-grade students. The data collected were their scores on basic reading inventories. Word lists and graded passages from the Qualitative Reading Inventory (QRI) served as the pre- and post-test measures in this study. Test scores provided quantitative data, and the researchers used Chi-square analyses to show that children in the little books group performed at significantly higher levels on the post-tests than did their counterparts in the basal reader group. This was a pre-test–post-test design to determine, first, whether there was gain in the reading scores, and second, whether one technique ended up with significantly better scores than the other. The pre-test–post-test design such as the reading example is one used very often in education.

The researcher interested in designing a project based on the topic used here has several sources of information from which to choose. The reading project used students as the data source. A different research plan could use teachers as a source for survey or interview data. Parents or administrators may be data sources for a project that deals with reading instruction as well.

A study that employed qualitative research in an attempt to understand how principal behaviors and actions influence the successful implementation of accountability practices may serve as an example of the careful selection of research participants. In the end, the research was a case study of two principals within the same large metropolitan school district, utilizing a purposive sample. The district was purposely selected for several reasons. First, it was nationally recognized for its improvements in student achievement; second, it had implemented the model the researcher desired to study: a holistic accountability system, including the development of district power standards. A third reason for the selection was that the district was recommended by an external consultant who knew of the success the model under study provided.

An important criterion for the selection of the schools was that every single school in the district had made gains in mathematics and language arts as reported on their state test scores. These gains exceeded 20 percent in the case of several schools within the district. Although every building displayed significant growth, those buildings with the highest poverty levels displayed the greatest growth in academic achievement. The two principals studied were from two of these schools. Thus the evidence source for this research was the principal, but the principals selected were done so based on the performance of the students in the schools.

For the purposes of triangulation, the researcher interviewed a total of four teachers, two at each of the buildings led by the two principals. Teachers interviewed were identified by each of the two principals: one teacher who "came on board" very quickly and another who was at first neutral or hesitant but eventually "came on board." The teachers were selected as sources to shed light on and corroborate the actions and behaviors of the building principals (Koehler, 2006).

When a research project has human subjects, and when the research is done as a representative of an institution like a college or university, there are federal guidelines for interaction with the people who become the data sources for the research. Most, if not all, institutions have a board or committee that reviews and approves the research when human participants are involved. These committees are referred to as Institutional Review Boards (IRBs).

Institutional Review Boards (IRBs)

Research done at institutions of higher education that includes human participants is subject to an internal review by faculty committee. These Institutional Review Boards (IRBs) are structured to fulfill a federal mandate that no harm will come to any human subjects who participate in the research project and that the research is conducted in an ethical manner (Title 45 Part 46, Code of Federal Regulations, Department of Health and Human Services). The IRB proposal form is a formalized account of the intended research methods and procedures to be used in conjunction with human participants.

The IRB research proposal clarifies what is to be done, how, and why. Special attention is given to participant risk, benefit, and autonomy. In addition, it becomes a vital part of an official paper trail showing that the research is acceptable to a board of reviewers. Should anyone raise questions about the research, the approved proposal is evidence that the project is of sufficient value to justify any risks or inconveniences involved.

The usual components of an IRB proposal include the following:

- Information about the researcher or research team;
- The objectives of the study;
- A description of the anticipated research participants;
- A plan for recruiting and selecting participants;
- The method to be used to obtain participant consent;
- The research procedures to be used, including copies of surveys or interview questions;
- The potential risks or discomfort to the participants;
- Any potential benefits to the participants;
- Plans for safeguarding the anonymity or confidentiality of the participants.

The IRB process can be an arduous one to navigate. Researchers conducting a study using human subjects need to get IRB approval from the data-collection site before they can collect data and publish their work. Doctoral students often have to get IRB approval from the data-collection site and the degree-granting institution before they can collect data and publish their work. For example, a doctoral student from Edgewood College who is going to survey middle school teachers in a particular K12 school district would be required to ascertain IRB approval from the school district and from Edgewood College. In this case, two IRB proposals would need to be submitted for approval. Not all institutions operate in this way, but it is important for students to be aware of the IRB requirements at their data-collection site and their host institution.

Submission requirements are not the only obstacle to IRB approval. The IRB process is time-consuming, and researchers should plan three to six weeks at minimum to complete the process. Typically, the amount of time to completion for the process depends on the level of participant risk. Research studies that involve collecting data from vulnerable populations carry much more risk than research studies that are conducted with an adult, able population using an anonymous survey. One way to reduce the amount of time required to navigate the IRB process is to submit an error-free, clear proposal. In the doctoral program at Edgewood College, research faculty review student IRB submissions for feedback and revision before they are submitted to the IRB board. Table 11.1 highlights some common issues that ultimately cause a delay in the IRB process at Edgewood College.

Most institutions have specific regulations as to the request for permission to use human subjects for research purposes. A well-written proposal should be clear, concise, and should respond to the formal queries directly. Protection of human participants in both scientific and social research is of the utmost importance.

Table 11.1 Common Issues with IRB Submission

Problem	*Recommendation*
Insufficient attention to the details surrounding the study objectives.	Make sure to include defining the major constructs measured in your study, and detailing the hypothesis and/or research questions to be examined.
Jargon is used to describe the purpose of the research.	Study objectives should be described in language understandable to a non-expert.
Insufficient attention to the details surrounding participant recruitment.	Describe in detail how and from where you will recruit participants. Include all recruitment materials with your proposal.
Insufficient attention to the details surrounding obtaining consent.	All the elements of consent must be included on the consent form. *The level of detail regarding recruiting participants and obtaining consent should be such that the IRB can determine that no coercion or undue influence has occurred.*
Insufficient attention to the details surrounding the research procedures.	Explain precisely what participants will do or have done to them, including where the study will be conducted. If not on the Edgewood campus, explain the nature of your cooperative arrangement and attach all appropriate forms.
Insufficient recognition of potential risks to participants.	Even minimal risks, such as discomfort when answering questions, must be identified and included on the consent form.

Other common issues:

- Incomplete cover page, lack of signatures or contact information, no mailing address.
- Typographical, grammatical, and punctuation errors.
- Inappropriate language on the informed consent document (too technical).
- Required documentation not included in the application (recruitment letters, advertisements, surveys, consent letters, etc.).
- Anonymity and confidentiality confused.
- Proposals submitted without enough lead time before research is planned to start.

Implications

In one of the examples discussed earlier, survey research was selected as the research tool. In this case the researcher must create a survey instrument to be used as a data-collection device. The items for the survey should flow from previous work in the area, or from the researcher's knowledge and experience in the area. The researcher will need to determine whether the survey is sent to the subjects, or whether it is to be used as an interview tool.

In either case the information collected – the data gathered – must come from reliable sources and be gathered in a systematic and intelligent way. Do the survey items have a numerical scale for response? Then it should be sent to the participants. Are the items open-ended responses that will need probing? Then the interview technique should be used. Form follows function when doing the data collection in research.

The research design should lead directly to the type of information or data needed to move the project forward, and the next step is to gather or collect those data. Data collection takes many forms, but research rules exist for careful handling and treatment of that research information. Care is necessary to gather what is needed, and to recognize that not all data may lead to the same end. Care is also needed to recognize what data pieces are important to collect, and which may be left uncollected. Chapter 12 provides several methods used to gather evidence, or collect data, in a research project.

At this point there are now five rules that need consideration while building an inquiry project. The new addition in one word is *select*. After the source of data has been carefully assessed by the researcher and the potential research participants identified, it is time to select the research sample. The first five pieces to building the project at this point are given in Figure 11.1.

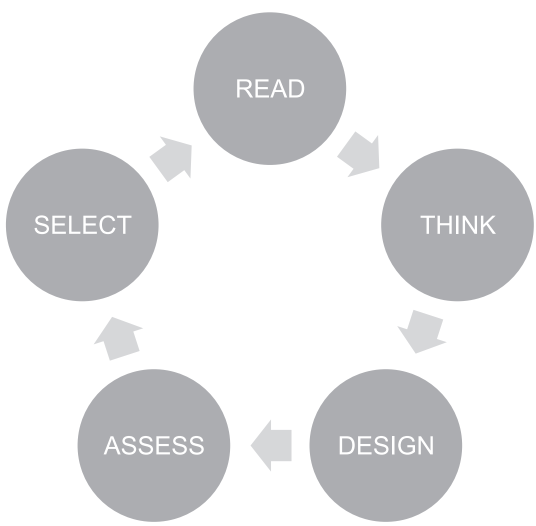

Figure 11.1 Read – Think – Design – Assess – Select.

Resources

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In-class Exercises

1. Have students in small groups discuss the use of a control and experimental group in a research project to answer the question: Why is it important to have the two groups very similar?
2. Have students in small groups design a survey for the class and report on what kind of data may be gathered through the use of surveys.

Discussion Items

1. How do interview data differ from survey data?
2. When would it be acceptable to consciously omit specific students from an action research project in a classroom?

Assignments

1. Write five interview questions for a panel of elected officials on the topic of property taxes.
2. If you were to do research using all teachers in a school, what subcategories for analysis might be created?

12 Gather the Evidence

Step 6 COLLECT: Pull the Research Data Together

Up until this point the researcher has delved deeply into a theory of how structures or phenomena act, react, or interact; has read the literature regarding experimentation or other research with this theory, and has summarized the pertinent features of that literature; has structured research hypotheses, or asked basic research questions; has determined the data source (population and sample); and has identified the data subjects or objects. Now it is time to gather the evidence for the research – to collect the data that will be used in answering the basic research questions.

Variables

As evidence is gathered in experimental research the concept of "variables" comes into play. A variable is a research construct that provides for a logical grouping of properties or attributes inherent in a sample or population. Anyone who has studied algebra knows that mathematically, "x" is a variable, and in the end, "x" has a numerical value. Variables in research have the same meaning as variables in algebra. They are a research construct that can take on measured values.

Variables fall into categories of their own. There are variables that may be considered the cause of a behavior or other research result, often referred to as the "independent" or "antecedent" variable. The independent variable may be thought of as the "if" part of a hypothetical syllogism "If A, then B." Dependent variables are those that are the presumed effect of the independent variable action – the consequence of the research, or the "B" part of the syllogism.

Other categories of variables that form a structure for data collection include *active* variables – those that are manipulated in the research; that is, a treatment is introduced to the variable and the effects of that treatment are studied and recorded; *attribute* variables – those that can be measured, but not manipulated (gender or age are two examples); *categorical* variables – those that define a group or subset of the sample (nominal numbers may be assigned to the categories, e.g., 1 = female and 2 = male); and *intervening* variables, also known as "latent" variables are those that are internal to the sample and, though not observed, account for resultant behavior (e.g., temper or frustration). These groups of variables are not mutually exclusive. In any given research project there may be attributes or categories that are defined for the research population to provide separate ways of viewing the sample.

The data collected in a research project must have meaning in order to answer the basic questions, and the variables defined for the research provide that meaning. There are a variety of techniques to collect data in research. The measurements in a laboratory are done with precision and accuracy using tools and techniques defined for the researcher by earlier work in the field. Standards of measurement exist, and researchers are careful to use those standards so that the peer review of their work is meaningful and accurate.

Finally, in order for variables to be meaningful, particularly in quantitative research, they must be *operationalized*. This means that when introducing a variable, the researcher should define the variable and explicitly explain how each variable will be measured. For example, if a researcher is trying to determine the extent to which the amount of time spent studying contributes to student success, it is very important for the researcher to operationalize *student success*, especially because it is a term that may be defined in multiple ways. Student success could mean grade point average, success in the course, a score on a test, or even passing the course. It is important that the researcher clearly define and describe how each variable will be measured in order for that variable to be meaningful.

Data-collection Strategies

The ways in which data are collected are different in quantitative and qualitative studies. Data collection in the qualitative approach takes on several forms, but each has its own framework as well. Variables in qualitative research are often referred to as constructs or concepts. Qualitative constructs include behaviors, sociological facts, opinions, or attitudes. *Behaviors* are characteristics of individuals or other research subjects that are observed or self-reported routines or reactions to stimulus (e.g., exercise regimes). *Facts* are statistics about the research population (such as income) or attributes of research subjects regarding their membership in a predetermined group (e.g., gender, race, or occupation). *Opinions* and *attitudes* are psychological variables that are often interrelated with facts to determine significant characteristics of selected groups (e.g., opinions on property tax based on occupation).

There are many ways to measure variables through the data collection process. These include observations, interviews, questionnaires, surveys, tests, focus groups, or the use of secondary sources for data. *Observation*, simply put, is looking at what the research subjects are actually doing and recording those inspections in a uniform way. In an *interview* the researcher actually talks to the participants to gather pertinent information regarding the research topic. *Questionnaires* are self-reported data-collection instruments used to gather and compile information in an orderly way according to the research construct. *Surveys*, which may be done person-to-person or through other means, are a form of questionnaire that may be used in a variety of circumstances. *Tests* are standardized measures of personality traits or of knowledge of subjects that have been scrutinized by the researcher for accuracy through reliability and validity checks. In all cases the sample is a group of people who become the research participants and who provide data on the existence, incidence, distribution, or interrelationship of the characteristics under scrutiny.

Interviews

In qualitative research, interviews are often used to collect data. Most interviews are scheduled meetings between the researcher and the interviewee and are based on a predetermined set of questions. The subjects of the interviews are those members of the research population who have the knowledge or reasoning ability to support the researcher in the quest for documentation upon which to build a case for the research findings. Personal interviews are a direct contact method of obtaining information. They use a prepared interview questionnaire or schedule. Factual information, along with attitudes or opinions on selected topics, can be obtained. Two important components of the interview method of data collection are, first, that the researcher can ascertain the underlying reasons why an individual does or believes something, and, second, that there is the ability to probe the interview candidate to clarify confusing or misleading responses. A third part of face-to-face interviews is that the researcher is able to read body language as responses are given. Gestures, images, impressions, or tones are all data that may represent reality as the subject sees or experiences it.

Telephone interviews, similar to personal interviews, are a good way to collect data for the research project. While the researcher is speaking person-to-person to the research subject however, there is not the ability to rely on non-verbal cues or communication to help with the interpretation. The body language is missing from telephone interviews. The benefit of telephone interviews is that the researcher is able to reach research subjects who may be geographically dispersed and not easily accessible or readily available for face-to-face interaction.

Group interviews are also used in qualitative research to gather the information necessary to answer the research questions. In formal settings, such as focus group interviews, a small group of research subjects interacts with a predetermined group moderator who is there to keep the discussion focused on the research topic. Group members in this type of data collection are often given the opportunity to react to the collective wisdom of the group and to analyze the summary statements at the end of the process. This member checking at the end of the interview provides the researcher with additional strength of data. Groups assembled for the purpose of data collection may be asked to respond to a paper-and-pencil survey as part of the group interaction.

Another type of group interaction used as a data-collection technique is the review of an issue by a carefully selected panel of experts. Called the "Delphi Technique" this data-collection procedure was named for the Oracle of Delphi, a focal point for intellectual inquiry where scholars would congregate. In this technique the researcher identifies and selects a sample that represents the best minds – the experts – in the field of study. The subjects are given open-ended questions for response, and the researcher codes the responses and creates a rating scale based on the coded responses. The rating scale is then sent to the panel for rating and return to the researcher. The results of this rating are shared with the panel members, and they are asked to do a second rating based on the combined results of the earlier responses. This may be continued until consensus on the topic is reached.

Surveys

The survey technique for data collection refers to the use of questionnaires, opinionnaires, or polls as instruments to gather information for a research project. It is, except for the group enterprise mentioned above, an indirect method of collecting data; that is, the researcher is not present when the subjects for the sample read and react to the questions or situations being presented for response. These research interrogatories are sent via mail, through automated telephone responses, or through the internet.

The survey technique relies on the willingness of research participants to complete either a paper-based or an online survey. The use of internet services has made surveying more efficient, but relies on the sample being able to respond using a computer. An issue with mail surveys is ensuring that the targeted sample in fact does receive the survey, and then having the confidence that the subjects interpret the items uniformly. Another issue with survey research is generating an adequate response, or being able to make the case that the non-respondents are not significantly different than those who do respond. Follow up of some kind is often necessary in order to increase the response rate.

Some basic rules for the use of survey research include the following:

- Be sure that the items flow from the research design.
- Use language that your subjects will understand.

- Keep the items short and to the point.
- Keep each item focused on one concept or issue.
- Allow subjects a chance to respond to open-ended items.
- Select a response scale that best fits the item.
- Avoid overlapping response categories.
- Triangulate response with multiple items for each concept.
- Complete a pilot test before finalizing and sending the survey instrument.
- Consider offering an incentive or reward for completing the survey.

Figure 2.3 provided some examples of survey research response forms. Likert scales or Likert-type scales are often used as a survey response format. Participants are forced to select one of a limited number of options that may describe behaviors, facts, opinions, or attitudes. These are often the variables in survey research. Surveys are used to determine either the incidence or the distribution of participants when measured against these selected variables.

Surveys are used to determine characteristics of individuals and how they react to, or in, specified circumstances. Things like time on-task, teaming, problem-solving techniques, or other personal or professional conduct under study may be self-reported in surveys. Surveys may be used to determine facts or attributes described by participants regarding their own circumstance or the situation around them (e.g., gender, income, work environment). Surveys are also used to measure opinions or attitudes, which are psychological variables that represent participants' beliefs. Individual characteristics or attributes may be interrelated with facts to determine significant characteristics of certain selected groups of participants.

Response formats for surveys vary and are determined by the type of information sought, or the variables under consideration. Some common traits measured, and a sample response format for each, include the following:

- *Importance*: unimportant – important – very important
- *Value/performance level*: unsatisfactory – needs improvement – satisfactory
- *Concern/priority*: no concern/priority – low priority – neutral – high priority – essential
- *Frequency*: never – seldom – sometimes – often – always
- *Satisfaction/opinion* – dissatisfied – neutral – satisfied
- *Agreement*: strongly disagree – disagree – neutral – agree – strongly agree
- *Support*: oppose – neutral – favor
- *Quality:* poor – fair – good – very good – excellent
- *Truth/belief*: False – true – don't know/no opinion
- *Role/rule*: must not – should not – may or may not – should – must

- *Discrepancy evaluation*: real or actual – ideal or desired
- *Influence*: highly negative – negative – neutral – positive – highly positive
- *Ranking*: forced choice from high to low priority

Each of the scales mentioned above, and others for other purposes, may be contracted or expanded by the researcher depending on the anticipated recipients and need for data diffusion. Generally, 3-, 5-, or 7-point scales are used with a midpoint assigned to a neutral response. Even-numbered scales are used when the researcher wants to force a choice that is not neutral.

Often, survey recipients select one response and use it consistently throughout the survey (use only the "agree" response for all items, for instance). The use of a discrepancy evaluation or ranking scale helps to provide a better distribution of response and may guard against this type of response behavior. The discrepancy evaluation uses two scales: the first for what is real or actual, and the second for what is ideal or desired. The ranking scale requires participants to set a priority for the items listed so that the same response for each cannot be used exclusively.

Another often-used response scale is the semantic differential. In the semantic differential technique, paired adjective descriptors that are bipolar are placed opposite one another on a 7-point response scale. Opinions, attitudes, or values can be measured using semantic differentials. This format is used with three separate types of descriptors, among others. These are as follows:

- *Evaluative*: good–bad/best–worst/clean–dirty
- *Potency*: strong–weak/large–small/heavy–light
- *Activity*: fast–slow/lethargic–sharp/calm–frantic

Survey methods have greatly improved over the past several years. Today, most surveys are completed electronically or over the telephone. While there is still a place for a paper-and-pen survey to be administered through the mail, online surveys now far outnumber those done with self-addressed, stamped envelopes for survey returns. Some basic internet, online survey tools include Google (https://apps.google.com), Survey Monkey (www.surveymonkey.com), Zoomerang (www.zoomerang.com), Qualtrics (www.qualtrics.com), or zoho (www.zoho.com/survey/).

Existing Data

Data may also come from existing sources. Often data are already available to the researcher without the need for new collection. Historical research, financial research, or education program research projects are areas where existing data are often used to complete a research design. One very current example of using existing data for research in the schools is the requirement for the testing of content knowledge for all students. These test scores may become the data to help answer questions about curriculum or instructional techniques in the schools. Existing school financial data may be used to answer questions about the cost benefit of certain programs when viewed over time. There are many sources of data available to the researcher to use to answer research questions. The trick is to identify exactly the information source and the best technique to obtain it.

Even with existing data such as financial records, or student test scores, there needs to be data manipulation to create appropriate partitions or to organize those data in a fashion suitable to respond to the research questions. Sometimes access to the needed data may be difficult. Researchers should review any permissions necessary to access the data needed to complete the project.

Mixed-methods Data Collection

Data may come from more than one source, and may be collected in more than one way. In some cases, the researcher may be too close to the subjects to allow for a fair and unbiased response. Such was the case for a superintendent researcher who was interested in determining parents' rationale for transferring their children to a different school district while continuing to live in the resident district attendance area. This study was conducted in two phases. In Phase I, surveys were administered to all families who had elected to attend a non-resident school district, a private school, or home schooled their child or children and still continued to live in this study's district.

Because the researcher was the current superintendent of the school district involved in this study, and to aid in the reduction of responder bias, an independent educational consultant was contracted to administer the survey. A letter was sent to the entire sampling of open enrollment participation families explaining the purpose of the survey and asking for their participation in this study. Participants were encouraged to take part in the survey online via the district's website homepage. If families did not have access to the technology needed, alternative access options were made available and explained in the survey introductory letter. A second letter along with a hard copy of the survey was mailed to the non-respondents after two weeks. Again, the group was asked to complete the survey online, but if it was more convenient they were allowed to submit a hard copy of the survey to the independent educational consultant in a self-addressed stamped envelope. By mailing the survey directly to the independent consultant, confidentiality of the respondents was assured. Confidentiality was emphasized in the cover letters that were mailed to all participants. After another two-week time period had elapsed a third and final letter with survey was mailed to the sampling that had not responded.

Phase II involved face-to-face interviews of the survey respondents that self-identified their willingness to be interviewed to supply more detailed information. The interviewees were self-selected from a specific Phase I survey question and asked if they would participate in an interview. Building rapport and asking effective questions during the interview was crucial in gathering good data. It was important to have a certain level of trust and a good understanding between the researcher and the participant. This rapport was developed by good, effective communication. The participants needed to be assured that confidentiality would be upheld and that they could withdraw from the study at any time (Richey, 2006).

In addition to developing effective questions designed to solicit responses focused on the central issue of this study, the notes and observations of the interviewer also contributed to the overall results. The interviewer's notes are a valuable method for recording the impressions, reactions, and non-verbal information. This example provides evidence of three methods of data collection in one study. First there was a survey administered both through electronic and paper-and-pencil (hard copy) formats. Reminders and encouragements were sent to elicit the best response. Part of the survey was to solicit potential participants for the interview stage. Data were collected through recording the participants' response to the interview items, but also through the interviewer making notes about pertinent non-verbal information that may be used to further describe and explain voiced responses.

Whatever the collection methodology, researchers should be concerned that their data are representative of the population under study, and that the data collected do in fact measure the characteristics under scrutiny; that is, the collection must provide reliable and valid data. Much has been written about the reliability and validity of data, and several of the source books in Chapter 20 should be reviewed for more information on these topics. Validity and reliability were discussed in Chapter 2 in their general form, but will be expanded here to deal with interview and survey data.

Validity

Validity in measurement and data collection means that the instrument, device, or technique used to collect evidence actually measures what it was designed and intended to measure. The first concern with the data is one of interpretation. The data collected must have an "internal" validity that represents a confidence that the responses or measurements do in fact describe the phenomena being studied. Questions asked about working conditions, for example, do describe actual situations in the workplace and the responses received may be interpreted to capture actual information about the workplace being studied.

Internal validity provides confidence that the measurement taken is appropriate and may be used to explain the phenomena.

Validity is also concerned with the generalizability of the data. This is the "external" validity of the measurement. Do the results of the research accurately describe the phenomenon being studied in the larger population? The need for a representative sample drawn randomly from the population is a basic condition for the determination of external validity. Samples drawn in a purposive or other non-random method often do not allow the researcher to generalize to a broader population, or even across factors within a given population. Just because the results of the research cannot be generalized beyond the research group, however, does not mean that the research is not valid.

Random selection of a sample is often not possible. One or more of the types of validity discussed in Chapter 2 may be applied with good effect to a research sample that is not randomly drawn. In general, there are two approaches to determine the validity of a measurement device:

- *Judgmental analysis*. A logical analysis of the content of the instrument (internal validity), or a logical analysis of the conditions that make up the trait, construct, or characteristic being measured (study the nature and meaning of the variables). A jury review done by individuals, who are knowledgeable in the subject but not part of the research group, can provide this analysis for the researcher.
- *Empirical analysis*. Use of a criterion measurement that is accepted as a standard or benchmark for the trait or characteristic and determining the association or correlation of the measurement instrument with that standard (external validity). The researcher can use the literature review to determine the basic criteria and make a case for validity based on a comparison of the instrument items with the established criteria.

Reliability

Data collected in a research project must be accurate and dependable if good decisions are to be made in relation to the basic questions or research hypotheses. This is the reliability of the data. Chapter 6 provided several methods to determine the reliability in a research project. Survey research generally uses three of these basic techniques:

- *Test-re-test*. A representative pilot group or reliability sample is selected and the same test is administered twice over a period of time. The results of the two data collections are then compared using a correlation coefficient to ensure that the survey provides dependable information.

- *Split-half*. Just one application of the survey is done to a sample, and questions measuring the same construct are compared using a correlation coefficient to determine accuracy within the survey instrument.
- *Internal consistency*. Determined through computing an average of all split-half comparisons. Cronbach's coefficient alpha (Cronbach, 1951) is generally used for this test. The alpha coefficient compares each individual response on an instrument or test to all of the other items.

Reliability is a necessary, but not sufficient, condition for validity. That is, a measuring device or survey may be reliable, but not valid; however, in order to be valid, it needs to be reliable. Reliability and validity may be thought of as aiming and shooting at a target. Figure 12.1 is a pictorial example of the relationship between reliability and validity. A device that does not result in similar findings upon repeated iterations is neither reliable nor valid, just like a shooter that is all over the target. If the shots are grouped on the target but miss the mark, then the device is reliable but not valid. Finally, if the shots are grouped and hit the mark, the device is both valid and reliable.

If repeated iterations of the same instrument result in widely varying data, then the instrument is neither valid nor reliable. That is, they are neither dependable nor accurate, and they do not consistently measure the phenomena under study. If repeated measures result in the same or very similar data, there is reliability of measurement, but if those data do not accurately measure the phenomena, there is no validity. In order for both to occur there must be accurate measurements in the data that remain consistent over different uses. Measurement

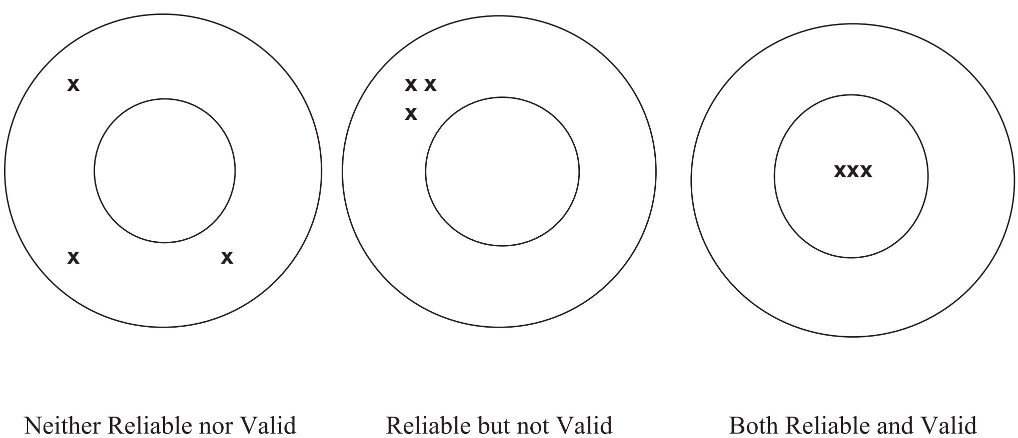

Figure 12.1 Reliability and Validity Considered Together.

instruments can be reliable but not valid, but they cannot be valid if not reliable.

Ethnographic research (e.g., research that often generates qualitative data) should also be concerned with the reliability of measures. Two types of reliability are discussed in relation to qualitative data:

- *External reliability*. Independent researchers working in the same or in similar contexts obtain consistent results from their research. A comprehensive description of the research methodology is essential so that both the replicability of procedures and the replicability of findings may be measured. External reliability is achieved when a replication of a study results in the same or very similar conclusions.
- *Internal reliability*. Different researchers studying the same data and constructs are consistent in matching data with constructs. Internal reliability means that two or more researchers agree on what they saw and how they interpret what they saw.

Trustworthiness

The concepts of validity and reliability are sometimes considered inappropriate to use in purely qualitative research. Instead of focusing on validity and reliability, some qualitative researchers substitute trustworthiness to indicate a purposeful attempt to minimize research bias. Trustworthiness comprises credibility, transferability, dependability, and confirmability in a qualitative research approach (DeVault, 2017). Similar to the constructs of reliability and validity, trustworthiness and dependability are achieved with prolonged engagement with the data, multiple and persistent observations, triangulation, member checking, and debriefing. It is important for qualitative researchers to always be aware of the dangers of bias, and to establish safeguards to ensure trustworthiness of data; otherwise they risk criticism from consumers of research who are interpreting the results and recommendations.

Selection in Action

Once the source of information is identified in a general way, the researcher must hone in on the exact location of the data that will be used to answer the research question. In the continuing example on reading instruction, the published researchers used classroom students as the data source. While this is a very common occurrence in education research, care must be taken with this type of data gathering and participant selection. This is especially true when there is an intervention, or an experiment, that is conducted using human subjects. The researchers in the reading example needed to assure themselves, and the public, that no harm would come to the first-grade students who were part of the project.

When human subjects are used in research there are specific protocols that agencies have in place that need to be met. The existence and value of Internal Review Boards (IRBs) are important to understand for researchers who are collecting data from human participants. Care must be taken that no harm – physical, emotional, educational, psychological, or social – befalls the participants. While this is especially true for school-aged children and youth, the same rules apply for adults who become sources of information or data in a research project.

The survey and interview examples shown above represent research with adult participants, so no vulnerable populations were included. Care must be taken when selecting the people who will participate that no adverse outcomes will result from their participation. One way to assure this result is to follow the strict guidelines for anonymity and/or confidentiality for all participants.

The sixth step in the process was outlined in this chapter. Put into one word, this step may be thought of as *collect*. Linked together here, the pieces are set out in Figure 12.2.

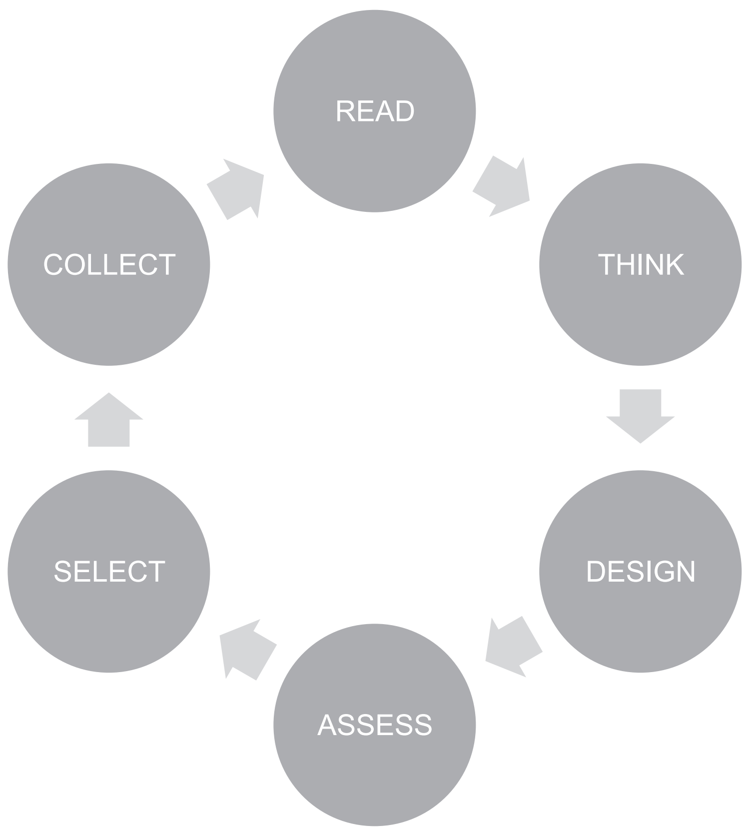

Figure 12.2 Read – Think – Design – Assess – Select – Collect.

Resources

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In-class Exercises

Have student pairs discuss the following:

1. Why do many researchers receive low response rates to surveys? What are some ways you might increase response rate?
2. Discuss the concepts of reliability, validity, and trustworthiness. What strategies would you use to ensure your instrument (survey, interview questions, observation rubric) are reliable, valid, and trustworthy?

3. What considerations would you make when deciding whether to use a survey, interview, or both as your data-collection strategy?

Discussion Items

1. Why is an interview sometimes a better way to collect data than through a survey?
2. How can a measuring instrument be reliable but not valid; valid but not reliable; and how do you address reliability/trustworthiness and validity of a qualitative measure?
3. What data-collection technique(s) could be used to measure student behavior in the classroom?

Assignments

1. What are the benefits of having respondents rank order a set of variables rather than providing numerical value response for each?
2. Why is a random selection of subjects less important for qualitative research?
3. Compare and contrast reliability, validity, and trustworthiness, and explain how you would "measure" or assess each of these in quantitative and qualitative research.

13 Review the Evidence

Step 7 ANALYZE: Examine and Organize the Data

Data from research projects may be in the form of numbers, words, images, impressions, gestures, or tones that represent actual phenomena or events, or at least a current perception of that reality. Data analysis is the categorizing, ordering, manipulating, or summarizing of the information collected in the project. Numbers, or quantitative data, are subject to researcher-selected statistical tests. Remember that "statistics" are simple mathematical computations using the numerical data collected. Quantitative statistics are data manipulations generated for the purpose of answering the basic questions or testing the research hypotheses. Textual information creates data of another sort, qualitative data, and analysis of qualitative data follows specific conventions as well. Both categories of data and their treatment are covered in this chapter.

Quantitative Measurement

Recall that Chapter 2 contained a description of the different types of numbers that may be generated in a research project. These included nominal (numbers as names), ordinal (numbers that have a sequential order), interval (numbers that have equal space between values), and ratio data (those with an absolute zero point). Numbers that are used as names and that have no comparative values were referred to as nominal values. Measurement of nominal or other categorical values is generally done through frequency counts where percentages of responses may be compared for analytical purposes. As the dataset includes more sophisticated numbers, the tools for analysis become more sophisticated as well.

The type of statistics used in analyzing the data depends on the type of numbers collected in the research project. The most basic data in a research project are referred to as summary statistics. Summary statistics are a compilation of the numerical data that gives a collective or general meaning to the dataset. One of the most common summary statistics used is percentage. Percentage is the ratio of data points in a subcategory compared to 100 (e.g., 45 percent female and 55 percent male means that 45 out of 100 participants were female).

Two of the most used summary statistics are measures of central tendency and dispersion. Central tendency simply means a single unit (one number) description of the dataset that provides a common label (number) to all of the responses. They are measures of how scores or values in the dataset cluster or collect around one value or score. Measures of central tendency are used with one variable only, or with subcategories within one variable.

Three basic measures of central tendency are as follows:

- *Mode*. The most frequently occurring number in the dataset (may be used with all data types nominal to ratio).
- *Median*. The true midpoint of the dataset where half of the numbers are above; half are below the median number (requires at least ordinal data).
- *Mean*. The arithmetic average of the numbers in the dataset (requires at least interval data).

Measures of dispersion using numerical data are used to provide information about how the numbers are spread out over the entire dataset. Used in combination with measures of central tendency, these statistics provide an accurate summary of the elements in the dataset, variable by variable.

Common measures of dispersion using numerical data include the following:

- *Range*. The spread of the numbers from the lowest value to the highest (e.g., salaries ranged from $33,000 to $99,000).
- *Inter-quartile range*. Dividing the numbers in the dataset into quarters (much like percentages divide the set into 100ths), the inter-quartile range is the difference between the first and the third quartiles.
- *Standard deviation*. A statistical computation using a mean value (arithmetic average) and measuring and averaging the spread of each data point from the mean.
- *Variance*. The average squared deviation from the mean for all items, and the standard deviation is the square root of the variance. Variance is used as a basic statistic in many of the formulae designed for data analysis.

In addition to summary statistics for numerical data there are test statistics that are used to examine the data more thoroughly in regard to answering the basic questions or testing the hypotheses. Researchers use common test statistics that are established to report specific values that may be used to summarize the data and draw appropriate conclusions. Different test statistics exist for the different types of numbers that may be present in the dataset, such as ordinal, interval, or ratio data (see Chapters 2 and 6).

Assumptions regarding the population and sample (population parameters estimated through sample statistics) must be made in order to choose appropriate statistical tests. Parametric tests are based on the assumption that the population has a "normal" distribution, that the sample is drawn randomly from that normal population, and that the sample is representative of the research population. Nonparametric tests are selected if those assumptions are not met and are based on the types of numbers in the dataset. Usual test statistics applied to numerical data include the following:

- *Chi-square*. A nonparametric statistic that measures any significant difference in a set of data cells that contain frequency counts (bivariate tabular analysis). Karl Pearson published Chi-square in 1900 as a criterion that could measure the goodness of fit. Using the assumption that all cells are proportionate, the Chi-square test measures any significant deviations of the observed frequencies from the expected frequencies (that all cells are proportionate).
- *t-test*. Also known as the student's t, since W.S. Gosset originally published it under the pseudonym of "Student," the t-test measures the difference between two mean values in a dataset, or may be used to measure the difference of the mean value computed from a selected scale score value. The higher the "t" score the more likely that there is a significant difference between the means, or between the mean value and the selected scale score value.
- *F-ratio*. The resultant statistic from a test known as "analysis of variance" or by the acronym ANOVA. The F-ratio, named for R.A. Fisher who created the statistic in 1925, gives a measure of any difference between groups by using the variance (a measure of dispersion calculated by using each data score and comparing it to the sample mean value) that can be calculated *within* each research group or category and comparing it to the variance that exists *between* the groups in a ratio. Computed F values have a corresponding table of significance, dependent on sample size, which gives a measure of confidence to any conclusions drawn based on the F-statistic.
- *Correlation*. Either a Spearman "rho" or a Pearson product–moment correlation coefficient ("Pearson r" or just "r"). The Spearman "rho," invented by Charles Spearman and first published in 1904, is most often used to correlate rank order (ordinal) data. The Pearson "r" is the standard correlation coefficient, first published by Karl Pearson in 1896, and a common statistic used for interval data to compare the association between two datasets. Both correlations coefficients vary between the values -1 and +1. When close to -1 the scores in the two datasets would appear to be distinctly different; that is, when one value is low the compared value is high. When close to +1 the relationship is one of great

similarity; that is, low values compare with other low values and high values are compared with high values from the second dataset.

- *Factor analysis*. A method for determining the number and nature of the underlying variables among larger numbers of measures in a dataset. Factors, which are constructs (concepts generated specifically for research purposes), are generated using common factor variances (similar trends in the data) from sets of measures. Given a survey instrument with multiple items aimed at measuring the same construct, a factor analysis can statistically confirm that the common items do in fact represent a similar trait.
- *Regression analysis*. Another technique that uses common factor variance but in a causal–comparative research paradigm based on least-squares computations. Regression uses a combination of regression ("r" values) and ANOVA to have one or more independent variables predict the selected dependent variable. The resultant statistic, or R^2 value, is the square of the correlation coefficient, and is subjected to a significance test through the analysis of variance technique. The R^2 value is the percentage of variation in the dependent variable that can be "predicted" by the selected independent variables.
- *Logistic regression*. A nonparametric test similar to the parametric least-squares model, logistic regression is used with categorical or dichotomous or binary variables (having two values like 1 = female, 2 = male).
- *Time series analysis*. Time series analysis is the use of regression analysis over time. The predictive capability of regression is used with time as a variable, and repeated measures over time are used to predict future events.
- *Hierarchical linear modeling (HLM)*. A multi-level analysis technique that is an advanced form of regression which allows for analysis at multiple levels such as classroom, school, or district.

Other statistical techniques used by researchers who generate quantitative data in their work are variations of these basic formulae. Generally, the variations are used due to anomalies in the dataset that contradict the basic assumptions, and more rigorous statistics are needed to correct for these deficiencies in the data. Problems may occur with using statistical analysis techniques if the researcher does not have direct control over the situation, if manipulation of the data is not possible or feasible, if random selection of participants is not possible (participants self-select or volunteer), or if too many uncontrolled influences exist that make causation difficult to ascertain.

When one or more of the issues noted above are present, researchers often rely on reporting and analyzing data in a textual rather than a numerical fashion. Qualitative data have similar analysis structures, but words, rather than numbers, are the basis for the analysis.

Quantitative Measures

Quantitative data have a commonly accepted method of display. From listing frequency counts of individuals or responses to calculating measures of central tendency or variation, there are straightforward methods of data presentation.

Summary Statistics

Measures of central tendency and dispersion, along with formal reports of test statistics, follow a prescribed pattern. Summary statistics are most often reported by one or more measures of central tendency (mean, median, mode) and a measure of dispersion (range, standard deviation, variance). The subjects or categories are listed on the left-hand side of tables, and the numerical data are placed in the table itself under the appropriate heading. One example of a table with summary data is presented in Table 13.1. In this presentation of findings from a study of teacher incentives, a 5-point Likert scale was used (Jorgensen, 2006). Scale scores for items with a mean of 3.5 or greater were considered to be "high" scores, while those at 2.5 or lower were considered "low." Scores with a mean between 2.6 and 3.4 were considered neutral.

Thus five of the items were considered positive by the researcher, and only one was considered a negative response. The respondents viewed the remainder of the items as neutral when considering incentives to remain on the job.

Table 13.1 Summary Statistics for Elements of Teacher Incentives

Structural Questions	*Mean*	*Standard Deviation*
Instructional Paperwork	2.57	0.65
Length of School Day	3.00	0.33
Length of Lunch/Prep Periods	3.24	0.44
Freedom to Act in Class	3.22	0.67
Collaboration Opportunities	3.89	0.74
Leadership Roles	3.65	0.60
Committee Work	2.47	0.85
Length of School Year	3.11	0.31
Involvement in Curriculum	3.41	0.60
Support Services	3.76	0.55
Professional Development Choice	3.92	0.64
Team Teaching	3.67	0.68

t-tests

If a researcher is interested in comparing two of the mean values generated in the study, a t-test could be used. The t-test is a statistical test of a hypothesis that two mean values are relatively (statistically) "equal." A significant finding indicates that the two values are "statistically significantly different."

In a study of high school principals' instructional leadership, a researcher used the t-test to determine whether or not average responses were significantly different from the selected scale score value of 3 (neutral) (Table 13.2).

In this case the researcher validated that nine of the ten items had a mean value statistically greater than the value of 3, at the .05 significance level. Seven of the ten were significant at the .01 level. Two of his items were not significantly different from the neutral scale score (Gothard, 2015).

Analysis of Variance

Statistical analyses of data also have commonly used presentation formats. For example, the analysis of variance (ANOVA) tables usually contain the degrees of freedom (df), the sum of squares (SS), the mean square term (MS), and the F-ratio with its probability of being statistically significant. ANOVA is a statistical method to compare the within-group variance with the between-group variance. ANOVA tests the hypothesis that there is no significant difference between two (or more) groups.

The degrees of freedom value represents the number of independent pieces of information on which the precision of the test statistic is based. The degrees of freedom for an estimate equal the number of observations (values) minus the number of additional parameters estimated for that calculation. In most cases

Table 13.2 t-test Results for Ancillary Question 2: Structure Domain

Survey Item	*M*	*Mean Difference*	*t-test*	*Significance*
1.	4.00	1.00	6.25	.000
2.	3.92	.92	5.20	.000
3.	4.08	1.08	5.11	.000
4.	3.77	.77	6.33	.000
5.	4.00	1.00	3.95	.002
6.	3.62	.62	1.38	.193
7.	3.54	.54	2.21	.047
8.	4.00	1.00	5.10	.000
9.	3.85	.85	2.51	.027
10.	4.62	1.62	5.20	.000

where there is one measurement being made, the degrees of freedom value is one less than the total number of observations or participants (n-1). Think of it as anchoring one piece of information, and the rest are free to fluctuate around that selected number. Another way to consider the concept of degrees of freedom is to think about the opportunities for change. Given one value, the opportunity to select a different value from your set is one less than the total, therefore n-1.

The sum of squares is the total of, first, subtracting the average value (mean) from each scale score value, and squaring the difference; then all of the squared differences are added together. The mean square is the quotient of the two sum of squares values divided by their respective degrees of freedom, and the F-ratio is the quotient of the two mean square values.

Table 13.3 shows the results of the analysis of variance (ANOVA) from a study that compared survey responses between school superintendents and directors of curriculum (Peterson, 2006).

ANOVA compares the variation between groups to the variation within each group by using the statistical variance. Looking at the ANOVA results for the combined group in Table 13.3, one notes that the null hypothesis (e.g., that there is no difference between the groups) is rejected, since the observed F-value is much greater than the computed critical F-value; the p-value (the level of significance) is very small. Thus, in the end, there was a statistical difference when comparing the attitudes of superintendents to those of curriculum leaders in the same districts regarding the status of technology integration in the district.

Note that in Table 13.3 the probability (P)-value is written in scientific or exponential notation. Often the P-value is well below the selected test level, usually .01 or .05, but is reported as an actual value. The exponent (10^{-15}) provides the number of decimal places that are zeros prior to the computed value. Many software products that do statistical analysis, such as Microsoft Excel, use this type of notation. In this example, the P-value is not 6.208, which would not be significant, but rather the number 0.000000000000006208, which is highly significant.

Table 13.3 ANOVA Combined Scores

Source of Variation	*Sum of Squares*	*df*	*Mean Sum of Squares*	*P-value*	*Observed F*	*F critical*
Between Groups	37.8812	1	37.8812	6.208×10^{-15}	92.9421	3.9634
Within Groups	31.7911	78	0.4075			
Total	69.9724	79				

Regression Analysis

Another statistic commonly used and reported in quantitative research reports is regression analysis. Regression begins with an ANOVA test, and then uses a least-squares method to align data points in order to produce a predictive value, the R-squared term. An example of an ANOVA table and the result of a regression analysis on the data are presented in Table 13.4. Modern statistical analysis packages on most computers are able to take the raw data and calculate the statistics and produce tables like the examples here. It is not essential that researchers know how to calculate the statistics, but rather they must know what each measurement or formula means.

In this example, the ANOVA comparing overall GPA with composite ACT for 102 students was statistically significant. The R-squared adjusted value was 40 percent, indicating that approximately two-fifths of the variation of the composite ACT scores could be attributed to the overall GPA of each individual student (McCarthy, 2007). In other words, the students' GPA is a fair predictor of how they will score on the ACT, but not a perfect predictor. A researcher may conclude that there are other factors influencing how well students do on the ACT, or that grade inflation masks the reliability of GPA as a measure across high school students.

Another research example of the use of ANOVA and regression is taken from the project that compared attitudes of superintendents and curriculum directors in districts where technology integration had been implemented according to a formulaic procedure. The final step in this process was to determine the type of relationship, if any, that existed between superintendents' responses and curriculum leaders' responses (Peterson, 2006).

Regression statistics may be presented in a variety of ways. Using a different part of the study mentioned above as a further example, Table 13.5 presents the results of a regression analysis using different data. In a linear regression formula, the correlation coefficient is multiplied by itself (squared) to generate the test

Table 13.4 Regression Analysis of Overall Composite GPA on ACT

Analysis of Variance					
Source	*DF*	*SS*	*MS*	*F*	*P*
Regression	1	66.45	566.45	68.96	0.000
Residual Error	101	829.61	8.21		
Total	102	1396.06			

Notes
R-squared Value = 40.6%
R-squared (Adjusted) = 40.0%

Table 13.5 Superintendent and Curriculum Directors' Combined Scores

Statistic	*Calculated Value*
R	0.4877
R-squared	0.2378
Adjusted R-squared	0.2178
Standard Error	0.4255
Observations	40

statistic R-squared. The statistic represents the amount of variation in one variable that may be attributed to the other variable.

The R-squared term, also called the coefficient of determination, measures the amount of shared variation between the two variables. It is often used to determine a level of influence or to predict future events. In the example, the R-squared value represents a 23.8 percent (an adjusted 21.8 percent) overlap in attitudes of superintendents and curriculum directors (Peterson, 2006). In regression analysis, the standard error of the statistical estimate is calculated by using the residual mean square; that is, the combination of the difference of individual scores from the regression model. Suffice it to say that the smaller the standard error, the better or more precise the predictions from the model.

Qualitative Data Analysis

Analysis of textual data is very different from the statistical analyses used for numerical data, but there are basic and rigorous structures for the review and appraisal of qualitative data derived from carefully structured research projects. Qualitative data are usually the result of a field-based study where behaviors or phenomena that are observed may not be quantifiable. The data collected are to be summarized in order that inferences may be made about the target population under study. Direct observations that are recorded, interviews that are audio or video taped, historical or other archival documents that are uncovered, or other textual materials become the information resource that must be analyzed. These data types most often do not have measurable characteristics (parameters) that are necessary for numerical analysis. Different methods of analysis are needed.

Qualitative analytical methods used to organize and report textual data include text coding, content analysis, phenomenology, case study, grounded theory, member checking, and triangulation. A researcher must have a good understanding of the research topic (*comprehension* of the phenomena being studied), an ability to distinguish salient features of the data (*synthesizing* the data looking for relations or linkages), the skill to appraise the uncovered relations (*theorizing* about the connections of data pieces), and the opportunity to reassemble the data pieces into a coherent argument in order to reach conclusions about the research topic (*recontextualizing* to help knowledge about the topic grow). The researcher sorts and separates the data, organizes selected data pieces or points according to the research questions, conceptualizes how the pieces fit together to provide a succinct argument for the phenomena, refines the argument based on further data analysis, and draws conclusions about the data based on the interpretation of the reorganized dataset.

Qualitative datasets usually have ample quotations, narrations, field notes, questionnaire results, and other details that allow the researcher the opportunity to understand the context under study from the research subjects' frame of reference or point of view. The analysis of the data is done to explain human behavior or specific phenomena, and perhaps to provide for causation of that observed behavior. As researchers consider the data and work to organize it into an appropriate array, issues of data congruence (accuracy and creditability), applicability to other settings (transferability), comparability to other research (dependability), trustworthy with a lack of bias (confirmability), and rigor (authenticity) must be considered.

Unlike statistical data analysis techniques, where most formulae are named for their author, qualitative data analysis techniques are the product of continual refinement. In the beginning, textual data treatment techniques were patterned after traditional quantitative methods, but have since grown to encompass characteristics of their own. Some of the basic data treatment techniques for qualitative data include the following:

- *Content analysis*. The technique used for historical, narrative, or interpretive data inspection. Content analysis is a systematic description of participant or research subject behavior that is done to understand the basic meaning or foundation structure of the research topic. Researchers often separate the data to respond to the basic who, when, what, where, or how questions that may lead to research conclusions. Sometimes referred to as "deconstruction," it is taking the data apart to get at the basic essence of the information.
- *Discourse analysis*. Within the broad research category of linguistics discourse analysis is a research technique that studies how language provides meaning to a selected context. Individuals' language, either written or spoken, is recorded and studied for nuances of text that provide meaning to the focus of the study, which is often a social or psychological topic.
- *Text coding*. When the researcher has interview transcripts, field notes, and transcribed dictation from the field, oral histories, or other documents as the data source, the data need to be coded in order for analysis to be done. Text coding is the

technique of marking the text in some way with a series of codes that separate or identify segments of the text that are linked together. Typical manual techniques for text coding include marking the documents with pre-established code words, highlighting segments of data in different colors that represent different codes, manually separating the data pieces into distinct piles or groups that represent a code, or using electronic (computer) resources for the segmentation and coding.

- *Narrative inquiry*. The stories of the participants are the focal point in the narrative inquiry approach. Participants' stories are ascertained through interviews, conversations, journals, photos, and life experiences, and emerge as the data that help the researcher understand the ways in which people make meaning in their lives through their experiences. Narrative data are organized in much the same way as other qualitative approaches, meaning they are organized into groups based on commonalities and/or differences in experiences of an event or idea across participants. Results of a narrative inquiry study are often presented as a coherent story illuminating the experiences or stories of the participants that answer a particular research question.
- *Phenomenological analysis*. The extensive and thorough study of individual cases used to uncover or discover the basic essence of a phenomenon under scrutiny. Participant experiences are drawn out of the data, then compared and analyzed to describe or clarify the research topic as a phenomenon.
- *Case study*. Analysis in a case study approach to research is characterized by its focus on the case, or selected cases, as the unit of analysis rather than the research topic collectively. Carefully selected categories that are created to describe a limited number of details or a specific dynamic are used to separate and analyze the data.
- *Grounded theory*. The analysis of the research data is an attempt to create a specific theory about the research topic. The theory proposed is "grounded" in the data and developed or proposed using a systematic set of procedures, including intuition and inductive reasoning by the researcher. The theory developed is most often a general pattern or theme that describes the behavior observed, and is the product of constant comparison analysis of significant data pieces.
- *Triangulation*. A strict interpretation is to have a third party review (thus the triangle), but basically the concept is to have separate data pieces point to the same end or research conclusion. In some cases, a combination of quantitative data analysis along with the qualitative results may be used for triangulation; in other cases, multiple raters, different cases, or peer theme interpreters are used.
- *Member checking*. Information that is provided by research participants is returned to them for confirmation. Part of the

analysis is to select quotes or references from research subjects, and then to confirm with the subjects that the selected data are accurate.

Qualitative data are, for the most part, textual. In order to analyze the data a researcher needs to prepare a strategy for the analysis. Predefined categories, or keywords, or phrases are often used for this purpose. Once again, computer programs have been created for ease of textual data analysis, the most common being QSR's NVivo (www.qsrinternational.com/product). Three examples of handling qualitative data follow.

The research referenced in Chapter 12 (Richey, 2006) used a data organization technique that listed the basic responses to interview questions for three categories of parents in order to make judgments about the research questions. This tabular analysis of data is presented in Table 13.6. The three categories were used as the column heads for the table, and the qualitative survey data were summarized into separate lists for the three categories of respondents.

The data captured in this model listed the comments in a rank order of most often occurring. Comparisons between the respondent categories were made possible by this type of data analysis to answer the research question why parents opt out of public schools.

Grounded Theory

Grounded theory is a valuable mechanism for the organization and review of research information. It is a constant comparative method used to generate theories. A researcher who studied

Table 13.6 Top Reasons Parents Chose an Alternative Educational Option

Private School Families 33 Completed Surveys	*Open Enrollment Families 29 Completed Surveys*	*Home School Families 15 Completed Surveys*
Religious Beliefs and Values	Quality of Teaching Staff	Beliefs and Values
Quality of Former District Administration	Curriculum Concerns	Quality of Teaching Staff
Quality of Teaching Staff	Location of Schools	Location of Schools
Quality of Former Board Members	Quality of Support Staff	Block Scheduling
Block Scheduling	Quality of Former District Administration	Quality of Former District Administration
Facility Concern	Quality Building Principal	Quality of Former Building Principal
Lack of Materials and Resources	Quality of Former Board Members	Quality of Former Board Members
Budget/Finance Issues	Quality of Current Board Members	Facility Concerns
	Quality of Coaches	Quality of Food Service
	Facility Concerns	

the implementation of democratic principles in post-communist Romanian schools used the grounded theory approach. Romanian teachers were interviewed, and the transcribed interviews became the data for the study. The study used semi-structured interviews coordinated by a key informant on a similar topic, and the interviews gave voice to Romanian teachers' understandings of the promotion of democratic processes within their schools and the effect on students and society. Observational field notes were kept by the researcher as well. Grounded theory was employed during data analysis.

This researcher did not come either to the interviews or to the analysis with a predetermined, unchangeable framework. Instead, the data were used to develop theory both at the time of collection and afterward during reflection. However, the researcher did attempt to become sensitized to the possible ways in which interviewees may understand and communicate their thoughts as members of Romanian society. The nonlinear model for assessing teacher perceptions of democratic principles within public schools in Romania was contemplated throughout the process. The themes or categories of policy, practice, and societal influences were taken into consideration as perceptions were revealed (Decker, 2007).

A second example of a data guide for qualitative research is from a study of early intervention for primary-aged students. The researcher was looking for factors that influenced the referral of African-American males to special education services, particularly information from a pre-referral process for the school's Building Consultancy Team (BCT). In this case parent, teacher, and student interviews were organized using a systematic approach required in the grounded theory application. The researcher used a conditional relationship guide to transfer data into a reflective coding matrix (Kelley, 2007).

All staff, parent, and student interview questions were placed into the conditional relationship guide individually as separate categories due to the nature and connectedness of the questions to the study. The purpose of the guide was to identify relationships and interactions among the categories while contextualizing the interview responses. Once the questions were placed into the category column, responses were organized in the relationship guide as what, when, where, why, how, and, finally, with what consequence. The completion of the conditional relationship guide was reviewed and double-checked against the actual audio and written responses to ensure that all perspectives were captured in the formatted process.

The statements within each consequence category were individually conceptualized and when combined formed a core category (of links and relationships) for the reflective coding matrix and further analysis. The concepts identified in the staff interview conditional relationship guide were problem-solving, interdisciplinary, belief, change, and progress. Table 13.7 is an example of

Table 13.7 Staff Conditional Relationship Guide

Category	*What*	*When*	*Where*	*Why*	*How*	*Consequence*
Evidence used to construct the problem	Teacher concern brought forward to the BCT members	Twice a month	Building consultancy team meetings	Teacher has tried basic classroom intervention but concerns continue to exist	Teachers have prepared ahead of time any logs of the tried intervention	Gain support from the BCT members
Evidence used to evaluate the intervention	Discussion of the teacher's tried intervention	During the BCT meeting but the teachers are not present	One BCT member usually talks ahead of time with the teacher	To gain a better understanding of the teacher's efforts	May or may not have well-documented efforts, but if so, two to three weeks of intervening is common	Not always sure the intervention matches the concern
Resolve differences in perceptions	Teacher may disagree with the team, team members discuss why they feel the way they do, and often use supported research	When trying to come to agreement on an intervention much discussion happens but time may hinder further discussion due to the number of children	During meeting time	The BCT members want to see progress and therefore try to ensure the intervention matches the concern	Observe between BCT sessions	May have to make adjustments
Types of interventions when problem occurs	If a behavior intervention is needed the social worker or school psychologist assist most; if academic the reading or math specialist offers recommendations	Enough of a concern to disrupt the educational process of the student or others	Interventions are carried out within the classroom or during unstructured times	The members believe this is the best intervention for the child at the time	The members often support the teacher in implementing intervention throughout the day, visit the classroom or meet with the child individually	Student shows progress, or has further behavioral or academic concerns

Perception of effectiveness of the interventions	By the mere fact the behavior may decrease or increase	When the staff are observing	In the appropriate setting	Natural context of where the behavior occurs	Gather 2–3 weeks' worth of data	If staff are not focused on specific outcomes it can be difficult to know
Perceived effectiveness differences within	At times one staff person may have a better relationship than others so the problems are perceived differently	When student is in multiple environments	Often unstructured times Lunchroom, recess, music, art, or physical education	It appears there is less structure during these instructional times	Each person has a time to voice any differences during the meeting	The team tries to come to agreement in choosing the appropriate interventions
Factors during the intervention process that influence the referral for special education evaluation	Frustration from the staff. Continued behavior or academic concerns, staff insist the student needs help	When they say feel the student would benefit from small group or one on one instruction	Student will benefit from small group instruction within the special education classroom	Student is not showing any gains in behavior and/or academics	Accumulated data indicates a disability may exist	A referral for special education evaluation is made

a more complex data organization where teacher interview data were organized into the conditional relationship guide for the purpose of analysis.

Most, if not all, of the analysis techniques used for qualitative data are for the purpose of making summary statements about the research topic that are carefully drawn from individual pieces of data. This is the “inductive” method, which is reasoning from the part to the whole or from particulars to the general. Data are collected in qualitative research in order to build theoretical concepts, test existing hypotheses or create new hypotheses, or challenge existing theories using intuitive understanding of observed events or recorded information. The researcher, much more than the method, is key in the data analysis in qualitative research.

In the end, the type of data collected predicts the type of analysis to be used. The main link to keep in mind is the relationship of the data to the basic questions. The researcher must study the data, rearrange it, or combine it in several ways so that a logical conclusion may be drawn to the investigation. Too often a researcher gets lost in the individual pieces of data, such as one quote or one statistic. It is essential to step back from the individual pieces and to gain a broad overview of what is there in order to make sense of the whole.

Implementation

Many tools exist for the collection of research information. The examples above used the results of interviews or surveys from colleagues. One of the researchers used a pre-test-post-test design to gather the research data. This means that the same tools (e.g., Quality Reading Inventory) were used before and after the intervention of the different types of reading instruction. In order to compare apples to apples, the researcher must take care that the same information is collected in the same way from the same children. These are the things that make the comparison valid.

If the researcher doing the survey has used a numerical response, then the surveys are collected and the responses are combined in a meaningful way. The number of responses to each item may be reviewed, or the total responses to each item may be added together and averaged to create a measure of central tendency for analysis. Often statistical analyses are planned and carried out on numerical data. If respondents were asked to answer “yes” or “no” items, then the researcher may use a Chi-square analysis to determine whether or not the observed yes and no answers were significantly different than expected (equal cell) values. If a 5- or 6- or 7-point Likert-type scale was used, the researcher may use t-tests or analysis of variance (ANOVA) to determine whether significant differences appear between or within groups.

If interviews were done, then the tape-recorded responses need to be transcribed and analyzed either through an online method or by hand. Trends in the data or categories of responses need to be established and meaning applied to them by the researcher. The researcher may need to check back with the participants to clarify responses or to delve deeper into the meaning of the response.

Other types of data call for the use of other sources of information. Test scores may be housed in a district office and made available to an individual or committee interested in studying the results and making judgments for the curriculum or instructional plan. Financial data, too, may be housed centrally and available for use in a research project. In most research the questions asked lead to the identification of, first, the type of information needed to answer the question, and, second, the actual source of that information.

Data Mining

Sometimes in research, questions arise following the collection or analysis of a dataset. Delving deeper into a dataset to recognize patterns in the data or to explore further than the basic questions would lead is known as data mining. Known as *knowledge discovery in databases* (Wikipedia, 2015), data mining is used to search for previously unknown data patterns, unusual data items, or data associations. There are three steps in the data-mining procedure. The first is exploration of the data where parts of a large dataset are selected for further review, sometimes reducing the dataset to a manageable size. The second step is to build and validate a model using the data selected. New ways to arrange the data and compare items or variables are created in this step. The third step in data mining is to use the model created or selected in the second stage to new data to measure its veracity and usefulness.

Data mining is primarily used in businesses with large sets of data to do predictive analyses. It is also a technique that may be used with textual as well as numerical data. Research abstracts, interview transcripts, or other published works can be managed through different computer systems to determine patterns previously unknown as well.

Summary

Seven steps, or steps in the inquiry process, have been covered at this point, and the most recent step may be referenced as *analyze*. One important part of the analysis stage for data review is to make a determination as to what data are usable and which are not. Too often researchers see data collected as necessary data to use. Sometimes the data do not respond well to the basic question, or the data may be tainted as to the method or timing of collection, making the information unreliable and unusable. It is essential for the researcher to keep accurate and complete notes regarding the data-collection process and to discount any information that is not relevant or valuable.

Linked together at this juncture, the steps in the process are shown in Figure 13.1.

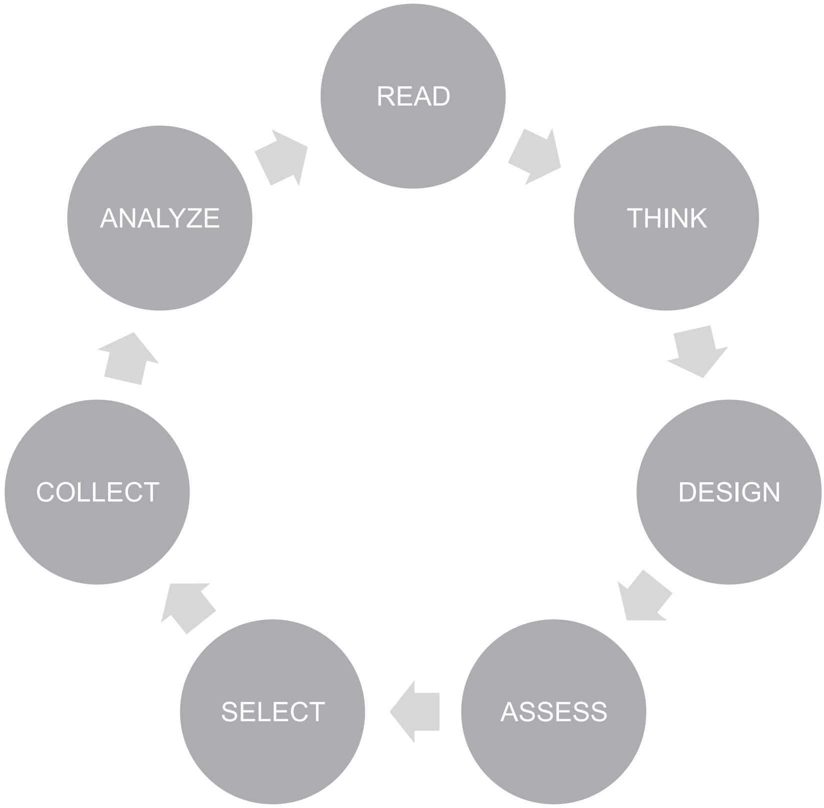

Figure 13.1 Read – Think – Design – Assess – Select – Collect – Analyze.

Resources

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In-class Exercises

1. Have student groups discuss a research report on salaries where the mean value (average) reported was $145,000 and the median (midpoint of the range of values) was $35,000, what conclusion could you draw regarding the sample?
2. Have student groups discuss why member checking is an important tool for the ethnographer.
3. Divide students into small groups and ask each group to discuss one of the qualitative research approaches introduced in this chapter. Ask each group to report back to the class about the history and nature of the qualitative method, when a researcher might use the method, ways to collect data using the method, steps to analyze data using the method, and strengths and limitations of the method.

Discussion Items

1. What is triangulation of the data, and why is it important?
2. If a dataset contains "yes" and "no" answers from 50 men and 50 women, what would be the expected frequencies in the cells of a Chi-square test? Why would a researcher use a Chi-square test on this dataset?

Assignment

1. Suppose a researcher had responses to a 5-point value inventory (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) where the difference between the mean for women (3.8) and that for men (4.1) was statistically significant. Would that be a substantial (professional) difference?
2. Identify five of the statistical tests introduced in this chapter and explain when a researcher would use each test. For example, when would a researcher use a t-test? What do the data have to be in order for a t-test to be appropriate? What types of research questions are answered by a t-test?

14 Display the Findings

Step 8 PRESENT: Portray the Data to Answer the Question

Once the data in a research project have been collected and analyzed by the researcher, it is time to prepare data displays that provide the substance of the project. As in the analysis phase, different types of displays are used for different types of data. The data analysis was done to test research hypotheses, or to answer basic research questions. The data displays are offered in a research report to communicate that analysis to a larger audience. Numerical data are usually displayed using tables, figures, or graphs; statistical results from analyses have a traditional format of presentation; and textual data are often summarized using selected quotations from research participants or other annotations from the data to confirm traits or phenomena.

The presentation of the data in a research project is a bridge between the research questions or hypotheses and the conclusions and recommendations. The data selected for display must be those that are logically linked to the basic questions. The style of presentation is often to select data for each question or hypothesis and to display those elements of data that are clearly connected to the topic. The presentation should also prepare the reader for the conclusions to be drawn. The researcher should be able to draw upon the data presented and refer to those data in the final part of the report where conclusions, recommendations, and implications of the study are discussed.

Research Ethics

Data displays must be presented in an ethical manner. While the researcher must select those data that answer the questions, contradictory data should be identified as well. Researchers must take care to protect the confidentiality or anonymity of research participants so that individuals are not singled out or made obvious in the data displays. Research ethics call for the total and honest display of the information gathered in the research project. Unethical display of data compromises the integrity of the researcher. There are several excellent texts on research ethics annotated in Chapter 20.

It is important to note that not all data collected as part of a research project needs to be presented in a research report. In fact, the true meaning of research is to ferret out those quintessential elements that shed light on the subject under scrutiny and then to use those elements as evidence leading to a conclusion. It is imperative that researchers take all safeguards available for the collection and analysis of data, and then use standard methods of display to make the points or draw the conclusions warranted. General methods of data display for numerical and textual data are provided below.

Quantitative Data

Quantitative data are numbers and, for the researcher, the easiest data to display, since there are basic conventions to use. The most rudimentary method of displaying numerical data is in the form of frequency counts or through frequency distributions. Numbers and percentages may be included in the text of the report, or they may be displayed using tables and cross-tabulations. Research variables or categories may be divided by subject, or by the different levels of subject responses.

Graphs provide another method of displaying research data. The data must have the capacity for a two-dimensional representation, and selected research constructs are then chosen for the horizontal and vertical axes of the presentation. Line graphs are used to connect the data points on a display, and bar graphs are either horizontal or vertical rows or columns that provide summaries of the data. Figures drawn using the raw data or summary data from the research are another useful tool for data displays.

Measures of central tendency for data displays may also be placed in graphs, or may serve as part of the written analysis of the display. If statistics are used to measure similarities or differences of the measures of central tendency (mean, median, and mode) or of dispersion (range, standard deviation, and variance), then the actual computed statistics need to be presented, along with the usual statistical table for the type of measurement selected. The data in the tables for numerical analyses are in all cases manipulations of the raw data collected by the researcher. Statistics are computations done using the data derived from the study.

When including research data in tabular form or with graphs or charts, the researcher should be aware of the common structure for presenting condensed data in reports. In our doctoral program we have named this the “Burke Convention” and there are three steps in the process:

- Introduce the table, graph, or figure in the text (“Table 1 contains [.]”).
- Present the table, graph, or figure (consult the APA reference for common table formats).
- Discuss the salient features of the table, graph, or figure in the text (pick out and report the highlights).

Two guidelines should be borne in mind in the discussion of data in the condensed version. First, not all data need to be discussed. Point out the highlights or salient features of the data displayed. Items on the fringe, the highest or lowest numbers or scores, or the outliers in the dataset may be selected for special attention. The second guideline is to try not to draw conclusions from the data in the presentation stage. The discussion should be simply pointing out facts from the data in the table, not offering an interpretation as to why those special features occur. This information should be presented in the discussion of the findings.

Qualitative Data

Summary tables and figures designed by the researcher to help the reader follow the interpretation lines created by the researcher are the basic techniques for displaying textual data. Concepts such as "thick description" or "rich attribution" serve as foundation tools for the researcher. This means that the reporting is replete with quotations, narrations, or other details that emerge from the data sources.

As with the numerical data, textual data form a bridge between the research questions and the summary discussion at the end of the report. Information in the data is separated into cogent pieces, categorized according to the research topics or questions, combined along those category or question lines to give strength to the argument, and then reported by category or question.

The researcher should focus on the questions and use them as an advanced organizer for the arrangement and display of the data. Subheadings in the dataset should be directly linked to the research questions, and the report should follow the lines of reporting the data pieces that were deconstructed and then reorganized to respond to those questions. For example, if survey questions were part of the data collection, then the report should include responses to each question that has pertinence to the topic (e.g., "In response to question A, Group Z said [.]").

When the data are anecdotal, the researcher should provide ample evidence from the situations described to support any conclusions that may be drawn. It is incumbent upon researchers reporting on qualitative work to include those items or data pieces that do not fit with the majority direction, and in the end to discuss why that may have occurred. Data that do not conform to the direction of most should not be hidden, but rather explained.

Analysis in Action

Once the data are collected, the researcher needs to step back from the dataset and begin to look it over with careful scrutiny – the researcher must *analyze* the data. Analysis, or the evaluation, appraisal, and questioning of the information collected, is essential. Are the data linked to the questions or hypotheses? Do the data relate well to the sources? What are the reasons for contradictory data? Is more data needed? What are the connections of the different data pieces? These are all questions that should be answered in the analysis phase.

Included in the analysis phase in the research process is the need to *organize* the information – the data – for display, and to answer the basic questions. Research means summarizing the information into comprehensible packets that are directly related to the questions or hypotheses. What statistics are appropriate for the quantitative data? What quotes or passages are appropriate for the qualitative data? How can the data be organized to ensure a logical connection between the data source and the research outcomes? Organization is a necessary step in the creation of an acceptable and logical argument from a research project.

The results of the survey that has numerical data should be combined into tables that provide an overview of the responses. These may be the actual tally counts of responses or they may be the average with a measure of spread like the range of scores, the standard deviation, or some other technique to present the analyzed data. Experimental and quasi-experimental research has accepted conventions for the display of data, including the display of statistical tests applied to the data. The researcher should follow the existing conventions rather than attempting to be creative. The format of these presentation tools may be found in the literature read to prepare for the research project, or they are described in detail in the APA publication (VandenBos, 2010).

If textual data are involved, the researcher should be judicious in the selection of quotes, or in the combination of thoughts from several sources, and then present that information in a meaningful way. Often the best evidence from textual data is the careful selections of the respondents' own words to make the point the researcher is trying to make. Information from several sources is good, but the researcher should be careful not to overdo the inclusion of participant quotes.

Tables, Figures, Charts, and Graphs

There are several data display techniques that can be used by researchers. Bar graphs offer an opportunity to provide a visual comparison of the difference between concepts or categories. Figure 14.1 is an example of a bar graph on teacher characteristics taken from a study of highly qualified teachers (Plunkett, 2004). Classroom teachers who were identified as highly qualified by administrators participated in this research project. The intrinsic qualities listed by the respondents were varied, and the researcher combined the various responses into this category (intrinsic qualities) for data display. The researcher identified the

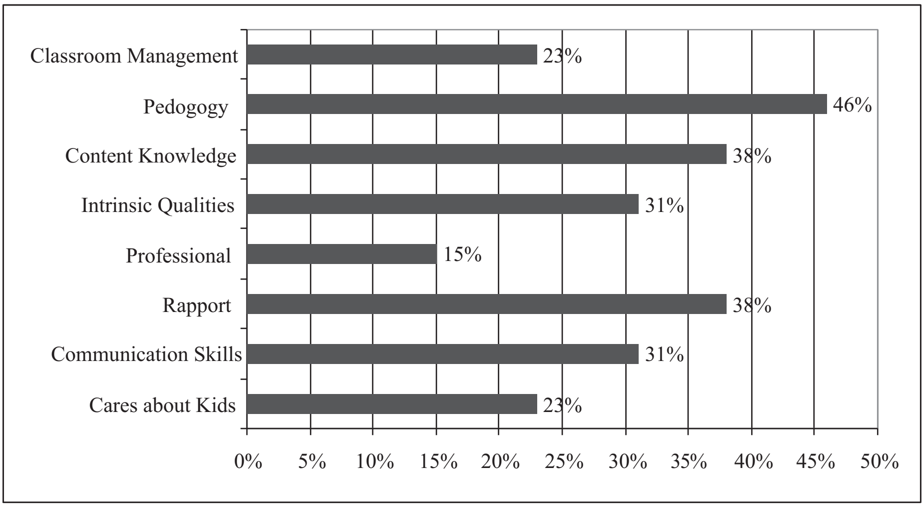

Figure 14.1 Characteristics of Highly Qualified Teachers Bar Graph.

characteristics mentioned by the participants and labeled the category for analysis purposes.

These characteristics included many different qualities, from a sense of humor to a strong work ethic, and from confidence in their teaching ability to being compassionate to others, with a final result of 16 sixteen different intrinsic characteristics listed. The same was true for the category of pedagogy. The researcher combined responses that included items such as knowledge of teaching strategies, knowledge of assessment strategies, and knowledge of child development for the pedagogy category. Figure 14.1 displays in bar graph form the results of the analysis done for this research project.

The value of using bar graphs, especially those that combine several individual responses into a category of response, is that they provide both an individual summary for the category and a comparison of response between categories in one visual representation.

Line graphs are another data display technique that provides a visual comparison for the reader. Figure 14.2 provides an example selected from a dissertation referenced previously (Peterson, 2006). It shows the use of a line graph to depict data from two sources, in this case superintendents and curriculum directors in the same districts.

The lines in the graph in Figure 14.2 show the data trends for two categories of respondents, and provide the researcher with a good pictorial of the average responses to the different research phenomena. In this example one category of employee (superintendent) was consistently above the other category (director of instruction), but the responses followed a very similar pattern.

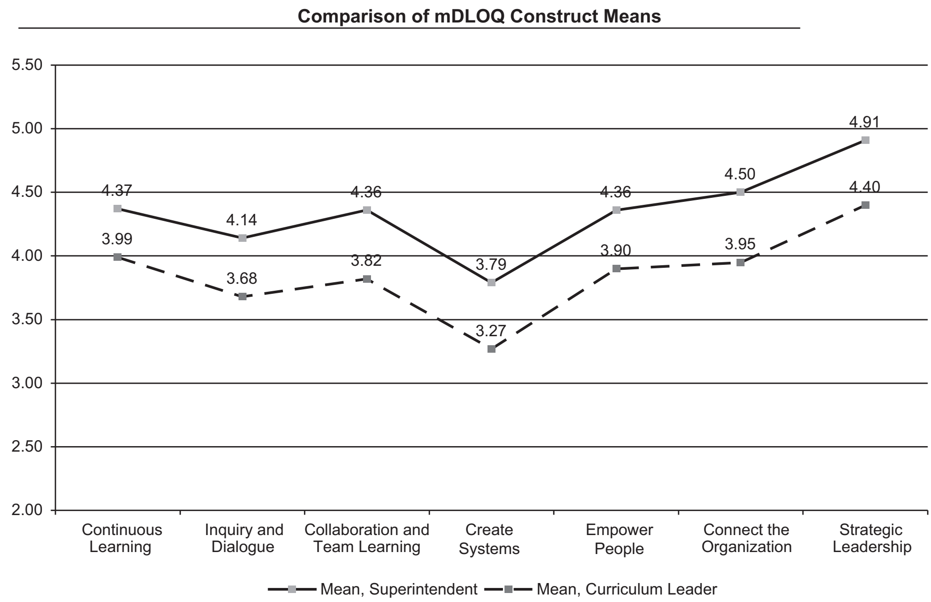

Figure 14.2 Comparison of mDLOQ Construct Means Line Graph.

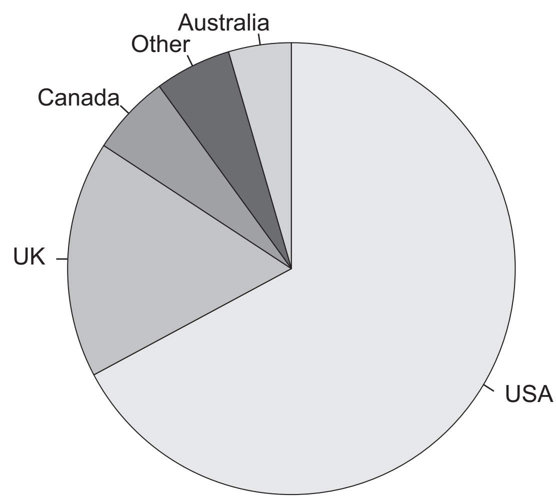

Figure 14.3 English-speaking Countries Pie Chart.

Circle graphs, also known as pie charts, offer a third visual display for research data. A pie chart is a circular graph that represents all of the data in a dataset (100 percent of the data) in a single picture, and is so named because of the resemblance to a pie with unequal slices. The circle is divided into sections emanating from the circle center to the rim, and each section is proportional to the quantity it represents. Together, the sections create a full circle. Figure 14.3 is an example of a pie chart from the Wikipedia (2015) file.

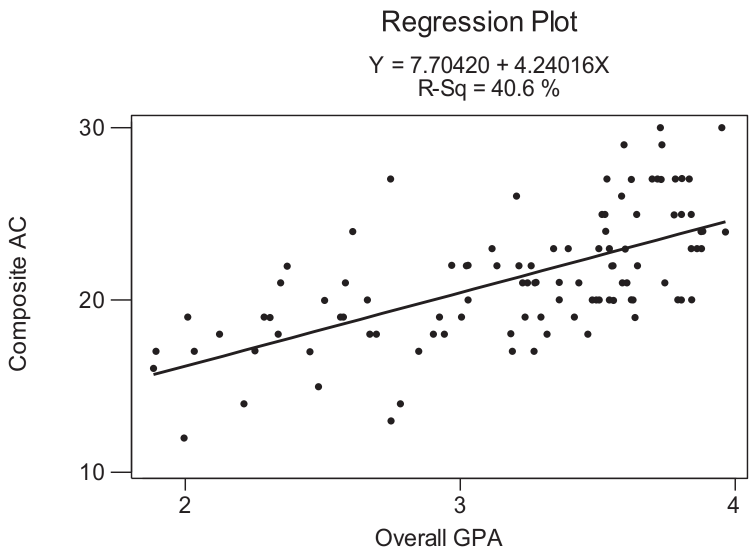

Figure 14.4 Regression Analysis of Overall GPA and Composite ACT Scatter Plot.

Scatter plots may be a helpful data display technique, especially when correlation coefficients or regression analysis is used for testing the data. An example of a regression line in a scatter plot is provided in Figure 14.4. This plot is from a research project that compared the results of the overall GPA and composite ACT scores for each individual student (McCarthy, 2007). One advantage of a scatter plot of quantitative data is that it provides a visual image of what the statistic measures. A reader can see the actual trend in the data, and that trend is substantiated by the statistical test. The scatter plot also provides a reminder of the outliers in the data, those data points that do not necessarily conform to the trend. An example for the plot in Figure 14.4 would be those students who have a high grade point average, but score low on the ACT, or, conversely, those who have a GPA below 3.0, but score above 20 on the ACT. It allows the researcher to ask the question "Why does that happen?"

Regression analysis has the added benefit of computing a regression statistic, R-squared, that provides the percentage of variation in the dependent variable – in this case the ACT score that may be predicted by the independent variable – e.g., the GPA. The R-squared term may be used to predict what a student may score on the ACT given that student's GPA.

Summary

With either numerical data or textual data, the information collected must be read, reviewed, combined, or separated in order to be applied to the research question. Plans for the dissemination of

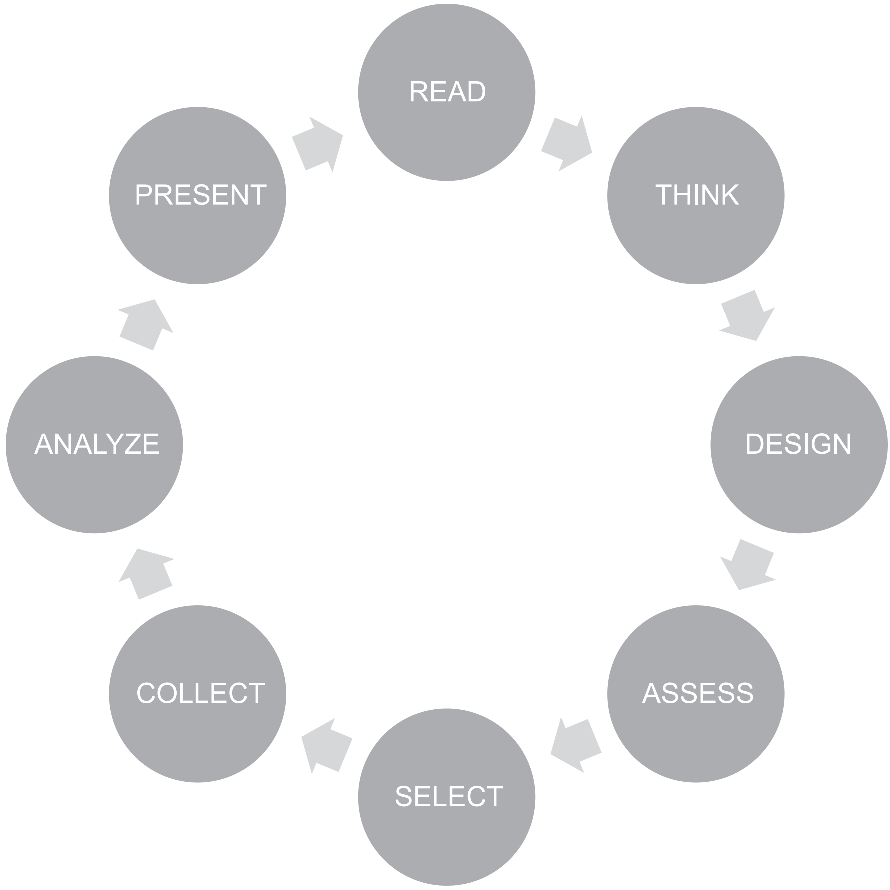

Figure 14.5 Read – Think – Design – Assess – Select – Collect – Analyze – Present.

the information should be made in advance of outlining and then writing the final report. The eighth step in the process, the eighth step of inquiry, may be summarized as *present*. Linked together, the steps thus far are outlined in Figure 14.5.

Resources

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In-class Exercises

1. Introduce a few different datasets (quantitative and qualitative data) and ask small groups of students to develop a plan for presenting the data in a professional and impactful way.
2. Ask small groups of students to discuss the other sources of information that may be helpful when reviewing interview data.
3. Ask pairs of students to discuss what to do with data that do not support the basic premise of the project.

Discussion Items

1. Why are tables or figures more effective in the presentation of numerical data than writing down the numbers in the text?
2. When are pie charts more effective than tables for data displays?
3. How are data displays helpful when drawing conclusions about the project?

Assignments

1. Create a pie chart from the data in Figure 14.1.
2. Create a bar graph from the data in Figure 14.3.
3. Create a table to display interview data.

15 Answer the Question

Step 9 INTERPRET: Decode and Translate the Data

While organizing the data for display, the researcher should keep in mind in which the directions the data take the project, and should begin a list of things found and things not found. That is, while analyzing the data and preparing the data for display, the researcher should keep a list of potential conclusions and possible recommendations or implications that flow from the dataset. The categories or headings for this list of potential final statements should be the research hypothesis or the basic questions. After all, the research is done in order to answer the question. By keeping track of what the data say, it will be much easier to report on the research findings.

There are three basic categories of discussion used in writing the concluding remarks regarding a research project: conclusions, implications (from speculation), and recommendations. The category of conclusions should be in every research report, and the other two categories may or may not be present. Once again, the data from the findings section will direct whether or not discussion beyond the conclusions drawn is warranted.

Answering the research questions or making judgmental statements about the hypotheses must be logically and solidly linked to the data. The reporting of the data must provide a direct link to any conclusions drawn. The researcher should make it clear that any interpretations are from the point of view of the researcher, and may not be the same results that another reviewer of the data may take. Complementary to the drawing of conclusions is the need to rule out other potential interpretations. Data should not be suppressed in this endeavor. If multiple interpretations or questionable causation are possible, the researcher should make the reader aware of those circumstances.

Since any research that is to be published should go through a peer-review process (as discussed in Chapter 7), researchers should be constantly vigilant to the problems of acting on premature findings, or moving to premature publication. Conclusions, implications, and recommendations need a direct and logical link to the data, and the data must be inclusive so that other potential contradictory results that may be warranted can be explained. Conclusions should be a category of results present in all research, since that is the appropriate way to enter and expand the knowledge base for the topic researched.

Conclusions

Conclusions are summary statements about the research topic that are linked to the basic questions or hypotheses, and to the data. The data analysis is generally a study of similarities or differences, or an attempt to describe and explain situations, circumstances, or phenomena. The concluding remarks are the result of the researcher making an inductive leap from the data, or the researcher making deductive statements about the data. In either case, there must be a logical connection to the data and the concluding statements must be related to the questions asked or the hypotheses posed.

Conclusions are the informed opinions or judgments of the researcher that are formed after careful examination of the research data. Research conclusions should serve a purpose. Theories or ideas may be confirmed or denied, problems solved, questions answered, hypotheses accepted or rejected, interrelationships between or among people or things may be explained, or new theories or ideas created or tested. Conclusions are an interpretation and discussion of what was found in the research. Interpretations that may result in data-driven decisions are conclusions that are helpful to readers.

When researchers are drawing conclusions about the work they have completed, the needs of the field or of the locus of the research should be taken into account. If substantiation of the status quo results from the research, or if a direction for change is recommended, the researcher must state those conclusions with credibility and in a way that may be understood by the public which the research is addressing. Brevity and simplicity in language is a plus for reaching the right audience with the research conclusions.

Not all statistically significant findings result in a solid conclusion for the research. As mentioned in Chapter 10, there may be a distinct difference between statistical significance (that is, the confidence in observed similarities or differences) and practical significance (that is, the importance for program or policy decisions). The same may be true for qualitative data. One quote from one individual may not lead to an appropriate conclusion, but if that one quote does the job of explaining or describing what the data say overall, it is appropriate to use to substantiate a conclusion.

Implications

The research data analysis may result in unexpected or unanticipated findings. These findings may lead to implications of the data. Data implications are speculations made by the researcher when the data do not necessarily confirm the result, but have a strong connection to a potential finding. The researcher implies that there may be a connection, without "proving" it with the data collected. Implications may also be stated for concepts that are outside of the basic research design. Results that provide a description of a construct that is not part of a basic question or hypothesis may lead the researcher to state an implication of the study.

Implications may lead to further study, new theories, policy directions, or may lead to using the same database to answer questions that were not posed in the original research. It is incumbent upon the researcher to offer these speculations so that the research may be understood in context, and to broaden the horizon of potential research in the topic. Implications may lead to recommendations for future research, which are a common result from dissertation research, and are a very good tool to be used to design another project and to add to the knowledge base in the topic area.

Recommendations

Research recommendations have two uses. The first is for recommendations for further research. Much like the speculation that the research may have implications in other areas, the recommendation may be for further research. The recommendation, however, may provide a more concise structure for a future researcher to use. The interacting variables or a new design for a research project may be recommended.

The second use of a recommendation section in a research report is to speak directly to the audience most closely connected to the research topic. Once conclusions are logically designed and stated, then the use of the research becomes the subject of recommendations for the research locus. The agency, group, or phenomena under study may be given direction for future action based on the conclusions drawn in the research.

Once again, the recommendations for redirected action or behavior should be succinct and focused directly on the audience. The researcher, based on the information gleaned from the research, provides a roadmap for future action with a prediction of consequences for action taken or avoided.

Write the Report

Once the data are analyzed and organized for display, it is time for the researcher to *write* about the project. This step starts with a summary of the basic literature from the *read* step, progresses through a description of the paradigm being used from the *think* and *design* steps, includes data displays from the *analyze* and *organize* steps, and moves forward with the researcher's conclusions, recommendations, and implications.

The write-up of a research project should follow the questions asked in the research. If survey items are used, then the responses to each item should be captured by the writer and explained with a connection to the basic question. It is in the writing of a research report that the reference text mentioned at the beginning of this book, *The Elements of Style,* becomes a valuable tool. The research writer should follow the basic conventions of both language use and research rhetoric. Remember, good writing is rewriting. Read what is written, and revise to make the meaning crystal clear.

It is always important to *review* what has been written. This review step is more than the researcher taking a critical look at her or his own work for editorial corrections. Important, nay crucial, to this step is the review of the conclusions drawn by others. Peer review is essential to every research project. Whether as an internal guide to implementation of results, or as a jury review for publication, every report should be scrutinized and critiqued to assure reliability.

Researchers may want help from the participant audience for the review stage, particularly when interview data are used. "Member checking" is the technique used for this purpose. In the example, the researcher may send a copy of the write-up to the participant whose quotes are used, and ask, "Is this accurate?" or "Does this capture what you said?" Once the report is written and the author is confident that the results are both reliable and valid, then the application phase begins.

Example

An example of data interpretation may be provided from a study of the impact of the standards movement upon school districts and the accompanying accountability to standards imposed by local, state, and federal policy. Perceptions of teachers and administrators were collected from surveys and interviews, and then used to determine a number of strands of the standards movement in order to gauge its effectiveness. Data interpretation pointed to possible strengths and weaknesses in the implementation process regarding standards-based education and the communications systems that guided its implementation. The categories or themes that emerged from this interpretation stage included the impact upon curriculum, equity, resources, assessment, accountability, time, and communication.

Captured below are the researcher's thoughts on each of these themes as she carried out her data interpretation (Fondell, 2004).

- *Impact on curriculum.* According to the survey respondents, the quality of the standards and benchmarks in the targeted district was acceptable. At least 75 percent of teachers and administrators alike responded that they agreed or strongly agreed with every statement that addressed the clarity of the standards and benchmarks, the teachers' and administrators' ability to understand the performance standards associated with the standards and benchmarks, and the quality of the standards and benchmarks in terms of addressing thinking skills and problem-solving. In addition, both groups perceived the alignment process to be successful.

- *Equity.* The issue of equity brought a different perception. When it came to assessing student achievement levels according to standards, a greater number of teacher respondents perceived that the achievement gap (because of race, poverty, language, background, or gender) was closing as evidenced in their classroom assessments than did teachers who perceived that gap closing when it came to state assessments. The perceptions of the administrators likewise differed in regard to the achievement gap, with more than half of the administrators believing the narrowing of the gap to be evident in classroom assessment.
- *Resources.* The teachers in this study seemed to feel the lack of resources more strongly than the administrators in every area except that of time for collaboration. Whereas the administrators expressed a positive view of the availability of resources, the percentage of administrators expressing more negative perceptions regarding time for collaboration was larger than the percentage of teachers responding negatively.
- *Assessment.* The teachers surveyed expressed between 25 and 42 percent disagreement in several key statements concerning assessment and accountability. Respondents did not know if state assessments measured what was taught in the district schools, nor if state, district, and classroom assessments collectively provided an adequate profile of student, school, and district performance. A major concern for administrators regarding assessment and accountability was that state assessments were not measuring what was taught in the district schools. The lack of confidence in the district's assessment and accountability system was highlighted in the survey results. The results indicate a strong need for staff development in the area of assessment so that teachers and administrators in the district would become more knowledgeable of state and district assessment practices and more capable of using test data to plan for curriculum and instruction.
- *Accountability.* According to respondent perceptions, two additional needs in the district were for teachers to meet regularly with other teachers in their content area and grade level to discuss students' progress and adjust instruction as needed, and also for the school to provide adequate remediation for students who need extra support to meet high standards. These seem to be two very critical pieces of the process for full implementation of standards-based education in any

district, and the issues that could make or break standards-based education in general.

- *Time*. If roadblocks to full implementation of standards-based education in a district are to be avoided, attention needs to be directed to those perceptions of teachers and administrators which cause the most discontent and frustration. Most of the key frustrations seemed to center on the element of time and stress: time involved in implementation that was an infringement upon already overworked teachers; trying to teach too much with too little time; and stress of accountability.
- *Communication*. A 10 percent minority responded "I don't know" to many key items in the survey. That type of a response would indicate the need for more information or better communication within the district. One example is communication about the use of the standards and benchmarks documents and how the curriculum is aligned with the standards and benchmarks. Responsibility for teaching to the standards and shared accountability needs also to be communicated to all staff.

In this example the researcher separated the survey and interview results that dealt with one or more of the issue areas, and those areas became the themes for interpretation. By outlining the interpretive results, the researcher is then able to move to the final stage of the research process: determination of the conclusions and recommendations. Interpretation is a middle stage between presenting the data and drawing conclusions, or answering the research question. Interpretation is very dependent on the data, and it is important for the researcher to make informed, data-driven assumptions about themes or categories prior to reaching conclusions.

Logic

Two basic methods of philosophical thought in drawing conclusions in research were identified in Chapter 1. These were *inductive* and *deductive* reasoning. As a reminder, induction involves gathering together a collection of pieces of information such as observations, experimental results, or other kinds of data that may be available, and then formulating a generalization, which reasonably explains all collected pieces of information. It moves from the specifics to a generalization. Deduction, as a form of reasoning, begins with a generalization. Predictions are made based on the generalization, and those predictions are challenged or tested using the research data.

Researchers are responsible for making logical and realistic sense of the data. Sometimes statistical significance is not professional or educational significance. Occasionally participants

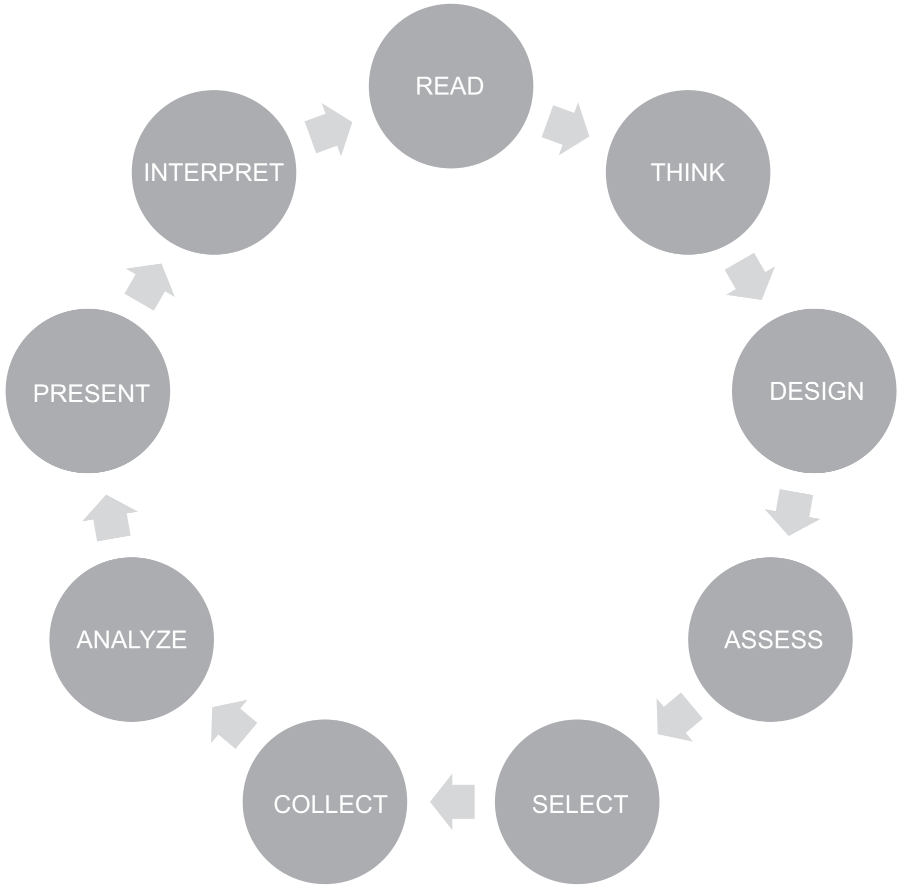

Figure 15.1 Read – Think – Design – Assess – Select – Collect – Analyze – Present – Interpret.

report what they think the researcher wants to hear rather than what they really feel. The data analysis needs to consider any preconditions or other influences that might make the conclusions questionable. Research conclusions must be logically connected to the research data, and it is the researcher's responsibility to assure that this happens.

The step added to the sequence by step 9 may be termed *interpret*. Linked together at this juncture, the pieces are shown in Figure 15.1.

Resources

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In-class Exercises

1. What can a researcher do if the data at hand are not adequate for the purpose?
2. What should a researcher do if the data from one hypothesis or question help respond to another one?
3. Divide students up into small groups and give each group a journal article. Ask students to differentiate between conclusions, implications, and recommendations as they are presented in their assigned journal article. Ask each group to share with the class the research question posed in the article, the method used to answer the research question, one conclusion, one implication, and one recommendation offered in their assigned article. If each element is not represented in the article, ask the students to infer what the missing element would be if they were writing the report.

Discussion Items

1. Why is it important to have data to drive educational decisions?
2. What is wrong with using data to make decisions before the research questions have been posed?

Assignments

1. Discuss the difference between conclusions and implications.
2. Are all statistical conclusions meaningful for professional decisions? Why or why not?
3. When writing recommendations, who might be the intended audience?

16 Determine Closure

Step 10 SYNTHESIZE: Combine and Report the Findings

The final step for completing a data-based inquiry project is to summarize the findings for quick retrieval and briefing. The abstract as a summary statement was outlined in Chapter 5. Rather than read abstracts as a preparation for the project, the researcher is now responsible for writing one. The subjects or variables in the research, the type of research used, the basic questions or hypotheses used as a foundation, key conclusions drawn from the data, and important implications or recommendations from the study are included in the abstract.

The Abstract

Professional journals have specific requirements for an abstract. VandenBos (2010) provides one such set of requirements. According to the APA, research abstracts should be accurate, informative, comprehensible, succinct, concise, yet specific, self-contained, non-evaluative, coherent, and readable to a wide range of consumers. According to VandenBos (2010), an abstract should be between 150 and 250 words, with no indents, double-spaced. It must be accurate, non-evaluative, coherent and readable, and concise (pp. 25–27). An effective abstract summarizes the major aspects of the entire paper, and should include the following elements:

- State the problem under investigation (one sentence).
- Describe the purpose of the research and the research question (one sentence).
- Describe the participants and include demographic information and the research site if applicable.
- Describe the essential and interesting features of the method giving careful consideration to key terms.
- State the key findings (two sentences).
- Include the implications and recommendations in one to two sentences (VandenBos, 2010, p. 26).

The following is an example of an abstract that meets the criteria for an effective abstract.

***Abstract* (*Casper, 2015, p. 3*)**

> American labor market researchers project a shortage of individuals with technical skill training needed to fill expected available jobs. Current associate degree completion at community colleges is insufficient to meet this need. Due to changes in public financing of higher education, institutions increased the amount of aid they provide to students. There is limited research on the effect institutional aid has on the completion of associate degrees in technical fields.
>
> This study assessed six predictors of student degree completion, with attention paid to receipt of institutional aid and enrollment status. A logistic regression analysis identified the predictor variables that significantly affected degree completion. The significant variables were analyzed to determine the difference in the odds of completion between students that exhibited the significant characteristic and those that did not.
>
> The receipt of institutional financial aid was a significant factor in degree completion. Institutional aid recipients were 2 times more likely to complete than those that did not receive such aid. Full-time enrollment was a significant predictor of degree completion, with such students being over 900 times more likely to complete a degree compared to part-time students.
>
> To meet labor market needs, policy-makers implemented policies to award college operational funding based, in part, upon degree completion. This study indicated that the receipt of government aid, although not significant, and institutional aid had a positive effect on completion. The findings were congruent with prior research on subsidies and should encourage policy-makers to provide sufficient grant funding to students to support degree completion.

Another helpful summary document is a research brief, or a synthesis of the research project. Longer than an abstract, but shorter by far than the complete report, the research brief has the same content pieces as the abstract, but each is handled in a more inclusive way. The research brief may go into more detail regarding conclusions and recommendations if the intended audience will be implementing program change based on the reported data.

Research as inquiry, for the most part, is connected by theory to other inquisitive endeavors. The synthesis of the project needs to make the link to former and future research so that the reader may see the work in the context of the broader picture. In this regard, very select items from the report's bibliography may be cited, especially as the citations link previous research to the new work. Implications drawn from the research become an important tool in the design of program or policy change based on the interpreted data, and the recommended design of additional research is important as well in the synthesis. A reference to the need for the next step in the research process – that is, recommendations for future research – is always a good way to end a synopsis of the project.

Researchers' Responsibilities

The consumer who is not interested in the design and completion of an authentic research project may come back into the discussion at this stage. After reading several of the reports identified through the ERIC search used previously as an example, the reader may decide to use the little books approach for a group of challenging students in her or his classroom. The confidence gained by comparing the subjects in the research project with students in the classroom may help in the application of the results of the research.

It may be that the plan is to replicate a published project in one's own circumstance before making an implementation decision. This may be due to a different student population than that used in the original research, or a different structure for the instructional day, or any other deviation that may lead to spurious conclusions if the design of the original research was implemented. In this case the application of the findings of the primary research is in the replication at another school or at another time.

Whether using the research to make program adjustments, or doing original research to test new ideas, any changes made may be considered data-based and substantiated by research. Data-driven decisions are those most often resulting in successful programs, in education as well as in other walks of life.

The success or failure of program plans needs to be confirmed and reported to the appropriate audiences. These reports can take many different forms. There are the formal research articles to be written and submitted for peer review. There are oral presentations of results to colleagues, staff, managers, board members, or other audiences. The selection of the type of report is directly related to both the audience and to the configuration of the setting for the report.

Research ethics play a crucial role in the responsibilities of researchers at the reporting stage. First and foremost is the recognition of researcher bias. If bias exists with the research topic or subject group, it needs to be identified and reported. Using statistical results inappropriately, or not reporting complete results, is another ethical consideration. The research must make clear and concise references to the data reported and the analysis done to support the findings. Taking participant input or quotations out of context is also an ethical question. Does the full context create a different interpretation than the one drawn by the researcher? Drawing conclusions not supported by the data, or not presenting data that contradict findings desired by the research, creates an ethical dilemma as well.

Synthesis

Synthesis is the process of combining different ideas, concepts, phenomena, or objects into a new structure. The purpose of synthesizing research data is to answer the research question, and to provide thoughtful recommendations for future research. The categories for data synthesis include conclusions, implications, recommendations, and conjectures. The conclusions are the primary synthesis results, since they should be direct responses to the research questions.

A dissertation studying the beginning teacher's preparation in classroom management was conducted by way of a survey of all beginning teachers in a selected geographical area. Conclusions drawn from the data that answered the research question and provided closure to the project were as follows (Burhop, 2004):

> The data received to analyze how beginning teachers spend a majority of their time came from a rank order survey from which beginning teachers responded. Beginning teachers were asked to rank instruction, classroom management, staff development, school organization, and general duties. Classroom management, by the data received in this study, has solidified itself as a major component of a beginning teacher's school day. With the data supporting that beginning teachers spend adequate and important time dealing with classroom management issues, it is then important that teachers receive adequate training in that area. The message sent by the respondents on this issue is relatively clear. The need for better curriculum in the area of classroom management is needed, especially in the development of a class or classes that teach students about classroom management, its styles, and how it fits to the subject area that they teach at the middle and high school levels. Observations of veteran teachers and practical field experiences were also identified by a small portion of the sample group as a vital element to teacher training. Beginning teachers responding to this survey were split among the strengths and weakness of their teacher education programs. Although some strengths were identified, such as hands-on experiences, or classroom instruction, the respondents stated there needs to be improvement in those areas in preparing preservice teachers for the classroom.

Conclusions for a study are often followed by recommendations for action on the part of the researcher. In the study quoted above, a recommendation for teacher preparation institutions was as follows:

> Classroom management as it relates to time use and teacher effectiveness, which then relates to better student learning, means it must be a priority in our teacher education programs. The recommendation of this research is a call for a stronger review of the curriculum of teacher education programs.
>
> (Burhop, 2004, p. 123)

Ethical Reporting

The final step in the process is to *report* the findings in an appropriate way. Once completed, most research is reported for the review and acceptance by others. Co-workers, other researchers, other professionals in the field, or other consumers all represent individuals or groups who become the recipients of the researcher's work. The length, style, and language of the reports must recognize and be prepared for the appropriate audience.

The audience for the research example of testing different methods of teaching reading may be a small group of colleagues, or a wider audience through publications. If the researcher intends to publish the results, care must be given from the very beginning to the journal or other publication for which the manuscript is intended. Topic, type of research (quantitative or qualitative), format of writing (scientific or expository), and other considerations must be borne in mind throughout the design, data, and writing stages.

Often the data analysis stage of the research sequence provides the proper tools for the reporting stage. The tables, graphs, figures, or tables constructed by the researcher, or found in the research literature, may be used as a visual tool in the reporting stage. Projecting the summary data on a screen through a PowerPoint presentation, or through other means, gives life to the presentation and realism to the data. Form follows function in the reporting of research information, so that the size and makeup of the audience most often dictates the type of presentation to be used.

In the reading teaching method example used throughout this chapter, the interested individual may want to share the results of the original research with colleagues. This may be a brief presentation of the summarized results in a faculty meeting. Copies of the original research may be the best vehicle for that discussion. If there are other supportive or contradictory research articles, they could also be used. If a committee has read the research and intends to present the findings to an administrative committee or to a school board, then a summary with combined visuals may be the best route to follow.

For those who replicate a study, or create an original research project based on existing literature, the report should include the basis for the design, and the verified results of the research. When all is said and done, the reason for doing research is to add to the knowledge base of the subject under study, and this addition is certified through the publication of the results according to accepted research protocols. The final piece in the sequence of action that leads to a research project being completed is to *synthesize* the findings. This final step completes the logical train of thought that represents the steps in any inquiry endeavor. As mentioned earlier, not all steps apply to all situations, but the steps provided here should help consumers or researchers make sense of the inquiry process.

Summary

As a consumer examines completed research, or as a researcher begins, proceeds, and finalizes a project, the following steps may serve as a checklist for items that must be accomplished. These steps apply to all kinds of research in many different professions and settings.

- Step 1 *READ*. Identify the existing theoretical basis of the research concept, then read and summarize the pertinent research literature.
- Step 2 *THINK*. Isolate the purpose of the study and identify the research topic and basic research questions.
- Step 3 *DESIGN*. Choose a research methodology that becomes the design of the study.
- Step 4 *ASSESS*. Recognize the evidence needed to answer the research questions and identify the data sources where the answers may be found.
- Step 5 *SELECT*. Ascertain the appropriate evidence source and identify the data sources or subjects or the research participants.
- Step 6 *COLLECT*. Gather the needed evidence by collecting the research data.
- Step 7 *ANALYZE*. Review the evidence by organizing and analyzing the data.
- Step 8 *PRESENT*. Display the research findings through a formal presentation of the data.
- Step 9 *INTERPRET*. Answer the research question by thoroughly interpreting the data.
- Step 10 *SYNTHESIZE*. Determine closure to the project by *s*ynthesizing the findings (Figure 16.1).

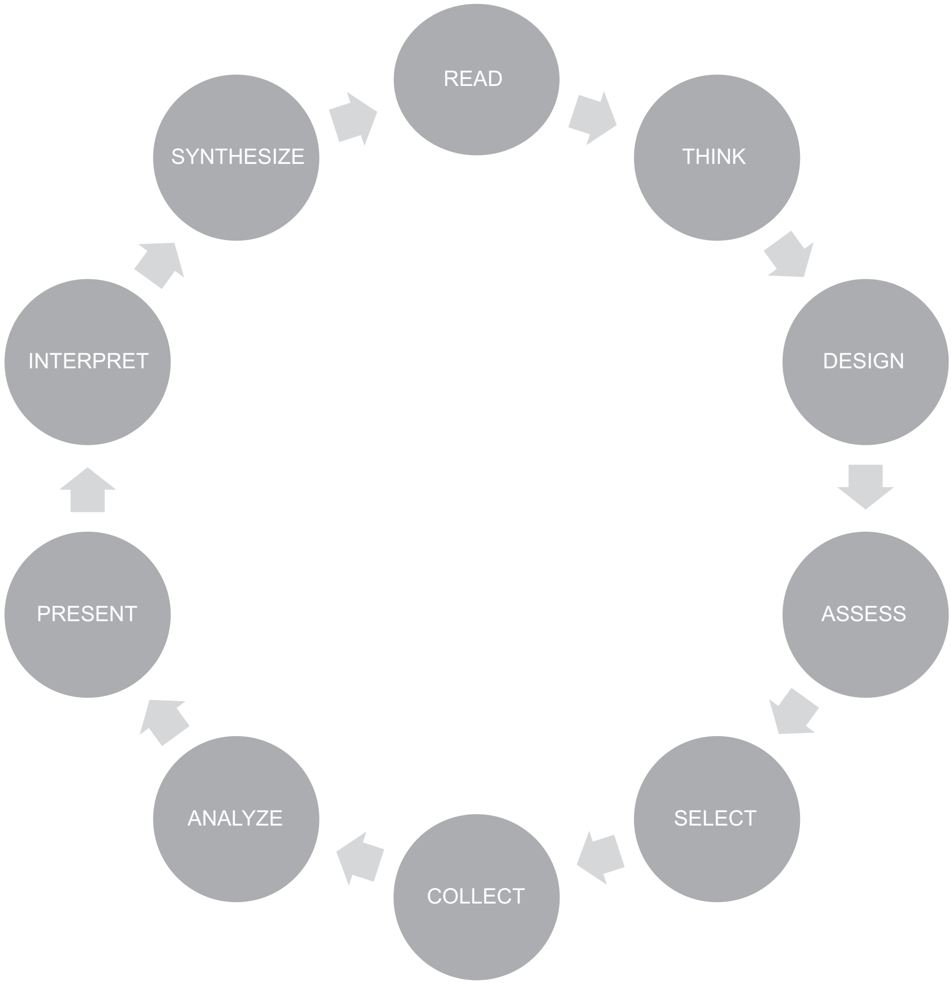

Figure 16.1 Read – Think – Design – Assess – Select – Collect – Analyze – Present – Interpret – Synthesize.

Resources

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In-class Exercises

1. Pair students and have them discuss how peer review enhances the reliability of research findings.
2. Have student groups list the parts of a research project that are crucial for the abstract.

Discussion Items

1. Why is it important to link the results of an individual research project to the research done in the past?
2. How may tables, figures, and graphs be valuable as a communication tool for research presentations?
3. Why is it important to project new research needed in the future as part of a report?

Assignments

1. Find examples of what you think is unethical reporting of research and explain why you feel that way.
2. Summarize what you have learned from the chapters in Part II of this volume.

PART III

Resources

The next four chapters in Part III of this text provide a summary of the steps in the research process and a list of resources for research that should be supportive to the consuming and designing of research projects.

17 Research in Action

Research is a human endeavor that has its foundation in natural inquisitiveness and a person's basic "need to know." Curiosity about how things work, or fit together, or why phenomena occur, or why people act as they do, and the need for substantiation to credit or discredit what common sense tells a person continues to fuel the need for research. It all starts with an organized theory or philosophy about how things are or how they interact, which leads to the study of knowledge, or epistemology. Empiricism is the branch of epistemology that is the study of knowledge through observation and experience. Observation and experience create a knowledge base regarding a topic that is ripe for study. The researcher needs to ask the right questions, contemplate how answers may be found, and design a method to find and report the answers to the questions posed.

Inquisitiveness has always led to inquiry, and the need to satisfy or answer that inquiry has led to structured forms of research. Formal research began as a scientific endeavor, and science has been honing the methods of research ever since. Conceptual schemes have been designed to do empirical testing of theoretical structures, to take a systematic look at relationships, or to attempt to explain observed phenomena. Science relies on measurement, and the control of the objects or subjects of the research, in order to be accepted by the public.

Specific paradigms exist for the structure or framework to carry out the research. These patterns exist for both number-based (quantitative) and text-based (qualitative) research. Information collected is usually categorized, ordered, manipulated, analyzed, summarized, and reported to support answers to the basic questions asked. The researcher makes inferences, or draws conclusions based on the analysis of the information collected. Sometimes statistical analysis, or numbers generated from the research data using accepted formulae, is used to make the researcher's point. Test statistics are numbers calculated from the research data used to verify decisions about the basic questions, or to test the hypotheses, depending on what paradigm is being used by the researcher. Statistics rely on having good numerical (quantitative) data.

Textual interpretations of data have similar rules to follow. When the information collected is in the form of words rather than numbers, or when the researcher does not change or attempt to influence conditions in the research, care must be taken to validate findings and substantiate conclusions drawn from the data. Replications of the research or meta-analyses of past and present research help with this validation. Repeated case studies, when analyzed together, provide both potential solutions to problems, and potential new questions to be considered.

Realistic research settings such as those that occur in education often do not give the researcher the desired control to complete a valid scientific experiment. However, field-based projects allow for the study of more complex circumstances. They may be used to seek solutions to practical problems, they can help a researcher design and develop new theories, and, finally, field-based research allows for a broader, though less documented discussion of the topic or phenomenon.

The following sections provide a summary of the steps presented in Part II of this book. Much research can be carried out and be valid for the consumer without using all of the steps. As mentioned in the beginning, these steps are there as a checklist of what typical research contains, or the steps in a traditional research project. Each separate step should be considered, then used or omitted, as dictated by the design being implemented.

Step 1 *READ*

Identify the existing theoretical basis of the research concept, then read and summarize the pertinent research literature.

A graduate student in education often comes to a research course with a problem or issue area in mind. One approach to conceptualizing the research project through the review and assimilation of the literature is to create a theoretical model of the research project. A pictorial model can represent the connection and interaction of the disparate pieces of information gleaned from the literature into a mosaic that pictures the work which the researcher is hoping to accomplish. A theoretical model can also serve as a categorization of the concepts that need further study through reading research.

A literature map is another vehicle for organizing previous work completed on a topic of interest. Published reports reference work that came before, and those works also contain references to other researchers. By collecting the published works in categories that represent the basic constructs of the project theme, a researcher can both trace the train of thought that led to the current situation and create the structure of the argument being made in any new project.

In reviewing the literature, it is important to make clear the difference between primary and secondary sources. While it is possible to trust a secondary source reference in a text, it is always good policy to check the original source if possible to ensure that the author's reference is whole and accurate, not taken out of context, or bent to fit the author's predisposition about the topic. Once the reference material has been consumed, the next step is to organize the argument for the project. That is the think stage.

Step 2 *THINK*

Isolate the purpose of the study and identify the research topic and basic research questions.

Thinking, of course, is part of the entire process of inquiry, but this stage focuses on the thought process necessary to step out of the literature and into the design of a research project. The topic of the research project must flow from the existing literature, and from the concepts and constructs that exist in that literature. Especially important are those references that are bona fide research studies connected either directly or tangentially to the prospective topic. It is important to clarify the authenticity and validity of the research read. The work that has been read and attested to by others through a peer-review process is the best source to help outline and define a research topic.

Once the topic is isolated based on what has been read, the researcher must then carefully state the actual problem or issue in a way that it can be solved or answered using new information – new data – to add to the literature. Literature in research will include recommendations for replication or for further research. These recommendations can help in defining a new project.

Important in the think stage of creating a research project is the careful definition of the constructs or variables in the study. While there are many well-known and accepted definitions of professional terms that represent concepts or constructs in the profession, sometimes the research being designed needs to create specific meanings for the terms that define the project. Those constructs and their definitions can form the outline for organizing the literature search through the literature map as well. A careful compilation and expression of the research literature leads to a focused research problem.

Articulating a problem statement or the research problem is the first step. The research problem is a statement about the problem that is grounded in research and context. A good problem statement clearly articulates the issue that can be addressed by the research study. It identifies the gap in the literature that the research aims to fill. Research problems should be aligned with clearly stated research questions and hypotheses. These basic research questions provide the direction not only for the data collection for the project, but also for the analysis and subsequent reporting of the results. It is important to ask questions that are not in the "yes" or "no" style, so that discussion and debate can occur with the reported results and conclusions drawn. Ancillary questions must flow directly from the basic question, and they offer a further delineation of the topic or a specialized treatment of the data that will be collected in the study. Ancillary questions may also be directed to specific subgroups of the sample being studied rather than to the whole group.

Hypotheses are conjectures of how research concepts or phenomena interact. A hypothesis is a beginning point for the study, and it offers a potential explanation of the topic in advance of testing the theory. Written in an if-then form, the hypothesis clarifies the interaction among research concepts. "If I have sanctions for behavior then discipline will improve" is an example of a hypothesis statement. Research organized through the hypothesis method also uses a null-alternate form. A null hypothesis states that there is no relationship between groups or variables being studied. The alternate hypothesis used in the same project states what the researcher anticipates as a probable result of the research. For example, "There is no difference between the attitude of men and women on the topic of capital punishment" is a null hypothesis. An alternate hypothesis for this research would be "Women have a more negative attitude than men on the issue of capital punishment." Data collected from a representative sample of men and women would be analyzed to determine if the null hypothesis could be rejected.

Whether stated in question or hypothesis form, the topic of the research must be clear, must be linked to the existing knowledge base for the topic, and must provide for an answer or solution through the careful analysis of data. These are the mechanisms for knowledge to grow through research. Once the research problem is clear it is time to design the project.

Step 3 *DESIGN*

Choose a research methodology that becomes the design of the study.

Throughout this text, readers have been made aware of the distinction in the research tradition among the basic designs of qualitative research, quantitative research, and a project that combines qualitative with quantitative in a mixed-methods approach. Once the research questions or hypotheses have been formalized, the next step for the researcher is to determine how to go about getting the information pertinent to answering those questions. Knowing the location and type of data available for the research helps determine the research methodology to be used. A well-written problem statement, along with either the research questions or the stated hypotheses for the topic, should give direction to the research method as well. The researcher must clearly articulate the rationale for choosing the method, and the method should align with the research question(s) that are posed.

Quantitative research usually connotes numerical data and statistical analysis of those data. Qualitative research includes an analysis of textual data, but also uses statistical procedures when the data are numerically labeled or organized. Mixed methodology combines the use of numerical data with textual confirmation of the findings in a triangulation assessment. Triangulation is using different approaches to collect and analyze data on the same topic. Having a sample of people complete a survey, and then interviewing a select number of those surveyed, or a completely different sample from the same population, and then comparing the survey results with the interview results, is an example of triangulation.

In education, as with many fields of study, there is a great amount of numerical data available to researchers to help answer questions through quantitative research projects. The use of existing datasets or sources is often the methodology for graduate students interested in specific aspects of an educational event or endeavor. Other data sources are available to the public regarding public schools such as the budgets of schools and districts, aggregated student test scores, graduation rates, or the per-pupil expenditures of each school district. Questionnaires, opinion or attitudinal surveys, or other survey techniques also lend themselves to quantitative designs when using numerical response scales.

Most textual data used in education research come from interviews or other interactions that provide answers to questions or responses to prompts dealing with the research topic. The interview questions or research prompts flow naturally from the basic questions, and often include opportunities to expand upon the information directly related to the research topic. The usual design of a qualitative study using textual data begins with the preparation and vetting of interview items. Subjects are chosen for the study based on identified knowledge or experience with the subject, and data collected are subjected to some form of categorization. Qualitative data may also be derived from historical documents, archival records, observations, or other descriptive sources. Research design first identifies and then makes use of the source of information to be collected for the research program plan.

Many education research projects combine numerical data with textual data to ferret out the answers to the research questions. These mixed-methods designs are intended to use the best information available and to make the case for reliable data by triangulation of the information received. Often the design is to survey a broad range of participants, and to then select subjects from the database to do more in-depth interviews. The interview questions come from the same categories of items in the survey, and the purpose of the researcher is to confirm, or question, the survey results through the interviews.

Step 4 *ASSESS*

Recognize the evidence needed to answer the research questions and identify the data sources where the answers may be found.

Once again, data sources abound for education research projects, from the classroom, the school, the district, the state, and even at the federal level. These data are a valid and reliable source for research information. Many research projects are designed to collect new data from the appropriate sources in order to answer the research questions. If the question is on funding, then budget data are used. If the question is on student performance, then test scores are generally the data used. If the questions deal with professional perceptions, attitudes, or knowledge, then the evidence needed may come in several forms.

Most research reports have a section that outlines the potential sources of data, especially when the previous research used similar sources. The issues of population identification and sampling play an important role in the identification of data sources. Research tradition has allowed for carefully selected samples from a well-constituted research population to offer a technique or procedure to legitimately answer questions for the entire population. A more recent phenomenon in education research, as well as in research in other disciplines, is to use the case study approach to provide the evidence required to answer the questions.

Stratification of the research population is a technique often used to separate and distinguish the categories that may naturally exist in the population, or that are meaningful to the research questions. Potential evidence sources are divided into groups for the collection and analysis of data. Comparisons or contrasts are made between the groups rather than between individuals. Researchers may use already established stratifications of populations (e.g., race, gender, income, or living location), or they may create their own for the purpose of the research.

In many cases in educational research a convenience sample is used for a specific purpose. Schools within a district, or districts within a specified geographic area, often an athletic conference, are used for comparison purposes. The rationale for these purposive samples is not to generalize research findings to all schools, but rather to make informed decisions about the local conditions based on local or area measurements.

The adage that form follows function may be applied to the design of formal research projects. The problem statement with the basic questions or hypotheses creates the function to be studied, and that function is the driving force for the form or design of the study. When data needs have been isolated for the topic under scrutiny through the design of the study, then the framework needed to actually search and find those data is next in the process.

Step 5 *SELECT*

Ascertain the appropriate evidence base and identify the data sources, subjects, or research participants.

In some cases, the source of the evidence for the research project is readily at hand. Many case studies are completed by participant observers who are integrally involved in the circumstance or process being studied. If that is the case, the data sources are a known quantity, and access is available to the researcher as a trusted member of the group. More often the researcher needs access to the appropriate data source, and must gain access to the needed records or rely on the participants' willingness to contribute to the project.

If the research data exist in some form, then the researcher needs to identify the record keeper or custodian and request permission for access. In some cases, the records may not be wholly available, which creates a dilemma for the researcher. It is crucial to ascertain not only the accuracy of records provided, but also whether the records have been subjected to some redaction, editing, or culling. Data records that provide only part of the story may not allow for proper analysis. When public records are necessary for a project the researcher must be aware of access rules for those records and identify exactly the information needed in making a public records request. Personnel records, for instance, are often subject to specific rules of access.

There are protections for human subjects as well. Most colleges and universities, school districts, and other information sources have a review board that makes judgments about research with employees or students. Chapter 11 contains a discussion of the Institutional Review Boards (IRBs) that exist on most campuses. Researchers must gain permission from those boards in order to access the necessary data sources. The reason for board review of proposed research is to minimize the risk of harm to participants. One basic principle of ethical research is to do *good,* or, put another way, to *do no harm* to individuals.

Human subjects must give informed consent to participate, and be allowed to withdraw if they become uncomfortable with the direction of the research. The guarantee of anonymity and confidentiality is important when identifying and judging data sources. Participants in research projects are often more willing to be involved when they feel comfortable that their input will be part of a larger picture, will be meaningful, and that there will be anonymity. That is, there is an understanding that the responses will be reported in aggregate, not in individual and attributable forms.

An important consideration in the identification and selection of a research sample when people are the data source is to not provide a predisposition to the members of the sample. Indicating to a potential interview candidate that "I selected you because I know you will say . . . ." is not appropriate. Prejudicing members of the sample in advance of collecting the data violates a basic research ethic, and could be considered a deceptive practice.

Once the records are identified or the individuals selected for data collection the next step is to collect the data. The following section provides some cautions regarding the collection and management of research data.

Step 6 *COLLECT*

Gather the needed evidence by collecting the research data.

Once the data sources are known, the collection of the research data begins. Data collection in a research project is the process of gathering information from identified sources for the purpose of answering the basic research questions. Collected data are also used to test the research hypothesis or evaluate program outcomes. Data are collected by accessing existing records, measuring identified constructs, observing and recording situations, conducting a survey, or talking to people.

The researcher should generate a list of individuals to interview, a group of participants to survey, numerical data sources to collect and organize, or other information sources identified to help answer the research questions. Form follows function with the collection of research data. The research design, if carefully thought out and organized, should give direction to the data collection.

Researchers must keep in mind issues that may arise in the collection phase. The data may not relate to the research question, the subjects may have been given a predisposition to the topic, recent events could prejudice responses that may otherwise have been different, or records may have been edited and therefore not accurate or reliable. The researcher is responsible for accurate and unbiased data collection in order to substantiate the integrity and maintain the ethical nature of the research.

In some cases, the researcher may be too close to the subjects to allow for a fair and unbiased response. In that case an outside observer can fulfill the data-collection need. In addition to developing effective questions designed to solicit responses focused on the central issue of this study, the notes and observations of the interviewer also contributed to the overall results. The interviewer's notes are a valuable method for recording the impressions, reactions, and non-verbal information.

Having too much information, namely data overload, is not as big a problem as having too little data. Researchers need to monitor the collection process and decide whether to end the collection or to find ways to increase the amount of data collected. Existing records may provide only a portion of the picture desired, interviews may only provide part of the answer needed, or survey returns may be dismal. In those cases, the researcher needs to determine how to go about gaining more information so that an accurate and reliable answer to the research question may be found.

A final note on the collection of the data is to assure the accuracy of the results. When human participants are used in interview settings, it is imperative for the researcher to share the information that is to be used which came from specific participants with that person. Known as member-checking, this technique provides another guard against incorrect data interpretation.

Data analysis follows the collection, and the analysis may give direction to the need to collect more data. The following section provides a review of the methods of data analysis most often found in research projects.

Step 7 *ANALYZE*

Review the evidence by organizing and analyzing the data.

The review and analysis of data is driven by the research design. By reviewing all of the information collected in a research project, and then organizing those data into a framework aligned with the research questions, the researcher is able to begin to find the answers to the questions posed. Some of the data will be important to the research results; others may not have the direct relationship the researcher needs for proof. The review stage is for the researcher to select the wheat and discard the chaff accumulated through the data-collection stage. There are different conventions for the different modes of research. Basic techniques for both the qualitative and quantitative approaches are provided below.

Analyzing data from a qualitative study can take many forms. The researcher must review the textual data for themes or categories of responses, and select the quotes or attributions that best represent the accumulated response of the participants. Qualitative researchers should consider the most appropriate method for analyzing non-numerical data. Each of the qualitative traditions aligns with a method for analyzing data. For example, the narrative inquiry approach calls for organizing data into themes and highlighting the stories of the participants in a narrative way. Sometimes the number of times the same or similar concepts are quoted is tallied, and the concepts may be listed with their respective totals. A valuable mechanism for the organization and review of research information is a constant comparative method, also known as grounded theory.

Grounded theory is an approach to data analysis that may be applied to both qualitative and quantitative data. It uses an inductive reasoning approach to generate or conceive of data patterns through observation. General principles are derived from the data that lead to judgments about the research topic, often constructing new theories about the topic based on the data.

Quantitative data have several commonly accepted methods of analysis. Summary statistics and formal reports of test statistics have a prescribed pattern of use. The type of data collected is directly related to the kind of analysis used. When the data are interval numbers summary statistics may be used. Summary statistics are generally computed by using one or more measures of central tendency (mean, median, and mode) and a measure of dispersion (range, standard deviation, or variance). Interval or ratio numbers are needed to use the statistical tests outlined in Chapter 13.

Special tests are available for the analysis of data that can be put into numbers that are nominal or ordinal as well. Dichotomous variables have two values often used to name different data categories (e.g., 1 = female, 2 = male), and there are also statistical procedures available to test the data with these kinds of numbers.

Step 8 *PRESENT*

Display the research findings through a formal presentation of the data.

There are several data display techniques that can be used by researchers. The beginning of the data presentation comes from the review and selection of the tables, graphs, and figures that are generated in the data review stage. The first step is to know how to generate data displays based on the type of data and the programs used to store, retrieve, and analyze the data. The researcher must then select those that best respond to the research questions, determine how best to present the data, and then create the medium to do that presentation.

Tables

Tables have a consistent method of display. The subjects or categories are listed on the left-hand side of tables, and the numerical data are placed in the table itself under the appropriate column headings. Some of the displays will be just those tables used as examples in previous chapters. Not all tables generated in the data analysis phase will be part of the final presentation, but many will be. In addition, the researcher will combine results for data-generated tables to make summary points or judgments about the research questions. These basic questions become the organizing vehicle for the presentation of data. What pieces of information best represent the answer to the question? Those are the pieces that need to be displayed for the reader. Figure 17.1 provides a typical data display table configuration.

Graphs

Bar graphs offer an opportunity to provide a visual comparison of the difference between concepts or categories. The value of using bar graphs, especially those that combine several individual responses into a defined category, is that they provide both an individual summary for the category and a comparison of response among categories in one visual representation. Bar graphs often use percentages and the quantifiable measure for comparison. Figure 17.2 shows a typical bar graph display.

Line graphs are another data display technique that provides a visual comparison for the reader. When data trends over time or over data categories can be compared, line graphs often provide that opportunity. Line graphs are a two-dimensional display connecting selected data points across an axis that provide a usable comparison of similarity or difference of data trends. Figure 17.3 is an example of a line graph used for data display.

Subject/Category	Category A	Category B
Subject A		
Subject B		

Figure 17.1 Table Configuration.

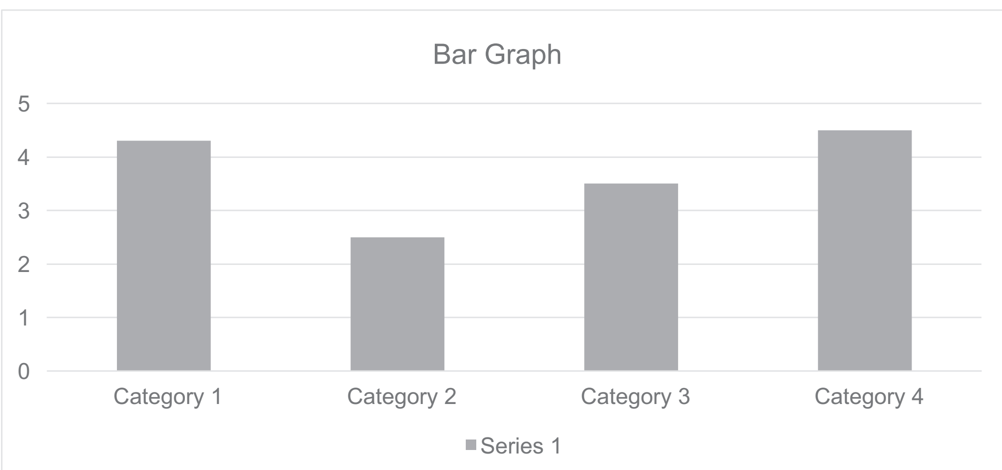

Figure 17.2 Bar Graph.

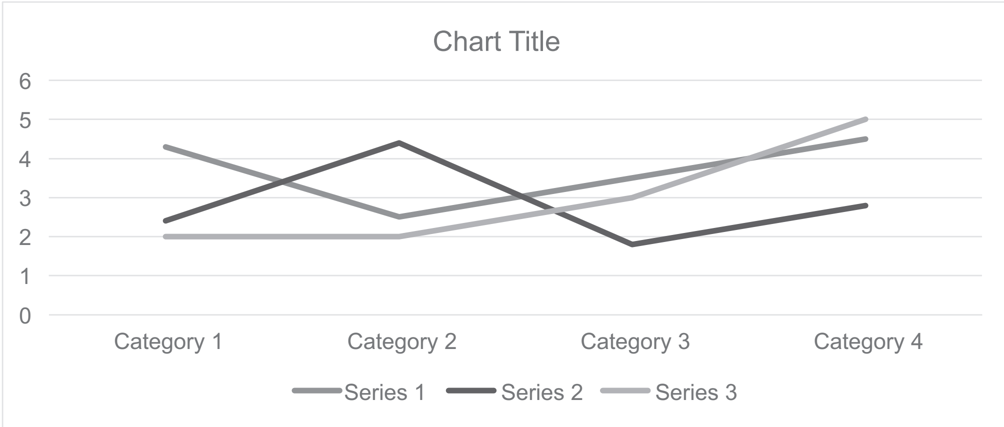

Figure 17.3 Line Graph.

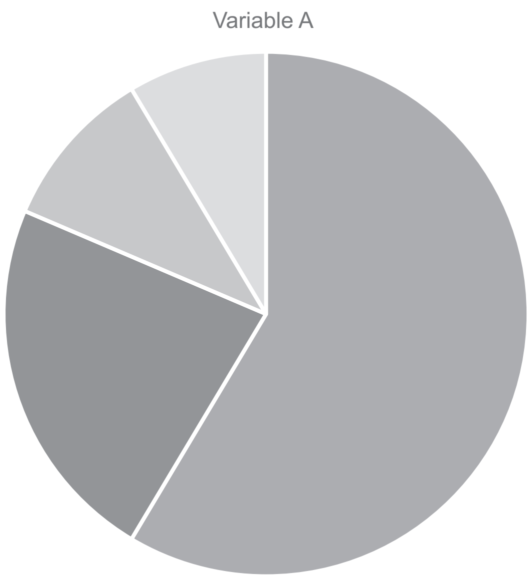

Figure 17.4 Circle Graph or Pie Chart.

Circle graphs, also known as pie charts, offer a third visual display for research data. A pie chart is a circular graph that represents all of the data in a dataset (100 percent of the data) in a single picture, and is so named because of the resemblance to a pie with unequal slices. The circle is divided into sections emanating from the circle center to the rim, and each section is proportional to the quantity it represents. Together, the sections create a full circle. Once again percentages are the measurement tool most often used in a circle graph along with frequency counts of the raw data within designed categories of data. Figure 17.4 is an example of a circle graph.

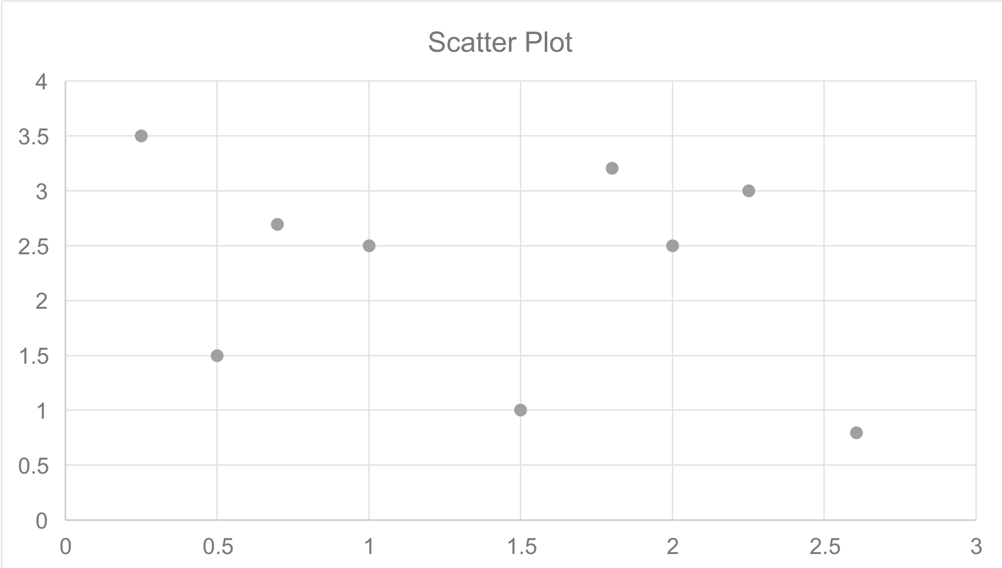

Figure 17.5 Scatter Plot.

Scatter plots may be a helpful data display technique, especially when correlation coefficients or regression analysis is used for testing the data. A scatter plot is a two-dimensional graph comparing two research variables, one on each axis of the graph. The raw data points are entered on the graph. One advantage of a scatter plot of quantitative data is that it provides a visual image of what the statistic measures. A reader can see the actual trend in the data, and that trend can be substantiated by a statistical test. The scatter plot also provides a reminder of the outliers in the data, those data points that do not necessarily conform to the trend. Figure 17.5 is an example of a graph with a scatter plot of data points.

Step 9 *INTERPRET*

Answer the research question by thoroughly interpreting the data.

Data interpretation is the most fundamental and significant activity for a researcher in any project. The research question has been posed, the information that was identified to help answer the question has been collected or generated, and now it is time to make sense of those data in order to answer the question. The basic decision to be made is whether the analysis provides adequate evidence to answer the question posed.

Data interpretation is talking about the data in research terms, with the research question(s), problem statement, and theoretical framework as the organizing vehicle. The researcher needs to allow the data to talk by way of creating categories or themes that emerge from the data – data categories that relate to the construct or concepts that have been created for the research design. These categories or themes flow from the analysis phase.

Statistical tests may be computed using data that are numerical, or whether data can be represented in numerical form. While these tests provide the probability that there may be a statistical difference, the researcher must determine whether the difference makes sense professionally. The researcher must also make the determination as to whether or not the results of the analysis answer the research question.

The same is true for purely qualitative data. Once amassed and analyzed, the researcher must ask whether the compilation and careful combination of the information makes sense and is adequate to answer the research question. Common data patterns that align directly with the questions and that are both relevant to the topic and sustainable over time are crucial to the interpretation of non-numerical data, including text and visual data.

By outlining the interpretive results, the researcher is then able to move to the final stage of the research process: determination of the conclusions and recommendations. Interpretation is a middle stage between presenting the data and drawing conclusions, or answering the research question. Interpretation is very dependent on the data, and it is important for the researcher to make informed, data-driven assumptions about themes or categories prior to reaching conclusions.

Step 10 *SYNTHESIZE*

Determine closure to the project by synthesizing the findings.

Synthesis is the process of combining different ideas, concepts, phenomena, or objects into a new structure. The purpose of synthesizing research data is to answer the research question, and to provide thoughtful recommendations for future research.

The categories for data synthesis include conclusions, implications, recommendations, and conjectures. The conclusions are the primary synthesis results, since they should be direct responses to the research questions.

Research can be exploratory. The researcher is looking for an insight into an issue area, or for an explanation of some phenomena. The data synthesis is aimed at discovery or trends that, while not necessarily conclusive, may be used to explain a circumstance or provide direction to further research.

Research can be descriptive. Descriptive research includes case studies, historical analysis, ethnography, field observations, surveys, or correlational studies. The aim of the researcher is to review the data and describe or explain the phenomenon under study. Interactions between constructs, defined differences or similarities, and projections over time can be the results of the synthesis of data from descriptive studies.

Research can be experimental. The scientific method of comparing a control group to a group that has received a planned treatment is one basic method of experimental research. Basic conditions such as random sampling from a normally distributed population are prerequisite to this method. Since these conditions are not always possible, researchers have quasi-experimental or non-experimental designs to use as well. Hypothesis testing may be a structure for experimental research. The synthesis of data analysis in experimental research is to report statistically significant differences found through applying traditional statistical tests, or to accept or reject hypotheses based on the research design used.

Research can be causal-comparative. Causal research looks for a cause-and-effect result from the data. Also known as ex post facto research, causal research explores the result of some action or event that may be responsible for the status of the phenomenon under study. The synthesis should result in a description of the similarities or differences among groups or constructs being studied.

Synthesis of research data, in the end, is the end. Conclusions are drawn, recommendations made, implications discussed, and future projections that deal with the research topic are compiled. It is in the synthesis stage that the researcher's voice should be clearly heard. The data speak to the researcher and the researcher speaks to the public about the results of the study, adding to the knowledge base that existed prior to the research being done.

Summary

In summary, the basic steps for a researcher to consider, and check off of the list, in any research project include the following:

1. Read the related literature.
2. Think about the literature's consequences.
3. Design a research project.
4. Identify the information needed.
5. Collect the research data.
6. Analyze the data collected.
7. Organize the data.
8. Write the research findings.
9. Review the written report.
10. Report to the selected audience.

The Annotated Bibliography in Chapter 20 provides references and resources that the reader may use to expand knowledge on any of the identified research topics, and will be helpful to expand a researcher's knowledge on a particular aspect of research selected for further study.

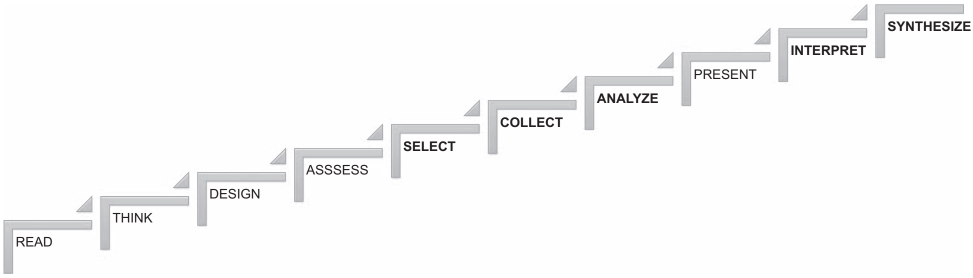

Figure 17.6 Steps in the Research Process

Resources

References

Clarke, A. (2005). *Situational analysis: Grounded theory after the postmodern turn*. Thousand Oaks, CA: Sage.

Glaser, B. (1992). *Basics of grounded theory analysis: Emergence vs. forcing*. Mill Valley, CA: Sociology Press.

Strauss, A. and J. Corbin. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd edition). Thousand Oaks, CA: Sage.

In-class Exercises

1. Pair students and ask them to identify potential data sources for the following topics:
   a. Teacher mentoring.
   b. Administrative contracts.
   c. Student test scores.
   d. Policy requirements for classrooms.

2. Design comparative studies for the following pairs of constructs:
   a. Job satisfaction and salary.
   b. Time on task and pupil learning.
   c. Class size and student reading scores.
   d. Student teaching and first year teachers.

Class Discussion

Describe the contents of a research report based on the following:

- Interview data.
- Survey data.
- Budget analysis.
- Federal and state policy.

Assignment

Describe how data analysis may be used to draw informed conclusions, and discuss how researchers may abuse data to reach unwarranted conclusions.

18 Templates for Success

The usual format for a research dissertation is five distinct chapters. Most often a student prepares a research proposal prior to embarking upon the research project, and that proposal is the first three chapters of the dissertation. Each chapter has its own use and meaning, and readers of research expect to find specific items commonly in each chapter. The sections that follow offer a template to the creation of, first, the research proposal, and second, the dissertation in total. The purpose of this chapter is to describe each section within each chapter of a traditional five-chapter dissertation. The Appendix includes the dissertation template used in the doctoral program at Edgewood College.

Chapter 1 Introduction to the Study

The template for Chapter 1 of a research manuscript has eight basic components. These include an introduction to the concept under study, an orientation to the context within which the issue is being studied, a clear and concise statement of the problem under consideration, a rationale or purpose statement for the study, clear and specific research questions or hypotheses, a theoretical model or conceptual framework, an argument as to the significance of the study, and a summary of the content in the chapter. Each of these template components is discussed below.

Introduction

An introduction to a dissertation presents the specific problem under study and describes the research strategy (VandenBos, 2010, section 2.05, p. 27). The introduction is grounded in the literature, and shows how the research being conducted will revise or extend existing knowledge about the problem. The introduction should identify the gap in literature that needs to be addressed by research, and show how the research will contribute to filling that gap. The introduction should provide a brief description of a topic's historical and theoretical backgrounds, and describe the scope of the problem. For example, if the problem being addressed is the achievement gap for a particular district, the problem should be contextualized from the big to small (national-level problem, state-level problem, region-level problem, district-level problem), citing literature to support the description along the way.

In an introduction, the researcher should:

- Discuss the broad foundation for the problem that leads to the study.
- Place the study within the larger context of the scholarly literature.
- Identify and reach out to a specific audience.
- Create reader interest in the topic.

Given that the introduction to a study sets the stage for the entire research project, it is important that it not only establishes the problem in a clear and coherent way, but it must also situate the study within the larger body of literature, and it should be interesting enough to capture the attention of the intended audience. It is customary for the researcher to review other studies in the literature to justify the importance of his or her particular study, and to differentiate it from past studies so as not to advance replicated work. Typically, introductions are about two pages in length.

Statement of the Problem

Following an introductory discussion of the major issues contained in the problem, write a clear articulation of the problem statement. A research problem is the issue that denotes the need to carry out the research study and generates the questions which the research aims to answer. A problem may originate from a gap in the literature, an issue faced in the researcher's workplace, personal experience and interests of the researcher, policy debates, or a combination of all of these issues. The problem statement describes the context of the study and situates the problem within that context. The problem should be stated in a way that is understandable to the general audience. Effective problem statements address the reasons why the research needs to be done. In other words, after reading a good problem statement, the consumer of research should know what the problem is, and why it is important to address it with research. A good problem statement is written in one succinct sentence, and is usually followed by one to three paragraphs of evidence. The problem statement typically does not exceed 250 words.

The problem statement typically contains three distinct parts. First, the problem is stated clearly within a context with enough detail to establish why the problem is important to investigate.

This includes identifying the gap or gaps in the literature that need to be addressed, and that can be filled by conducting the research. Next, the researcher introduces the method of solving the problem. Finally, the population, or audience, affected by the problem is identified, along with possible solutions that may result from engaging in research on the topic. Problem statements should not be written in the form of a question, and they should align with the method used to carry out the research project and the questions posed that guide the research study.

Purpose of the Study

After the problem is clearly articulated, the purpose statement is presented and establishes the intent of the research study. According to Creswell (2014), the purpose statement is "the most important statement in the entire study, and it needs to be clear, specific, and informative" (p. 123). Purpose statements should provide a specific and succinct description of why the study is being conducted. The purpose statement can also incorporate the rationale for the study. The following are key points to keep in mind when writing purpose statements:

- Begin with a sentence like "The purpose of this study is . . .", ensuring that the first sentence of the purpose statement is in alignment with the last sentence of the problem statement.
- Clearly identify the central concepts of the study (qualitative) or independent, dependent, and moderating variables under scrutiny (quantitative).
- State the research question(s) clearly (more discussion about research questions to follow).
- Outline the type or method of inquiry used, such as case study or narrative approach (qualitative), or survey or experimental (quantitative).
- Identify the participants in the study as well as the research site (without disclosing individual identities) so that the reader has a good idea of where the study takes place.
- Include some language about generalizability or application of results to a particular audience, and mention any delimitations that could affect the scope of the study.

The purpose statement should begin with two to three sentences describing the purpose of the study and the chosen method. This statement is followed by three to five sentences that state the research question(s) in a specific and clear way. Any terms that need to be defined should follow your research question(s). Restate the chosen method in slightly more detail and provide a rationale for using the particular method for the research question(s) at the end of the purpose statement. The following is an example of a clear purpose statement, provided by Dr. Ting-Lan Ma, Assistant

Director of Research and Assistant Professor of Research at Edgewood College:

> The purpose of the study is to identify cultural differences and similarities in early adolescents' coping strategies in response to peer victimization at school in both Taiwan and the United States. Using a mixed-method approach, the specific research questions addressed in this study are: (1) Do early adolescents in Taiwan endorse coping strategies outlined by Causey and Dubow (1992) more or less than their U.S. counterparts? (2) In what way is culture reflected in adolescents' social cognitions used in the coping process in response to actual peer victimization experiences for both Taiwanese and U.S. early adolescents? This study will use a quantitative approach to answer the first question because cultural comparisons can be made on an existing measure of coping *responses*. I believe that the second question is better approached by a qualitative procedure because I seek to conduct an initial exploration into how the adolescent coping *process* is permeated by cultural values.

Research Questions

Research question(s) and research hypotheses should be in alignment with the theoretical framework guiding the study and the problem statement central to the study. They should indicate whether proposed findings could improve educational practice. A research question often poses a relationship between an independent, or input, variable and a dependent, or outcome, variable. A research question should be developed before the methodology is determined because the way in which the research question is worded influences the type of analysis that must be done to answer the question. For example, a research question that asks, "What is the relationship or similarity between variable A and variable B?" leads the reader to expect a correlational analysis; a research question that asks, "What is the difference between males and females on A?" leads the reader to expect a difference-of-means test, or t-test; and a research questions that asks, "What is the impact of A on B?" leads the reader to expect a regression analysis.

A good research question identifies and defines the variables under study, outlines the methodology, establishes a tight focus for the study, and provides direction for the research. As a researcher develops a research question, the following checklist should be used.

✓ **Is the question appropriate for me?**

- Will it hold my interest?
- Can I manage any potential biases or subjectivities I may have?

- ✓ **Is the question right for the field?**
  - Will the findings be considered significant?
  - Will it make a contribution?
- ✓ **Is the question well-articulated?**
  - Are the terms well-defined?
  - Are there any unchecked assumptions?
  - Is the question open-ended and does it use words like *what, how, to what extent,* or *in what way?*
- ✓ **Is the question doable?**
  - Can reliable and valid information be collected in an attempt to answer the question?
  - Do I have access to the necessary information?
  - Do I have the ability to collect the data?
  - Will I be able to get it all done within my time constraints?
  - Are costs likely to exceed my budget?
  - Are there any potential ethics problems?

It is critically important that the researcher distinguish between the problem statement, purpose statement, and research questions. These three key elements of a research paper should be in alignment, but they are not identical constructs.

We have mentioned the word *alignment* throughout this chapter. Aligning the research problem, purpose of the study, research questions and hypotheses, and the theoretical foundation of a research study helps the researcher maintain a clear focus during the writing process. The problem statement stated clearly is central to setting the stage for the research. The purpose statement should flow directly from the statement of the problem, and each sentence included in the purpose statement should support the problem statement. If there is alignment between the problem statement and the purpose statement, the research questions should be easy to craft. The research question(s) direct the central inquiry of the study, and the main purpose of any study should be to answer the research question(s). The research question(s) must be in alignment with the method of collecting and analyzing data; otherwise the ability to answer the research question is in jeopardy. Finally, in quantitative studies, the research hypotheses should be written as slight variations of the research question(s) and, if done correctly, maintains the focus and integrity of the topic. By aligning the problem statement, purpose statement, research question(s) and hypotheses, and research methods, the research process maintains a narrow focus. We have introduced the idea of alignment with the analogy of a funnel. Keeping these four critical elements of the research paper in the funnel leads to a clear and focused research study.

Theoretical Model or Conceptual Framework

Theory plays an important role in research studies. Theoretical or conceptual frameworks are instrumental in qualitative, quantitative, and mixed-methods research. In quantitative studies theories are often tested to determine the relationship between independent and dependent variables. In qualitative studies theory may form the lens for understanding the nature of a phenomenon, or theory may be generated as a result of qualitative inquiry. A theory is meant to explain how and why variables and constructs are related, and often guides the organization of the literature review, the presentation of results, and the discussion in a research report.

A theoretical model is different from a conceptual framework. A theoretical model is a new or continuing review of existing theory, building on or extending the work of previous theoretical models done and tested by others. A conceptual framework is a unique structure of the concept or concepts that undergird a study. Students will generally have either a theoretical model or a conceptual framework for their research. Sometimes students will use a combination of multiple theories or conceptual frameworks. It is up to the student and the advisor to select the best framework for the study.

A theoretical model or conceptual framework is often demonstrated by a figure, but may also be described in a narrative without a graphic representation. The model or framework is used to identify interrelationships of variables or groups in the study. According to McMillan and Schumacher (2001), a theory should fulfill the following criteria:

- Provide an explanation of the relationship of variables in the study relevant to the outcome variable.
- Be consistent with the already established body of knowledge.
- Be considered a tentative explanation of the outcome variable.
- Stimulate further research in areas that need investigation.

Some students select an existing theory as the foundation of their work. In those cases, the student should cite the original theorist and show the visualization of the theory and describe the ways in which the theory grounds the study. In other cases, students should draw from the literature to present a picture of the relationship between the independent and dependent variables (quantitative) and/or central concepts of the study (qualitative), and rely on the literature to predict or describe the relationship between variables in the study. Regardless of the research design, it is important that the researcher explain how the theoretical or conceptual framework is appropriate for the research study.

Significance of the study

The significance section is used to validate the research. It should connect research questions to the literature examined and reported in Chapter 2, and indicate how the research will refine, revise, or extend existing knowledge in the area under investigation. The researcher should indicate how the research fills a gap in the literature. Finally, this section should articulate how the research is significant both practically and professionally. The potential practical implications of the study include what the research adds to the existing professional knowledge base, how the results may be beneficial to the profession, and what the results of the study may add to the literature in the topic area.

Summary

The summary should include a one- to-three-paragraph analysis of the key points included in Chapter 1. Often, good summaries are created by writing summary sentences using the headings in the chapter. The summary section of Chapter 1 should include a brief introduction to Chapter 2, and it may include a brief description of what will be included in Chapters 2 to 5 as well. Introducing future chapters is the decision of the researcher and advisor.

Chapter 2 Literature Review

The literature review provides the framework for establishing the importance of the study and the benchmark for comparing the results of a study with other findings. A literature review is a place to identify, select, and analyze sources on a topic. It provides a history of a topic and gives explicit credit to previous authors. It should provide a foundation for a problem statement and research questions. It relates the study to the larger, ongoing dialogue in the literature about the topic. It is a synthesized explanation of the results of other studies that are closely related to the topic. As such, the literature review should posit a logical argument for the dissertation. Often, a review of literature is the longest chapter in a dissertation. It includes theoretical and practical literature, making references to alternative viewpoints and methodological resources (Creswell, 2014).

There are four criteria in determining the adequacy of the review of literature: (1) complete enough to inform and enlighten the reader; (2) clear in every regard; (3) correct in style and accuracy, and (4) as concise as possible while meeting the complete criteria outlined below (SEMO, 2007). When writing a literature review, it is helpful if students include a map at the beginning of the chapter. The literature map serves as a roadmap to the bodies of literature and topic areas that the researcher will discuss in Chapter 2. Students should keep the following points in mind:

- Start with an introduction: restate the purpose of the study and clearly restate the research questions.
- Present the literature map and/or guide.
- Delineate the starting point for the review of the literature and explain how the study will refine, revise, or extend what is known.
- Avoid statements which imply that little is known about a topic area because usually this means that the researcher has not conducted a deep enough review of the literature.
- Be thoughtful about the literature included in the study. Literature included in the review should be pertinent and relevant.
- Avoid paragraphs that begin with a citation in the topic sentence, especially when paired with a description of the author's study as the body of the paragraph. Use your topic sentences to describe and delineate your argument.
- Document the search strategy and be prepared to share the process for developing the literature map.

Literature Mapping

Mapping is a very useful graphical technique that helps visualize connections and relative relationships between and among concepts. In the case of literature, these associations are between literatures and mapping can help identify issues such as proximity and connections in terms of ideas and findings (UWE, 2007). Analyze a paper using critical techniques, then decide how it fits in with other, previously analyzed literature. This may be achieved by literature mapping, which involves broadly identifying the key concepts across the literature and how each paper or piece of material fits into this overall conceptual map.

To start mapping, follow these steps:

1. Write down the major themes from the literature which have relevance for the current piece of research.
2. Begin a list of authors for each major theme and indicate the authors' point of view/finding/perspective on the theme.
3. Write down any areas of consensus between different authors.
4. Write down any areas of dispute or disagreement between particular authors.
5. State if there are any special reasons which might account for the different views held by different authors. For example, have they conducted their research at different times or by using different techniques?
6. Note the implications which cases of consensus and disagreement have for the current research, if applicable.

7. When appropriate, be descriptive about the details of key studies that form the foundation of the research and synthesize the research findings to tell the story behind the research problem.
8. Every time you read new literature, ask: Where does this paper fit in and does it alter any of the answers to the previous seven questions?

Chapter 3 Research Design and Method

Chapter 3 is the most demanding chapter (Bazerman, 1988) and usually generates the most discussion during a proposal presentation. Chapter 3 is often called the recipe for the design of the study. It provides details about the participants, measures, procedures, and the planned or completed data analysis. The template for Chapter 3 includes six separate components. The components include an introduction that serves as a transition from the first two chapters to this one, a description of the data sources or the participants in the study, an outline of the research variables or constructs used to structure the study, a description of the procedures used to find and collect the research data, the strategy used to analyze the data, and a chapter summary.

Introduction

Begin the introduction by restating the research problem and reminding the reader of the basic questions or hypotheses to be studied. Ideally, the introduction will briefly restate the purpose of the study. Then summarize the purpose of the study and provide a roadmap for Chapter 3.

Description of the Participants and/or Data Sources

Both the research setting and the research participants or data sources should be described. If the sources for research data are existing documents or datasets, then those sources should be identified and described. Often the data for social science research come from research participants or subjects. In the review of the identification and selection of people as data sources the researcher should consider the following questions:

- ***Who is included in the sample***? A part of a population is called a sample. It is a proportion of the population that ideally represents the population in all characteristics. It is often not feasible to try to study an entire population. For example, if the *population* of interest is *frequent, male Facebook users in the United States*, this could be *millions of users* (e.g., millions of *units*). If the researcher chose to study these Facebook users using *interviews* (e.g., the chosen *research method*), it could take a lifetime. Therefore, the researcher may choose to study only a *sample* of these Facebook users. An example of a population would be random selection of 1000 traditional-aged undergraduates at a Midwestern, research 1 institution. Another example would be a purposeful selection of ten initial educators working in a district who are representative of the population. That is to say, if the pool of 100 initial educators has the characteristics of 70 percent female, 30 percent under the age of 32, 40 percent first career out of college, ideally a sample of ten would have seven women and three men; seven over the age of 32 and three under the age of 32; and four first career out of college.

- ***What sampling strategy is appropriate***? Researchers can draw a sample from a population in many different ways. In selecting a sample, consider the sample size and the way that sample size affects the quality of the data. Simply speaking, while much information can be gained from interviewing 100 people, that is probably not feasible in a one- to two-year-time frame. In addition, survey data can be very useful, but not if the survey is conducted on a very small sample size (e.g., fewer than 15 to 20 people). There are different types of sampling strategies: probability sampling strategies and non-probability sampling strategies. Probability sampling strategies use a random selection of participants, and sampling can be completely random or can be stratified to ensure representation from all the different characteristics germane to the study. Non-probability sampling strategies rely on the subjective judgment of the researcher, and the types include purposeful sampling, convenience sampling, snowball sampling, and self-selection sampling.

Description of Measures/Protocol

For a quantitative study, it is important to begin with the source of the measurement. Researchers should use the variable name as a subheading in the Measure(s) section. The outcome measurement (dependent variable) should be described first, followed by the predictor measure (independent variable), and then any covariate measurement(s). For self-made measures, the reference to the theoretical framework on which the measure is based should be noted, and the process for validating the instrument (e.g., mapping survey items to constructs and piloting) should be described. If a predesigned measure that has already been validated is used, the researcher should include a reference to the source of the measure and should provide a rationale for using this pre-existing tool. A sample item from each subscale that is part of the measurement tool should also be provided, along with the range of possible scores. Finally, reliability measures should be discussed here.

For a qualitative study, the structure of and questions in the interview, observation, or focus group session are introduced. For self-deigned qualitative instruments, the researcher describes the process used to create them, and the process should refer to the theoretical framework. If pre-existing interview questions, observation rubrics, or focus group questions, include a reference to that source and provide a rationale for the choice of instrumentation.

Describing, defining, and operationalizing the variables is part of the **Description of measures/protocol** section. This process may include an operationalization of the variables in a figure, table, or narrative, and a description of how they are measured. The following template steps should be considered when describing how the measurement has been constructed:

- Describe the instruments you used. (Survey: designed or existing, scales, focus group protocol, observation rubric, interview protocol, meta-analysis strategy, a combination of these.)
- Describe the procedure for developing the instrument(s). Address each procedure if using multiple instruments.
- Describe the procedures of the pilot study.
- Describe the use of existing instruments or their modification. Does the instrument rely on the literature? Were stakeholders or experts in the field utilized to create the instrument(s)?
- Include a sample of the instrument in the text of the chapter. Map the constructs to the research questions. In survey design, think about including multiple questions that "get at" or relate to a construct to preserve internal validity of the constructs. For example, if measuring confidence of success and commitment to graduate from an institution, a researcher may use the following survey items, for example, each designed to measure the named construct:

    1. I am confident in my ability to be successful in college (Confidence).
    2. I believe I will graduate (Confidence).
    3. I have strong self-assurance in my ability to complete my degree requirements (Commitment).
    4. I believe I will be an active member of the alumni group after I graduate (Commitment).

- Test the reliability and validity of the instrument. Describe piloting the instrument with a sample. Describe how the advisor recommended testing, or how experts in the field validated the instrument that you plan to use.
- Describe the pilot study and the statistical tests of reliability. Include the entire instrument(s) in the appendix of the dissertation and make sure the appendix is referenced in the text.

Description of the Research Procedure

Introduce the chosen research method and explain the choice. Most social science research falls into one of the categories of qualitative, quantitative, or mixed methods. Describe the appropriateness of the design. This is an opportunity to explain, for example, the choice to engage in qualitative methods using interviews as the primary data source; or provide a rationale for choosing to conduct a case study using qualitative methodology to analyze multiple documents, strategic plans, and conduct focus groups of key stakeholders at the school, district, college, or organization; or why conducting a quantitative study that collects demographic and baseline data and utilizes a pre- and post-assessment of academic self-efficacy is appropriate; or why conducting a current mixed-methods study to survey the population and conduct in-depth interviews of a purposeful sample of participants on a topic is necessary. The critical criterion here is to describe the choice of method and explain how the method chosen makes the most sense to help answer the research question(s).

There are a number of different research designs that students employ. The research design guides the strategy for data collection, data analysis, and data reporting. Sample research designs include the following:

- Experimental and quasi-experimental research involves manipulating an independent variable to study its effect on a dependent variable, while controlling for extraneous factors. Both designs attempt to establish cause-and-effect relationships between variables.
- Correlational research explores the similar or dissimilar relationship between two or more variables, suggesting but not establishing causality.
- Descriptive and historical studies investigate and describe contemporary or historical educational phenomena, interpreting events, ideas, or conditions.
- Ethnographic research describes, documents, and analyzes cultural behaviors in the naturalistic conditions of a specific social group.
- Causal-comparative studies examine cause-and-effect relationships that already exist, suggesting but not establishing causality.

The research procedure section includes the method for inviting people to participate in the study, the method of collecting the data, the college or agency Institutional Review Board (IRB) process, and the data-collection timeline. The data-collection timeline should include a description of the phases of data collection, and people, places, and other pertinent information involved in each phase. The data-collection section should include a detailed description of all of the steps taken to collect data, with direct attention to research ethics. This process begins with getting approval from institutional review boards, identifying contact information for potential participants, inviting participants to the study and all correspondence included in that process, informed consent, medium used to collect data, and plans for storing the data.

Data Analysis

In the data analysis section, describe the types of analyses that will be employed to answer the research question(s). Consider arranging this section using the research question(s) as headings. The analysis should be driven by the research question. For both quantitative and qualitative studies, follow each research question with the analysis method (e.g., t-test, correlation, regression, grounded theory, constant comparative analysis, or content analysis), the rationale for using this analysis method, and the procedure of analysis. Indicate what software package (e.g., SPSS, NVivo) will be used for each research question. For quantitative studies, state the research hypothesis for each research question, explain the research hypothesis, and include any necessary references.

The description of data analysis in a research proposal goes beyond saying that SPSS or NVivo9 will be used to analyze the data. Describe the process for analyzing the results from the survey or the interviews, or the techniques to be applied to the existing data to be used. The following are some guiding questions that will help with writing this section:

- What types of data am I analyzing?
- What do I need to know about my data so that I can answer my research questions?
- What types of analysis does my research question call for? For example, "in what ways" questions often call for descriptive statistics; differences between groups questions call for t-tests or analysis of variance; and relationship questions use correlation or regression analysis.
- What is my confidence level and what are the different statistical tests I need to use to answer my questions?
- If analyzing interviews what is my coding strategy?

Summary

Summarize groups or variables, research types, techniques, and significance of the research design. The summary should not include new data but rather should recap the methodology employed in the study. The summary may also lead the reader into Chapter 4.

Chapter 4 Results

Chapter 4 of a dissertation presents the results and the findings from the data gathered by the researcher. The research questions and the nature of the design determine how the results are organized. Students should present both anticipated and unanticipated results, identify and describe the key findings that answer the research question or questions, and support the findings with evidence (data) gleaned in the study. The components of Chapter 4 include an introduction, a description of the data, key findings, and a summary.

Introduction

Start with a brief overview of Chapters 1 to 3 as your introduction. This is generally a one-page maximum summary of the earlier chapters. In addition, share with the reader the roadmap for Chapter 4 – describe the organization of the results. As a general rule of thumb, results should be organized by the research questions posed in the study or themes that emerged in the study. The theoretical model is also a great way to organize findings if the model is aligned with the research questions.

Preliminary Results

Most research templates neglect to include a preliminary results section. Reporting preliminary results is important because it provides an overview of the data to give the reader the big picture of potential findings. For quantitative studies, the preliminary results may include missingness of the data, and an identification of the appropriate statistical analysis method to address missingness. Another element that may need to be addressed is the normality of the data (e.g., skewness and kurtosis). Explain how these characteristics determined the appropriate method to analyze your data. You may need to describe the correlations among key variables.

For qualitative studies, an overview of the data may include a description of the interviewees, the research site(s), and characteristics of the data, including any unusual or problematic features that you needed to address to adequately analyze your data. For mixed-methods studies, include preliminary results for each component of your method, both the qualitative and the quantitative designs, and how they are to be combined.

Note: In the results chapter of a dissertation, there are three suggested sample-level 2 headings in bold, black font (see Appendix, p. 318). The red font indicates content that must be addressed in each section. You, with the guidance of your advisor, should decide on the names of headings or whether the content will be embedded in the text.

Table 18.1 Sample Table

Variables	*1*	*2*	*3*	*4*
1. Decision LVS	–			
2. Reflection LVS	0.26	–		
3. Transparency AL	0.34	0.22	–	
4. Internalized Moral Perspective AL	0.50	0.46	0.37	–

Note: If you need to make a notation, make it here.

Results

Organize this section according to your research question(s). Be sure to describe your results without restating the research design. However, if you uncover unanticipated results, it is important to describe and detail those results as well. Table 18.1 is an example of a table. For details on formatting tables, a helpful checklist is provided in the *APA manual* (VandenBos, 2010, p. 150).

Summary

Chapter 4 should be organized to answer or address the research question(s) posed in the study. Present findings in a clear, consistent manner. If illustrating a finding in a table, introduce the table, show the table, and discuss its salient points (Burke, 2009). In the discussion of the findings, be clear about the analysis process used to substantiate the finding. For example, if you tested for differences between groups, state that an independent samples t-test was conducted and indicate the level of significance of the finding. Generally speaking, Chapter 4 is reserved for findings. However, it is acceptable to include evidence from the literature that supports or negates the finding(s) represented. Restate the key findings, align them briefly with the research question, and lead the reader into Chapter 5. Summaries should not contain any new data or analyses. An example of a summary is the following: Chapter 5 will discuss the findings in detail, discuss implications for the major stakeholders, and offer recommendations.

Chapter 5 Conclusions, Implications, and Recommendations

Chapter 5 of a dissertation is often the most difficult and most rewarding chapter to write! Chapter 5 begins by summarizing the key findings from Chapter 4 – but goes one step further to explain why anyone would care about the results. The intent of Chapter 5 is to present the key conclusions, implications, recommendations for subsequent implementation and actions and to suggest studies for future research based on the result of the research study, and to state the limitations of the research. The basic structure for Chapter 5 is to begin with a brief introduction, then clearly state the conclusions, which are extrapolations of the data that respond to the question asked, offer specific implications that the data analysis may suggest, offer some projections for the reader and for future research, and identify any limitations that may be important to clarify the interpretations made. A final summary should provide closure to the manuscript and to the study.

Introduction

Using a few sentences, the researcher should begin by reminding the reader of the research questions, the purpose of the study, and why the research was conducted. The bulk of the introduction should be to briefly summarize your results section.

Key Conclusions

It is important for the researcher to make the distinction between a conclusion and a finding. A conclusion is not a finding. A conclusion is a reasoned inference based on the findings that is your interpretation of the data that leads to answering the question. These conclusions are grounded in the key findings and integrate a discussion of alignment with the literature and the theoretical or conceptual framework. Based on key findings, and based on where the findings fit in with the larger body of literature, what conclusions may be gleaned?

Implications

Implications are derived from the conclusions drawn. Researchers should discuss both the theoretical and empirical implications from their study. When discussing the theoretical implications, discuss the effects the study has on the theory chosen to guide the dissertation. Describe the consequences the study has upon the theoretical or conceptual framework employed in the study. When discussing the empirical implications, discuss the practical effects of the conclusions of the study.

Recommendations for Stakeholders

Recommendations are suggestions for actions, and how readers can apply the results of the study, for whom, when, and where. One may ask, "What is the impact of the study upon key stakeholders, impact of the study upon practice, and impact of the study upon the literature?" Identify the stakeholders and engage in a discussion about the impact of findings upon each stakeholder group – as well as the organization as a whole. The researcher should relate each recommendation back to the problem, and recommendations should be grounded in the data and the literature. Be sure to specify the stakeholders when offering recommendations. In addition, offer recommendations for further research. Suggest areas that the results of the study imply would be useful for future research by other researchers (Creswell, 2014). New doctoral students gain insight into ideas on possible dissertation topics by reading the suggestions for further research sections of dissertations, so consider the suggestions for further research section a legacy for future researchers. Reflect how the study may be expanded, or implemented with different populations. Suggest possible different designs. Do not forget to mention any research surprises in the results.

Identify Limitations of the Study.

It is important for readers to know the limiting factors and the delimiting factors in the study. These would include circumstances or factors that could not be controlled in the study. Was there a serious event in the place of the interviews that might have influenced how participants responded to certain questions? Were the surveys sent at an inconvenient or inappropriate time? Was it a small or biased sample? Answers to these questions could jeopardize the transportability or generalizability of the study conclusions, and that needs to be said.

Summarize the Key Findings and Discussion Points from Chapter 5

Chapter 5 concludes the research study, so it is critical to make it a point to summarize the discussion of findings, implications, and recommendations as well as to summarize the overall important points that you want the reader to remember. If action is taken based on the results of the research project, that too could be part of the overall summary of the study. The conclusion written in Chapter 5 is the end of the written material of the dissertation. It should not be written as a summary of the chapter, but rather as the conclusion of the dissertation.

Resources

References

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In-class Exercises

Pair students and ask them to review the Appendix: Dissertation Template. Ask them to discuss the usefulness of the template. Ask them to identify gaps in the template and share how they would fill the gap.

Class Discussion

1. Discuss research alignment, and ask students to share what they learned about it in this chapter, and discuss why it is important to maintain alignment between research question(s), theory, and method.
2. Discuss the process of writing a traditional five-chapter dissertation in class. Note that the research question and theory guiding the study are critical elements present throughout the five chapters. Ask students to reflect upon the process of writing a dissertation and to share their perceptions and feelings about the process (e.g., excitement, anxiety, challenges).

Assignment

Ask students to review the dissertation template provided in the Appendix. Ask them to review the formatting of the document to ensure that it aligns with the formatting requirements of their program. Remind students to write their drafts within the template to maintain embedded formatting.

19 Providing Structure

Most dissertations have important components within the manuscript, and appended to the manuscript. These include tables and figures that should provide the reader with easy-to-read summary data or information. Different styles of books have different ways of presenting tables and figures. Different institutions use varying style books, and several have unique adaptions for the work of their students. This chapter provides the directions the authors use for students in a doctoral program. Appended to the dissertation, once again to help the reader, are an abstract, a table of contents, references or bibliography, acknowledgements, dedication, and appendixes. Each will be discussed briefly below.

Table of Contents

Students will be able to create and update their Table of Contents quickly and easily by making sure that each heading in their proposal or dissertation is formatted in the appropriate style. Most computer software packages include tools for creating documents, such as the *Styles* section of the Home tab in Word 2010. Students will know which is the appropriate level heading by using the APA (VandenBos, 2010), which specifies the formatting of each level of heading (section 3.03, p. 62). In a Table of Contents, the formatting of *Heading 1 Style* corresponds to the Level 1 heading in the APA manual; *Heading 2 Style* corresponds to the Level 2 heading in the APA manual. Each additional heading follows the same format. For example, the abstract title is a Level 1 heading according to the APA. When students select the abstract heading in the template, they will see that *Heading 1* is highlighted in the styles section and that it is formatted according to the APA specifications. When students update the Table of Contents, the abstract heading and its correct page number will appear in the Table of Contents in the left margin. An APA Level 2 heading, such as Statement of the Problem, is a *Heading 2 Style* and will appear as such in the Table of Contents, with a small indent. Students update the Table of Contents by right clicking on the *Table of Contents* and choosing *Update Field*, then *Update* entire table. Students will be able to update their Table of Contents with this simple process if they use these styles appropriately.

Tables, Figures, and Quotes

When including research data in tabular form or with graphs or charts, the researcher should be aware of the common structure for presenting condensed data in reports. There are four steps in the process:

- Introduce the table, graph, or chart in the text (Table 1 contains . . .").
- Name and number the table or figure.
- Present the table, graph, or chart (consult the APA style manual on how to create tables).
- Discuss the salient features of the table, graph, or chart in the text (pick out the highlights).

The researcher should keep in mind two guidelines in the discussion of data in the condensed form. First of all, data need to be discussed. Point out the highlights or salient features of the data displayed. Items on the fringe, the highest or lowest numbers or scores, or the outliers in the dataset may be selected for special attention. The second guideline is to try not to point out facts from the data in the table, nor to offer an interpretation as to why those special features occur. The interpretation is to be presented in the discussion of the findings.

Tables

As per the sample given in Table 19.1, use the APA style for tables (VandenBos, 2010, section 5.07–5.19, pp. 125–150) *except for* the following:

- Follow the introduce-present-explain convention before and after inserting tables and figures.
- Table or figure number and title should appear on the same line.
- Table title should not be in italics.
- Font should be no smaller than Times New Roman 10 point.
- One-half-point borders should be at head and foot, plus one under header line.
- Use MS-Word Table commands.
- Don't use extraneous lines, tabs, or returns.
- Use Auto-Format to Window.

Table 19.1 Sample Table

Name	Gender and Age	High Schools	GPAs	Class Rank	ACT Scores
John	m, 18	DP HS	3.0	21/210	27
Jane	f, 17	LB HS	3.9	10/100	30

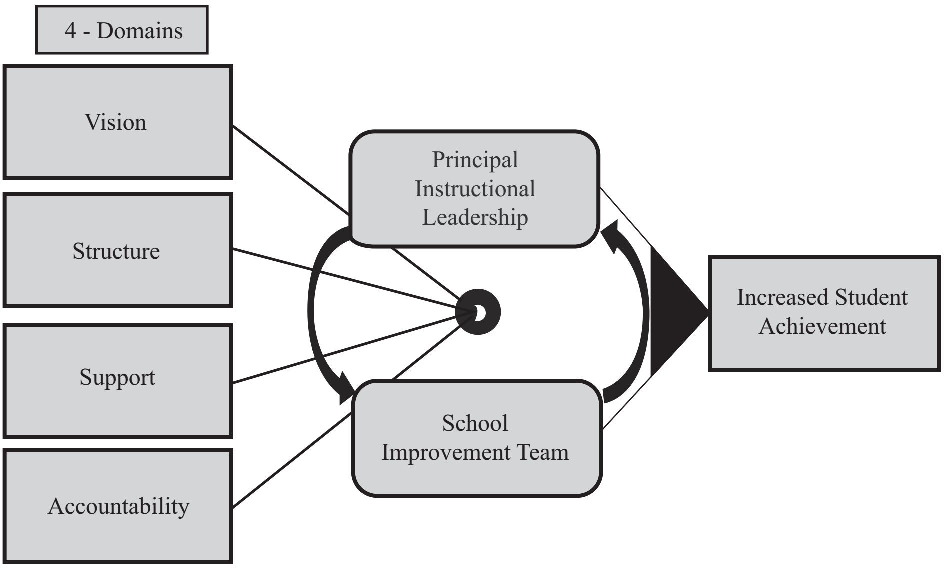

Figure 19.1 Principal Instructional Leadership Conceptual Model for School Improvement.

Source: Gothard (2015).

Figures

Use APA style for figures (VandenBos, 2010, section 5.20–5.30, pp. 150–166) *except for* the following:

- Use the introduce-present-discuss convention for displaying findings.
- The title and figure number should appear on the same line without italics.

See Figure 19.1.

If necessary, include a caption below the figure. See section 5.23, p. 158 of the APA 6th edition (VandenBos, 2010) guide for a more detailed description.

Quotes

The same convention should be used for quotes. In a similar fashion as tables and figures, when using a direct quote introduce it by stating the author, then present the quote, and follow with a discussion of the salient points of the quote. Every effort should be made to link the quoted material to the basic research questions, or to the theoretical model or conceptual framework.

Manuscript Components

Basic components of the research manuscript should follow accepted protocol for research writing. What follows here is a reference to specific grammar and structure usages for writing the final report or dissertation.

Tenses

Many students ask what needs to be done to ensure that their proposal and dissertation document is written in the correct verb tense (see VandenBos, 2010, section 3.06, p. 65). In general, during the proposal stage before the research has been conducted, use the future tense. After the research is complete, use the past or present tense as the context requires. Here are some guidelines:

- Chapter 1 should be written in the present and past tense (see VandenBos, 2010, section 3.06, p. 65). For the proposal stage, Chapter 1 should be written in future and present tense.
- Chapter 2 can be a mix of present and past tense. When addressing accumulated research, for instance, the present tense is appropriate. For example, "Research shows that classroom climate is a factor that affects students' academic self-efficacy" is in the present tense. When addressing a specific study that has already been completed, the past tense is appropriate. For example, "Hurtado (1998) found that students who experienced a 'chilly climate' in the classroom felt disconnected from the collaborative community, and therefore . . . ." While the word *shows* is in the present tense, the word *found* is in the past tense. The verb *tense* must fit the context and should be consistent throughout the chapter.
- Chapter 3 is primarily written in the past tense. During the proposal, however, Chapter 3 is written in the future tense, since the research has not yet been conducted.
- Chapter 4 is also primarily written in the past tense, but the present tense is acceptable as the context requires.
- Chapter 5: most students write Chapter 5 in the present tense and weave in some past tense. They use the past tense when they summarize what the research found. They use the present tense when they discuss implications and recommendations. For example, "This study identified [past tense] three factors that influence students' development of academic self-efficacy in the classroom. . . . This study has [present tense] implications for administrators, faculty and students."

Pagination

Pagination requirements may vary from style book to style book. A basic rule for assigning page numbers to a manuscript is:

- Page numbers begin on the abstract page, page 3.
- Page numbers are located in the top right-hand corner and are consecutive.
- Page numbers are in Times New Roman, size 12 font.

Abstract

An abstract is a self-contained, short, and powerful statement that describes a larger work. The abstract typically contains the scope, purpose, results, and significance of the work. The abstract should also include the results, conclusions, and recommendations from the work. Professional journals have specific requirements for an abstract. According to the APA (VandenBos, 2010), research abstracts should be accurate, informative, comprehensible, succinct, concise yet specific, self-contained, non-evaluative, coherent, and readable to a wide range of consumers. According to VandenBos (2010), an abstract is between 150 and 250 words, with no indents, double-spaced. It must be accurate, non-evaluative, coherent and readable, and concise (pp. 25–27). An effective abstract summarizes the major aspects of the entire paper, and should include the following elements:

- State the problem under investigation (one sentence).
- Describe the purpose of the research and the research question (one sentence).
- Describe the participants and include demographic information and the research site if applicable.
- Describe the essential and interesting features of the method, giving careful consideration to key terms.
- State the key findings (two sentences).
- Include the implications and recommendations in one to two sentences (VandenBos, 2010, p. 26).

Acknowledgments

If desired, on a separate page, acknowledge those who helped in the actual research and writing, or who provided support. Acknowledgments give credit to people or institutions that provided significant help in the writing or research of your dissertation. The acknowledgments title should be "Heading 1" in the *Styles* section of the Home tab. It should follow the abstract page. The acknowledgments are optional. If you choose to write an acknowledgments page, it should be double-spaced with half-inch indents. This section is less personal and more academic.

Dedication

If desired, on a separate page, some dissertation authors dedicate their work to those who played a significant role during research and writing. The dedication page should be "Heading 1" in the *Styles* section of the Home tab. It should follow the acknowledgments page. The format is similar to the acknowledgments page. The dedication page is more personal in nature, although the writing style is still formal and academic.

Appendices

Most dissertations include the following in the appendices:

- The IRB approval letter if appropriate.
- Correspondence providing permission to use other authors' work, where required.
- Lengthy data tables.
- Copies of survey or interview instruments.

If you have only one appendix, label it Appendix. If you have more than one, label them Appendix A, Appendix B, etc. in the order that they are mentioned in the text. Each appendix appears on a new page, and each appendix has a level 1 heading style applied to Appendix A, Appendix B, etc. Write the name of the appendix below the "Appendix A" title. A normal heading style is applied to the title of your appendices. The appendix title is required to be centered, unlike a level 2 heading (see VandenBos, 2010, section 2.13, pp. 38–40, for more information on what to include in an appendix).

References

Start on a new page, with a level one heading: centered, boldface, upper and lower case. It is important to reconcile all citations used in the text with the reference list, and vice versa. Format references in hanging paragraphs, double-spaced as follows:

Herbst-Damm, K.L. and Kulak, J.A. (2005). Volunteer support, marital status, and the survival times of terminally ill patients. *Health Psychology, 24,* 225–229. doi:10.1037/0278-6133.24.2.225.

Summary

The manuscript structure provided in this chapter completes the overall description of what goes into a research dissertation. On occasion, for the right purposes, students include additional chapters in their work. There may be a need to address the context of the research in detail, requiring an additional chapter. Some methods of qualitative study, such as scholarly personal narrative, often vary from the five-chapter format of the typical dissertation.

Students should pay close attention to the directions provided by their institution in order to complete their dissertation successfully. In this volume, the Appendix provides the directions used by the authors at their home institution. Chapter 20 provides a comprehensive list of research books that give more depth to the subject field. Readers are encouraged to review those texts that may provide additional support to the dissertation enterprise.

References

Gothard, J.M. (2015). *High school principal instructional leadership: The four domains of leadership for school improvement*. Unpublished doctoral dissertation, Edgewood College, Madison, WI.

VandenBos, G.R. (Ed.). (2010). *Publication manual of the American Psychological Association* (6th edition). Washington, DC: APA.

20 Annotated Bibliography

The books that are referenced and summarized here represent some of the more current and complete works in the specialized areas of research. The entries are divided into the following categories:

- Research Foundations
- Behavioral Research
- Library Research
- Statistics and Data Analysis
- Quantitative Methods
- Qualitative Methods
- Survey Research
- Interview Research
- Case Study Research
- Reading and Writing Research Reports
- Educational Research
- Research Ethics
- Action Research
- Dissertation Research

While not an exhaustive bibliography of research techniques, this brief annotated list should provide the reader with a beginning set of resources for reading and doing research. Most of the listed texts have a bibliography of their own that may be used to expand the reader's reference list on the specific topic. Annotations for many of the entries in this bibliography come directly from the publisher's book source or an online review of the text.

Resources used to identify and select references for this chapter include the following:

- A Google search for research textbooks. The URL for this search is www.amazon.com/Best-Sellers-Books-Research-Reference/zgbs/books/11653 along with a search through Google Scholar at https://scholar.google.com/. The two Google resources contain many more research references that may be of interest or use to the reader.

- A review of the current titles offered through Amazon. To search this resource the URL is www.amazon.com/Best-Sellers-Books-Research-Reference/zgbs/books/11653. Best-selling books on all areas of academic research are provided. Many of the textbook summaries provided are reproduced from the Amazon website.
- Action Research and Evaluation On-line (areol), a website that contains a listing of recent books on action research and related topics along with brief summaries. The URL for areol is www.scu.edu.au/schools/gcm/ar/arp/books.html. This is a resource file housed at Southern Cross University in Australia which supports a regular public program for action research and evaluation online.
- Publishers' websites that contain brief summaries of the textbooks published by the different publishing houses. Readers looking for textbooks on specific research topics would do well to visit the websites of the major publishers where the current texts in the annotated list presented here may be found, along with other references.
- The authors' professional analysis of textbooks used for various research courses at college and graduate school levels. For format and length consistency, the authors edited some of the data captured from the sources listed above.

Research Foundations

Campbell, D.T. and J.C. Stanley. (1963). *Experimental and quasi-experimental designs for research*. Boston, MA: Houghton Mifflin.

This 71-page book is a classic and a standard reference for research design. It is the foundation of the quasi-experimental approach. The authors outline 16 basic experimental designs for research and provide 12 common threats to valid inference that all researchers should know.

Creswell, J.W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th edition). Thousand Oaks, CA: Sage.

Every chapter now shows how to implement a mixed-methods design as well as how to tackle quantitative and qualitative approaches; ethical issues have been added to a new section in Chapter 3; writing tips and considerations have been expanded and moved to the first part of the book to ensure that research plans and proposals start in the right direction; and the latest developments in qualitative inquiry (advocacy, participatory, and emancipatory approaches) have been added to Chapter 10.

Eden, C. and J.C. Spender. (Eds.). (1998). *Managerial and organizational cognition: Theory, methods, and research*. London: Sage.

Readers gain a good understanding of the important theoretical and methodological challenges of cognitive research. Examples of research questions that may be pursued from a cognitive perspective are provided. Level of analysis problem and empirical cognition research are covered.

Fawcett, J. and F.S. Downs. (1999). *The relationship of theory and research* (3rd edition). Philadelphia, PA: F.A. Davis.

The relationship between conceptual models, middle-range theories, and empirical research methods are provided. The author discusses how to integrate research findings and presents guidelines for writing research reports. Appends several sample research papers with Fawcett's analyses.

Gall, M.D., J.P. Gall, and W.R. Borg. (2007). *Educational research: An introduction* (8th edition). Old Tappan, NJ: Pearson.

A comprehensive text for scholars and graduate-level students who need to understand educational research in depth and conduct original research for a dissertation or thesis. A complete introduction to the major research methods and types of data analysis used today, this text provides detailed coverage of all facets of research, from the epistemology of quantitative and qualitative scientific inquiry to the design, data collection, analysis, and reporting of a completed study.

Gliner, J.A., G.A. Morgan, and N.L. Leech. (2017). *Research methods in applied settings: An integrated approach to design and analysis* (3rd edition). New York and London: Routledge.

An integrated approach to quantitative research methods. This text provides guidance for graduate students in applied behavioral sciences to plan and conduct a research project. Collecting and analyzing data are covered along with tips on writing a research report.

Huck, S.W. (2011). *Reading statistics and research* (6th edition). Boston, MA: Pearson/Allyn & Bacon.

This text shows consumers of research how to read, understand, and critically evaluate the statistical information and research results contained in technical research reports. The text is also useful for applied researchers who need advice on how to analyze their own data and summarize their empirical findings. Students in education and other disciplines need to learn how to interpret and use statistics and research, but often they do not have any way to begin this process. This text clearly and methodically presents basic statistical and research concepts and illustrates how to employ them in making sound educational decisions.

Isaac, S. and W.B. Michael. (1995). *Handbook in research and evaluation* (3rd edition). San Diego: EdITS Publishers.

This book provides an overview of major methods of research, statistical analysis, and measurement instruments, as well as an overview of alternative approaches, exhibits of reference models, and listings of strengths and weaknesses of different models of research. There are some very useful summaries of common problems and solutions in designing, conducting, analyzing, and communicating the results of research projects.

Kerlinger, F.N. and H.B. Lee. (1999). *Foundations of behavioral research* (4th edition). Belmont, CA: Wadsworth Publishing.

This volume includes everything a researcher needs to know about the methods and principles of behavioral research. The examples are extremely useful in facilitating the understanding of research methods and the analysis of data. This comprehensive guide may be used for work in psychology, nursing, sociology, market research, and other areas.

Lattal, K. and M. Perone. (Eds.). (1998). *Handbook of research methods in human operant behavior.* New York: Plenum Press.

Methodological issues arise in any discussion of research on human behavior. This book addresses many of these questions with 19 experts in the field. It is a valuable resource for researchers who want to bridge laboratory developments with applied study.

Leedy, P.D. and J.E. Ormrod. (2015). *Practical research: Planning and design* (11th edition). Upper Saddle River, NJ: Pearson-Prentice Hall.

Excerpts from actual research projects guide the reader through all phases of the research process in this book. It is a manual designed to help research students in any discipline understand the fundamental structure of quality research and the methodical process that leads to genuinely significant results. It guides the reader, step by step, from the selection of a problem to study, through the process of conducting authentic research, to the preparation of a completed report, with practical suggestions based on a solid theoretical framework and sound pedagogy. This text shows two things: (1) that quality research demands planning and design; and (2) how their own research projects may be executed effectively and professionally.

Newman, I. (1998). *Qualitative-quantitative research methodology: Exploring the interactive continuum*. Carbondale: Southern Illinois University Press.

The centerpiece of this book is the author's graphic representation of inquiry as a cycle of steps that each type of method takes in a different order and manner. Quantitative inquiry is depicted as beginning with a theory to be tested, while qualitative inquiry is shown as starting with data collection and proceeding to the construction of new theory.

Patten, M.L. and M. Newhart. (2018). *Understanding research methods* (10th edition). New York and London: Routledge.

This updated text provides a detailed overview of all the important concepts traditionally covered in a research methods class. The numerous examples and large number of exercises help students master the material. Divided into short sections, this text facilitates customized assignments. Five new sections on in-text citations and reference lists have been added. Numerous changes have been made for consistency with the new edition of the APA and ASA manuals, and new examples have been added.

Paulsen, M.B. (Ed.). (2015). *Higher education: Handbook of theory and research*. New York: Springer International.

The Higher Education Handbook series provides a compendium of thorough and integrative literature reviews on a diverse array of topics of interest to the higher education scholarly and policy communities. Each chapter provides a comprehensive review of research findings on a selected topic and sets forth an agenda for future research intended to advance knowledge on the chosen topic. The Handbook encompasses the salient dimensions of scholarly and policy inquiries undertaken in the international higher education community. The chapters cover diverse topics, including research on college students and faculty, organization and administration, curriculum and instruction, policy, diversity issues, economics and finance, history and philosophy, community colleges, advances in research methodology, and more.

Singleton, R.A. Jr. and B.C. Straits. (2009). *Approaches to social research* (5th edition). London: Oxford University Press.

An ideal text for undergraduate and graduate courses across the social sciences. Research fundamentals are covered in a friendly, straightforward way. Experimentation, survey research, field research, and mixed methods are covered along with a revised chapter on research ethics.

Verdugo, E.D. (1998). *Practical problems in research methods: A casebook with questions for discussion*. New York and London: Routledge.

Fifty-three research cases are presented of practical problems faced by a researcher. Readers are encouraged to evaluate the researchers' solutions and consider alternatives. With cases drawn from published literature, all major topics in research methods are covered.

White, T.L. and D.H. McBurney, (2013). *Research methods* (9th edition). Belmont, CA: Wadsworth-Cengage Learning.

This concise text puts psychological research into a larger scientific context, to show students how psychology fits into a scientific approach to understanding the world. The authors cover all stages of the research process using a step-by-step approach, from project selection, literature search, and research protocol selection to the publication processes.

Behavioral Research

Ader, H. and G. Mellenbergh. (Eds.). (1999). *Research methodology in the social, behavioural and life sciences*. London: Sage.

An overview of behavioral research, including social sciences and life sciences, is provided. It is a good text to provide an introduction to behavioral research. Chapters include information on metadata, experimental design, measurement models, meta-analysis, graphs, well-defined models of datasets, causality and structural equation models, and more.

Babbie, E.R. (2013). *The practice of social research* (13th edition). Belmont, CA: Wadsworth-Cengage.

Behavioral research is carried out in the world of social sciences. This is a good general text on the fundamental logic and skill of this type of research. It includes easy-to-understand discussions of elementary statistics and a wonderful glossary of terms.

Cozby, P. and S.C. Bates. (2014). *Methods in behavioral research* (12th edition). New York: McGraw-Hill.

This text has been a standard with its concise and strategic approach to methodological decision-making. Combining helpful pedagogy and rich examples, the twelfth edition incorporates learning objectives, illustrative graphics, and activities to increase student involvement. Highlights of the new edition include a broader introduction of different research techniques, extensive revision of the validity of measurements section, and updated structural equations models.

Eichler, M. (1991). *Nonsexist research methods: A practical guide*. New York: Routledge, Chapman and Hall.

Researchers must take care to eliminate bias in their work. This book provides a systematic approach to identifying and eliminating sexist bias in social science research. Chapters are problem-defined. The book includes a non-sexist research checklist designed for use in the research process.

Johnston, J.M. and H.S. Pennypacker. (2010). *Strategies and tactics of behavioral research* (3rd edition). New York: Routledge.

This classic text features discussion of how research methods are relevant for practitioners, and many examples are based on field research and service delivery scenarios. It includes a comprehensive treatment of single-subject or within-subject design focuses on the strategic and tactical options available to investigators as they try to determine the most effective way of addressing research questions. The authors guide readers to consider the rationale for different ways of measuring behavior and designing experimental comparisons.

Kline, R.B. (2008). *Becoming a behavioral science researcher: A guide to research that matters*. New York: Guilford Press.

Researchers often discover that introductory statistics and methods courses may not have fully equipped them to plan and execute their own behavioral research studies. This book bridges the gap between coursework and conducting independent research. It helps the

reader build needed skills to formulate a precise, meaningful research question; understand the pros and cons of widely used research designs and analysis options; correctly interpret the outcomes of statistical tests; make informed measurement choices for a particular study; manage the practical aspects of data screening and preparation; and craft effective journal articles, oral presentations, and posters.

Leary, M.R. (2011). *Introduction to behavioral research* (6th edition). Old Tappan, NJ: Pearson.

This text shows students how to conceptualize questions, measure variables, design studies, and analyze data. It incorporates the four basic approaches to behavioral research (descriptive research, correlational research, experimental research, and quasi-experimental research) with chapters on research ethics and scientific writing.

Orcher, L.T. (2014). *Conducting research: Social and behavioral science methods* (2nd edition). New York and London: Routledge.

This updated edition takes students through the steps of selecting a research topic to writing the final research report. Balanced coverage of quantitative and qualitative methods makes this book appropriate for use by all students. A new chapter has been added to introduce citing references using ASA and APA styles. In addition, three new chapters are included to give additional guidance to students planning to do survey research.

Paul, J. (2005*). Introduction to the philosophies of research and criticism in education and the social sciences*. Upper Saddle River, NJ: Pearson-Merrill-Prentice Hall.

Intended both for education students who aspire to become researchers and for those who simply need to read and understand research literature, this book focuses on the underlying perspectives justifying the major approaches currently being used in educational research. Introductory chapters lay the foundation for exploring varying research perspectives. Nine specific perspectives on research are examined, through discussions written by senior scholars known for their expertise in the perspective. A "guided tour" of criticism is given, in which these same scholars demonstrate the use of the "critical method" by critiquing six studies selected as exemplars of different research approaches.

Privitera, G.J. (2013). *Research methods for the behavioral sciences*. Thousand Oaks, CA: Sage.

This book adopts a problem-focused approach to introducing research methods in a way that fully integrates the decision tree – from choosing a research design to selecting an appropriate statistic for analysis. It shows how methods and statistics work together and enable the testing of hypotheses through use of the scientific method. The text includes step-by-step instructions for SPSS.

Rosenthal, R. and R. Rosnow. (2007). *Essentials of behavioral research: Methods and data analysis* (3rd edition). New York: McGraw-Hill.

This text includes a comprehensive treatment of methods and data analysis. In order to use this book, the reader should have a basic understanding of research methods that require statistics. The first half of the text concentrates on research methods and the second half introduces advanced statistical procedures.

Somekh, B. and C. Lewin. (Eds.). (2011). *Research methods in the social sciences* (2nd edition). Thousand Oaks, CA: Sage.

Both qualitative and quantitative research methodologies are introduced, and readers are encouraged to become members of a community of researchers engaged in reflection on the research process. Researching in the postmodern context is covered, including deconstruction, hermeneutics, post-structuralism, feminism, and virtual realities, among others.

Tashakkori, A. and C. Teddlie (Eds.). (2010). *Handbook of mixed methods in social and behavioral research* (2nd edition). Thousand Oaks, CA: Sage.

This Handbook is a collection of articles by leading scholars on what has come to be known as the third methodological movement in social research. Aimed at surveying the differing viewpoints and disciplinary approaches of mixed methods, this book examines mixed methods, from the research enterprise to paradigmatic issues to application. The book also discusses the strengths and weaknesses of mixed-methods designs, and provides an array of specific examples in a variety of disciplines, from psychology to nursing. It may be used either as a pedagogical tool or as a reference for researchers, since it is rich in examples and includes a glossary, easy-to-follow diagrams, and tables to help readers become more familiar with the language and controversies in this evolving area.

Trochim, W. and J.P. Donnelly. (2006). *The research methods knowledge base* (3rd edition). Stamford, CT: Atomic Dog Publishing.

This third edition provides coverage of quantitative methods and enhanced coverage of qualitative methods. It may be used in a variety of disciplines and is ideal for an introductory comprehensive undergraduate- or graduate-level course. Through its conversational, informal style, it makes material that is often challenging for students both accessible and understandable. The book covers everything from the development of a research question to the writing of a final report, describing both practical and technical issues of sampling, measurement, design, and analysis.

Vagle, M.D. (2014). *Crafting phenomenological research*. New York: Routledge.

This book provides readers with methodological tools to build their own phenomenological study, addressing such issues as data gathering, validity, and writing. Replete with exercises, case studies, resources for further research, and examples of completed phenomenological studies, readers are provided with an introduction to post-intentional phenomenology – incorporating post-structural thinking into traditional methods.

Whitley, B.E.J. and M.E. Kite. (2013). *Principles of research in behavioral sciences* (3rd edition). New York: Routledge.

Intended for beginning graduate or advanced undergraduate students, this book provides a comprehensive review of research methods used in psychology and related disciplines. It covers topics that are often omitted in other texts, including correlational and qualitative research and integrative literature reviews. Basic principles are reviewed for those who need a refresher. The focus is on conceptual issues – statistics are kept to a minimum. Featuring examples from all fields of psychology, the book addresses laboratory and field research.

Library Research

Abbott, A. (2014). *Digital paper: A manual for research and writing with library and internet materials*. Chicago, IL: University of Chicago Press.

This text tells what every senior researcher knows: that research is not a mechanical, linear process, but a thoughtful and adventurous journey through a nonlinear world. It breaks library research down into seven basic tasks: design, search, scanning/browsing, reading, analyzing, filing, and writing. The reader moves through the phases of research, from confusion to organization, from vague idea to polished result. The book includes how to evaluate data and prior research, how to organize a project, when to start over, and when to ask for help.

Badke, W. (2014). *Research strategies: Finding your way through the information fog* (5th edition). Bloomington, IN: iUniverse.

Online resources have provided access to more knowledge than ever before. Defining what is and what is not genuine information becomes more of a challenge all the time. This text helps make sense of all of the available information, shows how to navigate and discern it, and details how to use it to become a better researcher. It focuses on informational research and provides a host of tips and advice not only for conducting research, but also for everything from finding a topic to writing an outline to documenting resources and polishing the final draft. It provides the skills and strategies to efficiently and effectively complete a research project from topic to finished product. It shows how research can be exciting and even fun.

Beasley, D. (2000). *Beasley's guide to library research*. Toronto: University of Toronto Press.

An invaluable "how-to" resource for library-based research; Beasley includes useful information on the many services of research libraries and includes computer databases and online computer searches.

Booth, W.C., G.G. Colomb, and J.M. Williams. (2008). *The craft of research* (3rd edition). Chicago, IL: The University of Chicago Press.

The third edition includes an expanded discussion of the essential early stages of a research task: planning and drafting a paper. The authors have revised and fully updated their section on electronic research, emphasizing the need to distinguish between trustworthy sources (such as those found in libraries) and less reliable sources found with a quick Web search. A chapter on warrants has also been thoroughly reviewed to make this difficult subject easier for researchers. This book explains how to build an argument that motivates readers to accept a claim; how to anticipate the reservations of readers and to respond to them appropriately; and how to create introductions and conclusions that answer that most demanding question, "So what?"

Gebhard, P. (1997). *The reference realist in library academia*. Jefferson, NC: McFarland & Company.

Search strategies and identification of reference sources are covered. Making use of information sources and the responsibility of professional librarians in working with clients is included.

George, M.W. (2008). *The elements of library research: What every student needs to know*. Princeton, NJ: Princeton University Press.

This practical book introduces the important components of the information-seeking process. It provides a foundation for success in any research and focuses entirely on basic concepts, strategies, tools, and tactics for research in both electronic and print formats. It includes ways to turn a topic into a research question, techniques for effective online searches, how to evaluate primary and secondary sources, when and how to confer with reference librarians and faculty, how to avoid plagiarism, and a glossary of key terms, from Boolean search to peer review.

Hacker, D. and B. Fister. (2002). *Research and documentation in the electronic age* (3rd edition). Boston, MA: Bedford/St. Martin's Press.

The first part of the book lays out how to pose a research question and determine a search strategy. The second part covers how to find and evaluate resources. The authors offer a good general introduction explaining what databases are and the types of resources found within them. The authors also supply strong advice and tools for previewing articles and websites to determine whether they are sources worth using. The third part covers the academic areas of humanities, social science, and science. Each of these broad topics is broken down into specific academic areas listing important print and electronic resources. The fourth part covers the major citation styles of MLA, APA, Chicago, and CBE. One great feature of the documentation section is that a sample paper (including in-text citation and a list of works cited) is included for each of the styles.

List, C. (2002). *Information research* (2nd edition). Dubuque, IA: Kendall/Hunt Publishing.

The updated and expanded second edition of this book is a well-organized introduction to the research process. The chapters cover how information is organized and presented, the terminology of information technology and the place of technology in the process, and the research process itself – from analyzing a research topic and choosing appropriate tools, to constructing a search strategy and evaluating and citing the information retrieved from both print and electronic sources.

Mann, T. (2015). *The Oxford guide to library research* (4th edition). London: Oxford University Press.

This text is an indispensable friend for students and scholars, or anyone in the general public who wants to improve their research skills and take full advantage of all the resources available to the library researcher in the computer age. In this book you will learn how the indexed subheadings in a subject browse on the library computer catalog can turn up unexpected sources that are just right for your topic, as well as how to negotiate the electronic databases with full-text articles from thousands of journals and newspapers.

Pan, M.L. (2017). *Preparing literature reviews: Qualitative and quantitative approaches* (5th edition). New York and London: Routledge.

This text provides a foundation for the inclusion of both qualitative and quantitative approaches to selecting literature and preparing a literature review. Major pitfalls in reviewing and evaluating literature for inclusion in a review are covered. Meta-analyses of literature are also covered.

Statistics and Data Analysis

Aron, A., E. Coups, and E.N. Aron. (2010). *Statistics for the behavioral and social sciences: A brief course* (5th edition). Upper Saddle River, NJ: Pearson.

This unique text capitalizes on a successful approach of using definitional formulae to emphasize concepts of statistics, rather than rote memorization. This conceptual approach constantly reminds readers of the logic behind what they are learning. Procedures are taught verbally, numerically, and visually, which appeals to individuals with different learning styles. Focusing on understanding, the text emphasizes the intuitive, de-emphasizes the mathematical, and explains everything in clear, simple language. This text not only teaches statistics, but also prepares users to read and understand research articles.

Box, G.E.P., J.S. Hunter, and W.G. Hunter. (2005). *Statistics for experimenters: Design, innovation, and discovery* (2nd edition). Hoboken, NJ: Wiley-Interscience.

A premier guide and reference for the application of statistical methods, especially as applied to experimental design, the second edition adopts the same approach as the first edition by demonstrating through worked examples, readily understood graphics, and the appropriate use of computers. Catalyzing innovation, problem-solving, and discovery, the text provides experimenters with the scientific and statistical tools needed to maximize the knowledge gained from investigation and research. The authors' practical approach starts with a problem that needs to be solved and then illustrates the statistical methods best utilized in all stages of design and analysis.

Coolidge, F.L. (2013). *Statistics: A gentle introduction* (3rd edition). Thousand Oaks, CA: Sage.

Basic statistical operations are presented in a conversational tone. The text shows how statistics does not need to be difficult or dull. Parametric and nonparametric topics are covered, including standard scores, correlation, regression analysis of variance, t-tests, and other statistical tests.

Cramer, D. (2003). *Advanced quantitative data analysis*. New York: Open University Press.

There are a variety of statistical techniques used to analyze quantitative data that Master's degree students, advanced undergraduates, and researchers in the social sciences are expected to be able to understand and undertake. This book explains these techniques, when it is appropriate to use them, how to carry them out, and how to write up the results.

Cronk, B.C. (2018). *How to use SPSS: A step-by-step guide to analysis and interpretation*. New York and London: Routledge.

Designed for the novice computer user, this guide is divided into short sections that describe statistics being used, the underlying assumptions, and how to interpret the results. It covers the major statistical techniques and includes a glossary of statistical terms.

Heiman, G.W. (2013). *Basic statistics for the behavioral sciences* (7th edition). Belmont, CA: Wadsworth Publishing.

Using real-world examples, this text demystifies and fully explains statistics in a lively, student-friendly format. It presents statistics within an understandable research context, deals directly and positively with student weaknesses in mathematics, and introduces new terms and concepts in an integrated way. It also offers tools to help reduce math anxiety.

Holcomb, Z.C. (1998). *Fundamentals of descriptive statistics*. New York and London: Routledge.

Students will learn the purposes of descriptive statistics, their calculation, and proper interpretation with this concise book. Actual data are used to illustrate various ways of deriving meaning from data with descriptive statistics. This book has been thoroughly field-tested for student comprehension.

Holcomb, Z.C. (2014). *Interpreting basic statistics: A guide and workbook based on excerpts from journal articles* (7th edition). New York and London: Routledge/Taylor & Francis.

The 62 exercises in this book show real examples of statistical reporting and ask questions requiring them to interpret the examples. Thirteen exercises interspersed throughout show students how to interpret a greater variety of statistical reporting.

Holcomb, Z.C. (2017). *SPSS basics: Techniques for a first course in statistics*. New York and London: Routledge.

Without previous knowledge of SPSS, the reader can understand and use the software to create, edit, and present quantitative results for a research project. Step-by-step directions are provided along with specific and clear examples. The examples follow the APA style book for publication.

Hopkins, D.K., B.R. Hopkins, and G.V. Glass. (1996). *Basic statistics for the behavioral sciences* (3rd edition). Boston, MA: Allyn & Bacon.

The approach in this book is conceptual rather than mathematical. The authors stress the understanding, applications, and interpretation of concepts rather than derivation and proof or hand computation. The book provides clear definitions, examples, and problem sets, and makes the reader feel more confident about statistics.

Keller, D.K. (2006). *The Tao of statistics: A path to understanding (with no math)*. Thousand Oaks, CA: Sage.

Statistics are provided in plain English. The text gives explanations of how statistics are used and what they mean, rather than exercises in computing statistical formulae. Both basic concepts and complex statistical models are covered.

Larose, D.T. (2004). *Discovering knowledge in data: An introduction to data mining*. Hoboken, NJ: Wiley-Interscience.

Data preprocessing and classification, exploratory analysis, decision trees, association rules, model evaluation techniques, and other data-mining topics are covered. The powerful black box data-mining software now available can produce disastrously misleading results unless applied by a skilled and knowledgable analyst. This book provides both the practical experience and the theoretical insight needed to reveal valuable information hidden in large datasets. Employing a "white box" methodology and with real-world case studies, this step-by-step guide walks readers through the various algorithms and statistical structures that underlie the software, and presents examples of their operation on actual large datasets.

Lohninger, H. (1999). *Teach/me – Data analysis*. Berlin, New York, andTokyo: Springer Verlag.

This resource is a multimedia tool on the analysis of complex data in research. It includes a comprehensive, hyper-linked textbook on data analysis. Additional highlights include an open architecture for use with any teaching material, interactive examples, a course and exam designer, protection of resources by encryption, and a data laboratory with sample datasets and import function for hands-on experience. Definition of basic statistical terms, precision, linear and nonlinear models, data types, and statistical tests for parametric and nonparametric data are covered.

Lomax, R.G. (2013). *Statistical concepts: A second course* (4th edition). New York: Routledge.

This book highlights how statistics work and what they mean to better prepare students to analyze their own data and interpret SPSS and research results. As such it offers more coverage of nonparametric procedures used when standard assumptions are violated, since these methods are more frequently encountered when working with real data. Determining appropriate sample sizes is emphasized throughout. Topics not ordinarily covered in basic textbooks are covered. Examples from education and behavioral sciences are included, and tables of statistical assumptions and the effects of their violations are provided.

Maier, M.H. (2012). *The data game: Controversies in social science statistics* (4th edition). New York: Routledge.

This book introduces the collection, use, and interpretation of statistical data in the social sciences. Intended for social science introductory statistics and research methods courses, it provides chapters devoted to data in the fields of demography, housing, health, education, crime, the economy, wealth, income, poverty, labor, business statistics, and public opinion polling, with a concluding chapter devoted to the common problem of ambiguity.

Each chapter includes multiple case studies illustrating the controversies, overview of data sources including websites, chapter summary, and a set of case study questions designed to stimulate further thought.

Manly, B.F.J. (2004). *Multivariate statistical analysis: A primer* (3rd edition). Boca Raton, FL: Chapman & Hall/CRC.

Multivariate methods are now widely used in the quantitative sciences as well as in statistics owing to the ready availability of computer packages for performing the calculations. While access to suitable computer software is essential to using multivariate methods, using the software still requires a working knowledge of these methods and how they may be used. This text provides a concise, accessible introduction to multivariate techniques ideal for research across the range of quantitative sciences. It includes recent ideas about multivariate analyses, important new material, updated references, compares and contrasts the major statistical software packages, and provides all the data used in the book on a companion website.

Mertler, C.A. and R.A. Vannatta. (2017). *Advanced and multivariate statistical methods: Practical applications and interpretation* (6th edition). New York: Routledge.

Designed for a second-level statistics course, this text shows students how to interpret, present, and write up the results for each statistical technique. Students also learn how to compute each technique using SPSS software. Covers advanced statistics without overemphasizing advanced math.

Paulson, D.S. (2003). *Applied statistical designs for the researcher*. London: Taylor and Francis/CRC Press.

Showcasing a discussion of the experimental process and a review of basic statistics, this volume provides methodologies to identify general data distribution, skewness, and outliers. It features a unique classification of the nonparametric analogs of their parametric counterparts according to the strength of the collected data. It includes three varieties of the student t-test, including a comparison of two different groups with different variances; two groups with the same variance; and a matched, paired group. It introduces the analysis of variance and Latin Square designs, and presents screening approaches to comparing two factors and their interactions, and meta-analysis and regression analysis are also considered.

Privitera, G.J. (2016). *Statistics for the behavioral sciences*. Thousand Oaks, CA: Sage.

This text is an introduction to statistics that will engage readers in an ongoing spirit of discovery by illustrating how statistics apply to modern-day research problems. By integrating instructions, screenshots, and practical examples for using SPSS software, the book makes it easy for students to learn statistical concepts within each chapter. The author adopts a user-friendly approach while balancing statistical theory, computation, and application with the technical instruction needed for students to succeed in the modern era of data collection, analysis, and statistical interpretation.

Pyrczak, F. (2017). *Making sense of statistics: A conceptual overview* (6th edition). New York and London: Routledge.

By providing an overview of descriptive and inferential statistics *without formulae and computations*, this text helps students who are struggling with statistical concepts. With its clear and to-the-point narrative and easy-to-digest layout, this short text is perfect for all courses where statistics are discussed.

Pyrczak, F. (2017). *Statistics with a sense of humor: A humorous workbook and guide to study skills* (2nd edition). New York and London: Routledge.

Beginning with a basic math review, the self-correcting, riddle-based worksheets in this book provide students with a fun way to practice their newly acquired skills. In addition, over 40 humorously illustrated study guides give students valuable tips and advice, ranging from tips for using calculators to time-management skills.

Pyrczak, F. (2017). *Success at statistics: A worktext with humor* (6th edition). New York and London: Routledge.

Divided into 62 short sections, this text allows instructors to assign only those sections needed to meet the goals of the course. Humorous riddles allow students to check their work without providing the answers; if the answer to a riddle makes sense, then students know they have answered all questions in an exercise correctly. All major statistics typically introduced in a first-semester course are covered. This book contains material on effect size, which provides technical solutions to issues raised earlier in the book such as the limitations of inferential statistics.

Rountree, D. (2004). *Statistics without tears: A primer for non-mathematicians*. Boston, MA: Allyn & Bacon.

This book is written in the belief that the basic concepts of statistics can be learned without having to perform calculations. It provides an introduction to the main concepts and terminology of statistics. This text uses words and diagrams, rather than formulae and equations, to help students from all subject areas understand what statistics is and how to think statistically.

Sheskin, D.J. (2011). *Handbook of parametric and non-parametric statistical procedures* (5th edition). Boca Raton, FL: Chapman & Hall/CRC Press.

The fifth edition provides unparalleled, up-to-date coverage of over 130 parametric and nonparametric statistical procedures as well as many practical and theoretical issues relevant to statistical analysis. It helps the reader decide what method of analysis to use, how to use a particular test for the first time, distinguish acceptable from unacceptable research, and interpret and better understand the results of published studies.

Sprent, P. and N.C. Smeeton. (2007). *Applied nonparametric statistical methods* (4th edition). Boca Raton, FL: Chapman & Hall/CRC.

This text emphasizes better use of significance tests and explains the rationale of procedures with a minimum of mathematical detail, making it not only an outstanding textbook but also an up-to-date reference for professionals who do their own statistical analyses. There is expanded coverage of topics such as ethical considerations, calculation of power and of sample sizes needed, statistical packages, and sections on the analysis of angular data, the use of capture-recapture methods, and the measurement of agreement between observers, runs tests, and regression diagnostics.

Sprinthall, R.C. (2011). *Basic statistical analysis* (9th edition). Old Tappan, NJ: Pearson.

The goal of this book is to demystify and present statistics in a clear, cohesive manner. The reader is presented with rules of evidence and the logic behind those rules. The book is divided into three major units: descriptive statistics, inferential statistics, and advanced topics in inferential statistics.

Urdan, T.C. (2017). *Statistics in plain English* (4th edition). New York: Routledge/Taylor & Francis.

This text is a brief and simple overview of statistics. Statistical tests and formulae, and how they work and how they are interpreted, are covered. Statistics are described, explanations of how they work, and examples are provided for each statistical process.

Willard, C.A. (2017). *Statistical methods: A worktext approach*. New York: Routledge/Taylor & Francis.

This text uses a conversational tone to explain core statistical concepts in a way that students can readily understand. After concepts and skills are introduced and demonstrated, hands-on opportunities are provided to work with the concepts and practice their newly acquired skills. Each chapter begins with a careful explanation of the statistical concepts relevant to that chapter. Following the explanation of concepts are examples that illustrate their applications.

Quantitative Methods

Balnaves, M. and P. Caputi. (2001). *Introduction to quantitative research methods: An investigative approach*. Thousand Oaks, CA: Sage.

This text is an introduction to quantitative research methods and basic statistics. It uses a theme throughout to show how quantitative methods have been used to solve real-life problems. The book focuses on principles and techniques that are appropriate to introductory level courses in media, psychology, and sociology. Examples and illustrations are drawn from historical and contemporary research in the social sciences. Content on sampling, basic statistics, and techniques for seeking out information from databases and other sources are provided.

Black, T.R. (1999). *Doing quantitative research in the social sciences: An integrated approach to research design, measurement and statistics*. Thousand Oaks, CA: Sage.

This text provides a comprehensive and integrated approach to using quantitative methods in the social sciences. The author's method focuses on designing and executing research so that issues such as planning, sampling, designing measurement instruments, choosing statistical tests, and interpreting results are integrated into the research process. Research design issues are introduced along with statistical procedures necessary for data analysis that develop analytical skills and decision-making powers. It includes a wide range of examples and activities providing the student with a solid foundation in research design, measurement, and statistics.

Chiulli, R.M. (1999). *Quantitative analysis: An introduction*. London: Taylor & Francis/CRC Press.

Written in a lecture format with solved problems at the end of each chapter, this book surveys quantitative modeling and decision analysis techniques. It serves to familiarize the reader with quantitative techniques utilized in planning and optimizing complex systems, as well as students experiencing the subject for the first time. A background in calculus is not required, since it allows the reader to comprehend the material through examples and problems, and also demonstrates the value and shortcomings of many methods.

Hoy, W.K. and C.M. Adams. (2015). *Quantitative research in education: A primer* (2nd edition). Thousand Oaks, CA: Sage.

This book is a brief and practical text designed to allay anxiety about quantitative research. The authors first introduce readers to the nature of research and science, and then present the meaning of concepts and research problems as they dispel notions that quantitative research is too difficult, too theoretical, and not practical.

Lim, W.M. and D.H. Ting. (2012). *Research methodology: A toolkit of sampling and data analysis techniques for quantitative research*. Munich, Germany: GRIN Verlag.

Researchers may encounter dilemmas when choosing the most suitable combination of methods to obtain a randomized sample and the best data analysis techniques which are able to project the true state of affairs of the researched phenomenon. This book features a wide range of sampling and data analysis techniques which have been proven to be effectively useful in guiding researchers in the adoption of the most appropriate sampling and data analysis techniques which are in line to accomplish the established research objectives.

Little, T.D. (Ed.). (2013). *The Oxford handbook of quantitative methods*. Oxford: Oxford University Press.

Comprising two volumes, this handbook covers a wealth of topics related to quantitative research methods. It begins with essential philosophical and ethical issues related to science and quantitative research. It then addresses core measurement topics before delving into the design of studies. Principal issues related to modern estimation and mathematical modeling are also detailed. Topics include statistical inference and modeling with chapters dedicated to classical approaches as well as to modern latent variable approaches.

Morgan, S.E., T. Reichert, and T.R. Harrison. (2002). *From numbers to words: Reporting statistical results for the social sciences*. Boston, MA: Allyn & Bacon.

This text is a valuable reference tool that guides students through drafting the results of quantitative experiments and investigations. Everyone who does quantitative social science research writes up the results of their experiments and investigations, but most texts offer little guidance on how to do so. This supplemental text teaches students how to draft the results of statistical experiments and investigations in text or visual format. This how-to book is designed to be used in combination with primary statistics or research methods texts, and also serves as an effective reference for students new to statistics and for experienced researchers.

Muijs, D. (2010). *Doing quantitative research in education with SPSS* (2nd edition). Thousand Oaks, CA: Sage.

This accessible and authoritative introduction is valuable for education students and researchers needing to use quantitative methods for the first time. Using datasets from real-life educational research and avoiding the use of mathematical formulae, the author guides students through the essential techniques that they will need to know, explaining each procedure using the latest version of SPSS. This revised and updated second edition now also includes more advanced methods such as log linear analysis, logistic regression, and canonical correlation. Written specifically for those with no prior experience of quantitative research, this book is ideal for education students and researchers in this field.

Schwab, D. (2004). *Research methods for organizational behavior* (2nd edition). London: Psychology Press/Taylor & Francis.

While the focus of this book is on quantitative research, readers with various levels of research knowledge can use it successfully. The first 15 chapters introduce basic research topics. The final section contains four short chapters, which extend the discussion of a basic topic. This book covers applied issues usually missing in research texts, such as cleaning data, handling missing data, coding data, and transforming data.

Tabachnick, B.G. and L.S. Fidell. (2012). *Using multivariate statistics* (6th edition). Boston, MA: Pearson/Allyn & Bacon.

This text takes a practical approach to multivariate data analysis, with an introduction to the most commonly encountered statistical and multivariate techniques. It provides practical guidelines for conducting numerous types of multivariate statistical analyses and it gives syntax and output for accomplishing many analyses through the most recent releases of SAS and SPSS. The book maintains its practical approach, focusing on the benefits and limitations of applications of a technique to a dataset – when, why, and how to do it. Overall, it provides a timely and comprehensive introduction to today's most commonly encountered statistical and multivariate techniques, while assuming only a limited knowledge of higher level mathematics.

Vogt, W.P. (2007). *Quantitative research methods for professionals*. Boston, MA: Pearson/Allyn & Bacon.

This text discusses a wide range of quantitative research methods, including advanced techniques such as logistic regression, multilevel modeling, and structural equation modeling. Because the text emphasizes concepts rather than mathematics and computational formulae, it is accessible to a wide range of research users, including professional practitioners in areas such as education, business, social work, and psychology.

Walter, M. and C. Anderson. (2013). *Indigenous statistics: A quantitative research methodology*. New York & London: Routledge.

This text opens up a major new approach to research across the disciplines and applied fields. It creates a new paradigm for Indigenous quantitative studies moving away from what have been considered straightforward and transparent numbers.

Williams, F. and P. Monge. (2001). *Reasoning with statistics: How to read quantitative research* (5th edition). Boston, MA: Harcourt Publishers.

This text is designed to help readers become knowledgeable about cross-curriculum quantitative research literature. It provides a clear, inviting view of quantitative research strategies for those who may or may not have a mathematical background. The authors impart a conceptual understanding rather than teach calculation methods. Examples are cross-curriculum and generic. Its strength is that it is very brief and does not overwhelm with too much detail.

Wrench, J.S. (2013). *Quantitative research methods for communication: A hands-on approach* (2nd edition). Oxford: Oxford University Press.

This text is a comprehensive guide to quantitative research. Research ethics and interaction with Institutional Review Boards are included, along with methods of interaction with statistical software packages. The importance of factor analysis and the use of Likert-type scales are linked to statistical procedures, especially in the area of communication.

Yaremko, R.M., H. Harari, and R.C. Harrison. (2013). *Handbook of research and quantitative methods in psychology: For students and professionals*. New York: Psychology Press/Taylor & Francis.

This comprehensive reference text organizes definitions and examples of key concepts in quantitative research into a single, convenient source. Alphabetically arranged and cross-referenced, the book presents experimental procedures, research designs, statistical methods, information theory, psychophysics, behavioral terminology, and scaling and testing.

Qualitative Methods

Atkins, L. and S. Wallace. (2012). *Qualitative research in education*. Thousand Oaks, CA: Sage.

This practical book is a quick guide for graduate researchers in education. Looking at the interdependence of teaching and research, the authors show that a critical and analytical exploration of policies and practices is a necessary part of what we mean by being a professional in education. Topics include discourse analysis, visual methods, textual research, data collection, and analysis.

Bailey, C.A. (2017). *A guide to qualitative field research* (3rd edition). Thousand Oaks, CA: Sage.

Clear, practical, and specific directions for field-based qualitative studies are provided. Research examples are outlined and explained, and readers are introduced to how the different parts of the research process interact.

Berg, B.L. and H. Lune. (2011). *Qualitative research methods for the social sciences* (8th edition). Boston, MA: Pearson/Allyn & Bacon.

With considerable breadth, this practical book covers a variety of qualitative techniques, including ethnography, historiography, action research, grounded theory, and case study. It examines

interviewing and focus groups. It discusses such topics as ethics, content analysis, and writing research papers. This text shows novice researchers how to design, collect, and analyze qualitative data and then to present their results to the scientific community.

Bocher, A.P. and C. Ellis. (2016). *Evocative autoethnography: Writing lives and telling stories*. New York and London: Routledge/Taylor & Francis.

The authors emphasize how to connect intellectually and emotionally to the lives of readers throughout the challenging process of representing lived experiences. Written as the story of a fictional workshop, based on many similar sessions led by the authors, it incorporates group discussions, common questions, and workshop handouts. The book describes the history, development, and purposes of evocative storytelling; provides detailed instruction on becoming a story-writer and living a writing life; examines fundamental ethical issues, dilemmas, and responsibilities; illustrates ways in which ethnography intersects with autoethnography; and calls attention to how truth and memory figure in the works and lives of evocative autoethnographers.

Bogdan, R. and S.K. Bilen. (2006). *Qualitative research in education: An introduction to theory and methods* (5th edition). Boston, MA: Pearson/Allyn & Bacon.

The purpose of this introductory-level text is to provide the reader with a background for understanding the uses of qualitative research in education (and other professions) to examine its theoretical and historical underpinnings, and to provide the "how-to" of doing qualitative research. This new edition places qualitative research within current debates about research methods and alternative ways of knowing.

Briguela, B.M., J.D. Stewart, R.G. Carrillo, and J. G. Berger. (2000). *Acts of inquiry in qualitative research*. Cambridge, MA: Harvard Education Press.

This comprehensive book from the editors of the *Harvard Educational Review* examines the nature and uses of qualitative research. Researchers, practitioners, participants, and scholars address the proliferation of methodologies, ethical and disciplinary concerns, and issues of equity and diversity which such research raises from a wide variety of viewpoints. *Acts of inquiry in qualitative research* also presents a broad assortment of articles by authors from several academic disciplines who examine their own fields' contribution to qualitative research in the past as well as future trends. The book is divided into six sections reflecting different acts of inquiry in qualitative research habits of thought and work, ethics and validity, the relationships of the researcher and the participants, data collection, data analysis and interpretations, and the uses of research. *Acts of inquiry* is unique in bringing together a rich

collection of theoretical arguments and case studies, making it an invaluable resource for teaching, learning, and practicing qualitative research.

Bryman, A. (1988). *Quantity and quality in social research*. London and New York: Routledge.

This text is relevant to any social science and is a good starting point for learning about qualitative research and mixed methodologies. The author provides excellent research examples of every point made, and includes a comprehensive 20-page bibliography for readers to further their study.

Bryman, A. (2016). *Social research methods* (5th edition). Oxford: Oxford University Press.

Traditional, established methods of social science research are integrated with e-research techniques in this 5th edition. Computer-assisted content analysis, mobile interviewing, and event sampling are covered. Methodological issues are discussed in light of publishing results.

Chang, H. (2008). *Autoethnography as method (Developing qualitative inquiry*). New York and London: Routledge.

This methods book will guide the reader through the process of conducting and producing an autoethnographic study through the understanding of self, other, and culture. Readers will be encouraged to follow hands-on though not prescriptive steps in data collection, analysis, and interpretation with self-reflective pre-writing exercises and self-narrative writing exercises to produce their own autoethnographic work.

Clandinin, D.J. (2013). *Engaging in narrative inquiry: Developing qualitative inquiry*. Walnut Creek, CA: Left Coast Press.

Narrative inquiry examines human lives through the lens of a narrative, honoring lived experience as a source of important knowledge and understanding. In this the author updates her classic formulation on narrative inquiry, clarifying, extending, and refining the method based on an additional decade of work. A valuable feature is the inclusion of several exemplary cases with the author's critique and analysis of the work. The rise of interest in narrative inquiry in recent years makes this is an essential guide for researchers and an excellent text for graduate courses in qualitative inquiry.

Clarke, A.E., C. Friese, and R.S. Washburn. (2017). *Situational analysis: Grounded theory after the interpretative turn* (2nd edition). Thousand Oaks, CA: Sage.

The authors present an innovative extension of grounded theory used in qualitative research projects. Situational analysis draws upon data from interviews, observations, or other discourse materials to picture the analysis as a complex real-world situation.

Creswell, J. (2012). *Qualitative inquiry and research design: Choosing among five traditions* (3rd edition). Thousand Oaks, CA: Sage.

This book focuses on five separate types of qualitative research. They include biography, phenomenology, ethnography, case study, and grounded theory. Methods and criteria of selecting an appropriate technique and the values of each method are provided.

Delamont, S. (Ed.). (2012). *Handbook of qualitative research in education*. Northampton, MA: Edward Elgar Publishing.

This handbook offers both basic and advanced discussions of data collection, analysis, and representation of all the best qualitative methods used in educational research. There are four comprehensive sections on perspectives, settings, data collection and data analysis, and representation. Its 44 chapters serve academics and graduate students in educational research across all sectors of education from pre-school to graduate school, and all settings from formal to non-formal.

Denzin, N.K. (2014). *Interpretive autoethnography: Qualitative research methods* (2nd edition). Thousand Oaks, CA: Sage.

The author covers the basics of autoethnography, including personal experience and life story research. It makes autoethnographic terms accessible, and the illustrations capture the abundance of terms used and characteristics of the methodology.

Denzin, N.K. and M.D. Giardina. (Eds.). (2016). *Qualitative inquiry through a critical lens*. New York and London: Routledge.

This volume highlights work being done in qualitative inquiry through a variety of critical lenses such as new materialism, queer theory, and narrative inquiry. Contributors ranging from seasoned academics to emerging scholars attend to questions of ontology and epistemology, providing, in the process, insights that any qualitative researcher interested in the state of the field would find of value.

Denzin, N.K. and Y.S. Lincoln. (Eds.). (2005). The *SAGE handbook of qualitative research* (3rd edition). Thousand Oaks, CA: Sage.

Once again, the editors have put together a volume that represents the state of the art for the theory and practice of qualitative inquiry. Built on the considerable foundations of the landmark first two editions, the third edition moves qualitative research boldly into the twenty-first century. The editors and authors ask how the practices of qualitative inquiry may be used to address issues of social justice in this new century. There are 14 totally new topics, including, among others, indigenous research, institutional review boards and human subject research, critical and performance

ethnography, arts-based inquiry, narrative inquiry, Foucault, the ethics and strategies of online research, cultural and investigative poetics, and the politics of evaluation.

Freebody, P. (2003). *Qualitative research in education: Interaction and practice*. Thousand Oaks, CA: Sage.

This textbook provides a comprehensive overview of qualitative approaches to educational research. The text draws upon a broad range of real-life examples to describe and illustrate the methods through which educational data may be analyzed. Through a detailed yet concise explanation, the reader is then shown how these methods work and how their outcomes may be interpreted.

Freeman, M. (2017). *Modes of thinking for qualitative data analysis*. New York: Routledge/Taylor & Francis Group.

The author provides an argument for engagement with the conceptual underpinnings of five prominent analytical strategies used by qualitative researchers: categorical thinking, narrative thinking, dialectical thinking, poetical thinking, and diagrammatic thinking. This book provides a platform for choosing from among the strategies by determining the strengths and limitations of each.

Glesne, C. (2015). *Becoming qualitative researchers: An introduction* (5th edition). Boston, MA: Pearson/Allyn & Bacon.

The fifth edition of this basic text provides an understanding of qualitative research methods, and explores the diverse possibilities within this inquiry approach. This text covers the range of possibilities along with numerous exercises that offer beginning students the opportunity to practice and refine the skills of being a qualitative researcher. The wealth of examples in the text is exceptional, as is the accessible writing style.

Gummesson, E. (2000). *Qualitative methods in management research* (2nd edition). Thousand Oaks, CA: Sage.

This is the second edition of a book noted for its wide-ranging examination of qualitative research, its philosophy and practice, with reference to management research. The book takes into account issues of both management consultancy and applied research, and effectively integrates the two traditions.

Hughes, S.A. and J.L. Pennington. (2017). *Autoethnography: Process, product, and possibility for critical social research*. Thousand Oaks, CA: Sage.

This book provides a short introduction to the methodological tools and concepts of autoethnography, combining theoretical approaches with practical "how-to" information. Written for social science students, teachers, teacher educators, and educational researchers, the text shows readers how autoethnographers collect, analyze, and report data.

Lapan, S.D., M.T. Quartaroli, and F.J. Riemer. (2011). *Qualitative research: An introduction to methods and designs*. San Francisco, CA: Jossey-Bass/John Wiley & Sons.

This text is an up-to-date guide to qualitative study design, data collection, analysis, and reporting. Step by step, the authors explain a range of methodologies and methods for conducting qualitative research focusing on how they are applied when conducting an actual study. The book includes methods of data collection, specific approaches to qualitative research, and current issues in the field. Specifically, chapters cover the methods, designs, and analyses related to the methodologies of history, case study, program evaluation, ethnography, autoethnography, narrative, life histories, emancipatory discourses, feminist perspectives, African-American inquiry, indigenous studies, and practitioner qualitative research.

Lee, T.W. (1999). *Using qualitative methods in organizational research*. Thousand Oaks, CA: Sage.

The concepts of reliability and validity in qualitative research are examined, and exemplary methods of generating and testing theory are presented. The use of focus groups, case studies, and interviews are included.

Lichtman, M. (2013). *Qualitative research in education: A user's guide* (3rd edition). Thousand Oaks, CA: Sage.

By blending history and tradition with some practical ideas, the book looks at the past and toward the future to give readers a sense of the field and how it has changed. It aims to help education students become savvy qualitative researchers and includes group and individual activities that provide practical suggestions to build the required skills. The major topics of gathering, organizing, and analyzing results are examined to provide practical information on doing qualitative research. Actual examples and illustrations help the user translate abstract ideas into concrete suggestions.

Marshall, C. and G.B. Rossman. (2010). *Designing qualitative research* (5th edition). Thousand Oaks, CA, Sage.

This text offers coverage of ethics, data analysis, research design techniques, distance-based research (such as email interviews), the implications of postmodern turns, integrating archival material, and creative ways of presenting the research. The authors include updates to popular features, such as vignettes that illustrate the methodological challenges which today's qualitative researcher face. This book takes the reader through the qualitative process, including building the conceptual framework, doing the research design, data-collection methods, recording, managing, and analyzing data as well as planning time and resources.

Mason, J. (2017). *Qualitative researching* (3rd edition). Thousand Oaks, CA: Sage.

In the third edition the author guides readers through the process of qualitative research. She explains how different theoretical approaches inform inquiry and practice. The text provides a grounded approach to qualitative researching that encourages reflection, interpretation, and crafting knowledge from qualitative research.

Merriam, S.B. (2002). *Qualitative research in practice: Examples for discussion and analysis*. San Francisco, CA: Jossey-Bass.

Qualitative research methods are presented in this book as more flexible, responsive, and open to contextual interpretation than in quantitative research. The author combines discussions of the types of qualitative research in detail with examples of qualitative research, including comments and reflections from the researchers.

Miles, M.B., A.M. Huberman, and J. Saldana. (2014). *Qualitative data analysis: A methods sourcebook* (3rd edition). Thousand Oaks, CA: Sage.

An up-to-date coverage of qualitative analysis, this edition adds new techniques, ideas, and references for researchers. The increase in the use of computers in qualitative analysis is reflected in this volume, and data display strategies are now presented in re-envisioned and reorganized formats. Fundamentals of research design and data management are described using five distinct methods of analysis: exploring, describing, ordering, explaining, and predicting. Through examples from a host of social science and professional disciplines, this text remains one of the more comprehensive and complete treatments of this topic available to scholars and applied researchers.

Muncey, T. (2010). *Creating autoethnographies*. Thousand Oaks, CA: Sage.

This book provides a background and considers some of the criticisms of autoethnography. It is structured to mirror the process of writing about experience, from establishing an idea through to the process of writing and the development of creative writing skills, and provides detailed worked examples of the whole process. A wide range of case studies drawn from a wide a range of social science disciplines and exercises are included throughout the text.

Patton, M.Q. (2014). *Qualitative research and evaluation methods: Integrating theory and practice* (4th edition). Thousand Oaks, CA: Sage.

An expanded version of what was already a valuable resource, this is a practical account of applied qualitative research methods in general, including qualitative program evaluation. Qualitative inquiry frameworks and analysis options are illustrated through new examples. This revision takes account of recent development in qualitative research and evaluation in the breadth of its coverage, and presents a compelling defense of the use of qualitative data in some research and evaluation situations.

Richie, J., J. Lewis, and C. M. Nicholls. (2014). *Qualitative research practice: A guide for social science students and researchers* (2nd edition). Thousand Oaks, CA: Sage.

This textbook leads students and researchers through the entire process of qualitative research from beginning to end – moving through design, sampling, data collection, analysis, and reporting. In this fully revised second edition you will find a practical account of how to carry out qualitative research that recognizes a range of current approaches and applications, along with a new chapter on ethics and a new chapter on observational research. Updated advice on using software when analyzing your qualitative data is included.

Saldana, J. (2011). *Fundamentals of qualitative research: Understanding qualitative research*. Oxford: Oxford University Press.

This book presents a concise yet rigorous description of how to design and conduct fieldwork projects and how to examine data in multiple ways for interpretive insight. The author acquaints readers with the major genres of qualitative research available and the elements of interviewing, participant observation, and other data collection methods to inform emergent research design decisions. Qualitative data analysis, conceptual foundations, coding, analytic memo writing, thematic analysis, assertion development, grounded theory, narrative and poetic inquiry, and ethno-dramatic approaches to data are covered.

Silverman, D. (2017). *Doing qualitative research* (5th edition). Thousand Oaks, CA: Sage.

Advertised as a practical and accessible text, this book shows readers how to go from the ideas of research to the practicalities of designing, conducting, and writing about research. A hands-on guide for those embarking upon their own research, both in the classroom and in the field.

Strauss, A. and Corbin, J. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd edition). Thousand Oaks, CA: Sage.

Grounded theory as a qualitative research technique is the focus of this text. The authors provide a description of the methodology, from the design of a research question through data coding and analysis, to reporting results. Methods of evaluating the research are also provided.

Swaminathan, R. and T.M. Mulvihill. (2017). *Critical approaches to questions in qualitative research*. New York and London: Routledge.

This book provides a comprehensive overview and treatment of critical approaches to questions in qualitative research. It also examines questions as tools for strategic thinking and decision-making at all stages of the qualitative research process, and it situates constructing and formulating questions as a critical aspect of qualitative research.

Thorne, S. (2016). *Interpretative description: Qualitative research for applied practice* (2nd edition). New York and London: Routledge.

This text takes the reader through the qualitative research process, from research design through fieldwork, analysis, interpretation, and application of the results; and provides numerous examples from a variety of applied fields to show research in action. Data analyses using knowledge synthesis and evidence-based practice are covered.

Torrance, H. (Ed.). (2010). *Qualitative research methods in education* (4-volume set). Thousand Oaks, CA: Sage.

This four-volume set brings together seminal and cutting-edge articles on qualitative research internationally, and shows how the field has developed in influence in recent years. This major reference collection reviews the ongoing debates and various issues about qualitative methods and the contribution they make to understanding educational issues. It reviews the methodological arguments for using qualitative methods, including critiques and rejoinders, and places these arguments in appropriate historical and epistemological contexts with respect to the development of qualitative methods in congruent disciplines, including anthropology, psychology, sociology, and education.

Willis, J.W. (2007). *Foundations of qualitative research: Interpretive and critical approaches*. Thousand Oaks, CA: Sage.

Key theoretical and epistemological concepts are introduced using historical and real-world examples. General guidelines for seven qualitative research frameworks are covered, together with the conceptual foundations of interpretive, critical, and post-positivist paradigms.

Survey Research

Babbie, E.R. (1990). *Survey research methods* (2nd edition). Belmont, CA: Wadsworth/Cernage Learning.

This classic text covers the waterfront for survey research. From the scientific context of survey research, through survey design and data collection, to survey research analysis, the contents of the book support the use of surveys in the social context in an ethical and scientific fashion.

Bethlehem, J. (2009). *Applied survey methods: A statistical perspective*. Hoboken, NJ: John Wiley & Sons.

This book provides a comprehensive outline of the complete survey process, from design to publication. It describes both the theory and practical applications of survey research with an emphasis on the statistical aspects of survey methods. The book begins with a brief historic overview of survey research methods followed by a discussion that details the needed first steps for carrying out a survey, including the definition of a target population, the selection of a sampling frame, and the outline of a questionnaire with several examples that include common errors to avoid in the wording of questions. Throughout the book, the author provides an accessible discussion on the methodological problems associated with the survey process, outlining real data and examples while also providing insight into the future of survey research.

Dillman, D.A., J.D. Smyth, and L.M. Christian. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th edition). Hoboken, NJ: John Wiley & Sons.

This latest edition provides direction for effectively planning and conducting mail, telephone, and internet surveys. The text is thoroughly updated and revised, and covers all aspects of survey research. It features expanded coverage of mobile phones, tablets, and the use of do-it-yourself surveys. It is a valuable resource for any researcher seeking to increase response rates and obtain high-quality feedback from survey questions. Consistent with current emphasis on the visual and aural, the new edition is complemented by copious examples within the text and accompanying website.

Fowler, F.J. (1995). *Improving survey questions: Design and evaluation*. Thousand Oaks, CA: Sage.

This book is part of the Sage applied social research methods series. It describes the development of a survey interview form focusing on how to structure questions that lead to the responses desired. It includes procedures to improve the quality of survey data for quantitative analysis and techniques of evaluation to use when analyzing and interpreting the data.

Fowler, F. (2008). *Survey research methods* (4th edition). Thousand Oaks, CA: Sage.

Researchers who want to collect and analyze survey data are provided with a foundation for evaluating how each aspect of a survey can affect its precision, accuracy, and creditability. This book includes the latest options available to researchers in using the computer and internet for surveys. It emphasizes the importance of minimizing sampling errors through superior question design.

Groves, R.M., F.J. Fowler, M.P. Couper, J.M. Lepkowski, E. Singer, and R. Tourangeau. (2009). *Survey methodology* (2nd edition). New York: John Wiley & Sons.

This text provides a state-of-the-science presentation of essential survey methodology topics and techniques. The authors have updated this edition to present newly emerging approaches to survey research and to provide more comprehensive coverage of the major considerations in designing and conducting a sample survey. Topics include sampling frame evaluation, sample design, development of questionnaires, evaluation of questions, alternative modes of data collection, interviewing, nonresponse, post-collection processing of survey data, and practices for maintaining scientific integrity.

Nardi, P.M. (2013). *Doing survey research: A guide to quantitative methods* (3rd edition). New York: Routledge/Taylor & Francis Group.

The updated third edition of this book prepares students to write a questionnaire, generate a sample, conduct their own survey research, analyze data, and write up the results, while learning to read and interpret excerpts from published research. It combines statistics and survey research methods in a single book. It strengthens connections between questionnaire design, online surveys, and statistical analysis of responses.

Orcher, L.T. (2017). *Conducting a survey: Techniques for a term project*. New York and London: Routledge/Taylor & Francis.

Designed for students who will be conducting their first survey as a term project, this text covers all the essentials, from selecting a problem area through writing up the research report. Extensive coverage on selecting an appropriate topic and refining the research purpose gets students off to a good start.

Patten, M.L. (2014). *Questionnaire research: A practical guide* (4th edition). New York and London: Routledge/Taylor & Francis.

This step-by-step guidebook provides detailed information on how to conduct a survey using questionnaires. All topics are covered, from planning a survey using objectives to writing up a report of the results. Two first-draft sample questionnaires are included, which give students material to evaluate and revise in light of the guidelines presented in the text.

Rea, L.M. and R.A. Parker. (2014). *Designing and conducting survey research: A comprehensive guide* (4th edition). Hoboken, NJ: John Wiley & Sons.

This book offers practical, actionable guidance on constructing the instrument, administrating the process, and analyzing and reporting the results, providing extensive examples and worksheets that demonstrate the appropriate use of survey and data techniques. By clarifying complex statistical concepts and modern analysis methods, this guide enables readers to conduct a survey research project from an initial focus concept to the final report.

Saris, W.E. and I.N. Gallofer. (2014). *Design, evaluation, and analysis of questionnaires for survey research* (2nd edition). Hoboken, NJ: John Wiley & Sons.

This text provides a thorough analysis of decisions which researchers make throughout the survey design process, including a comprehensive outline of the steps necessary for creating and testing survey questionnaires. Methodological and statistical tools used to create and administer reliable and accurate survey questionnaires are provided. The importance of the relationship between individual question characteristics and overall question quality is stressed.

Scheuren, F. (2004). *What is a survey?* (2nd edition). Alexandria, VA: American Statistical Association Section on Survey Research Methods. Retrieved from www.whatisasurvey.info/downloads/pamphlet_current.pdf.

This publication is a compilation of a series of ten brochures on survey topics, including quality of surveys, focus groups, telephone surveys, margin of error, and other topics. It was designed to promote a better understanding of what is involved in carrying out sample surveys. The American Statistical Association offers this publication online and free to the public.

Thomas, S.J. (2004). *Using web and paper questionnaires for data-based decision making: From design to interpretation of the results*. Thousand Oaks, CA: Corwin Press.

This practical handbook provides suggestions for using both web-based and paper-based questionnaires for data gathering. There is good guidance for planning a survey research project and for communicating the results to a variety of audiences.

Thompson, S.K. (2012). *Sampling* (3rd edition). Hoboken, NJ: John Wiley & Sons.

This text provides an up-to-date treatment of both classical and modern sampling design and estimation methods, along with sampling methods for rare, clustered, and hard-to-detect populations. The book covers basic sampling, from simple random to unequal probability sampling; the use of auxiliary data with ratio and regression estimation; sufficient data, model, and design in practical sampling; useful designs such as stratified, cluster and systematic, multi-stage, double and network sampling; detectability methods for elusive populations; spatial sampling; and adaptive sampling designs.

Interview Research

Gubrium, J.F., J. Holstein, A. Marvasti, and K.D. McKinney (Eds.). *The SAGE handbook of interview research: The complexity of the craft* (2nd edition). Thousand Oaks, CA: Sage.

The new edition emphasizes the dynamic, interactional, and reflexive dimensions of the research interview. Contributors highlight the myriad dimensions of complexity that are emerging as researchers increasingly frame the interview as a communicative opportunity as much as a data-gathering format. It encourages readers simultaneously to learn the frameworks and technologies of interviewing and to reflect upon the epistemological foundations of the interview craft.

Holstein, J.A. and J.F. Gubrium. (1995). *The active interview*. Thousand Oaks, CA: Sage.

Those who use field interviews as a research method often have limited access to their survey participants, so must make the most of the time spent together. This text includes suggestions on language to use during interviewing and hints at conducting better field interviews.

Houtkoop-Steenstra, H. (2000). *Interaction and the standardized survey interview: The living questionnaire*. New York: Cambridge University Press.

Through the use of in-depth qualitative conversation analysis (CA), the author provides a strong voice that illustrates the weaknesses in the assumptions and practices of standardized interviewers. Survey interviewing is an important source of social science data, and the state of survey interviewing is reliant on standardization. The author advocates administering survey questions via flexible interviewing.

King, N. and C. Horrocks. (2010). *Interviews in qualitative research*. Thousand Oaks, CA: Sage.

The authors present a clear and thorough guide to the use of interviews in contemporary qualitative research. The book also features a chapter which introduces the principles and practice of the thematic analysis of interview data, and the book concludes with a detailed consideration of the use of interviews in two major qualitative research traditions: phenomenological and narrative approaches.

Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.

This publication covers theoretical aspects of interviewing, ethical issues involved, and improving interview reports. The role of the interview in the research process is examined, and philosophical issues related to interviewing, including conversation, hermeneutics, phenomenology, and ethics, are covered. The author provides seven stages of the interview process.

Kvale, S. and S. Brinkman. (2008). *InterViews: Learning the craft of qualitative research interviewing* (2nd edition). Thousand Oaks, CA: Sage.

This text provides the "whys" and "hows" of research interviewing, preparing students for learning interviewing by doing interviews and by studying examples of best practice. The second edition retains the original seven-stage structure, continuing to focus on the practical, epistemological, and ethical issues involved with interviewing. The authors include coverage of newer developments in qualitative interviewing, discussion of interviewing as a craft, and a new chapter on linguistic modes of interview analysis.

Magnusson, E. and J. Marecek. (2015). *Doing interview-based qualitative research: A learner's guide*. Cambridge: Cambridge University Press.

This book is an accessible step-by-step guide to conducting interview-based qualitative research projects. The book describes how to formulate research questions suited to qualitative inquiry and then discusses in detail how to select and invite research participants into a study and how to design and carry out good interviews. It presents several ways to analyze interviews and provides readers with many worked examples of analyses. It also discusses how to synthesize findings and how to present them.

Salmons, J. (Ed.). (2012). *Cases in online interview research*. Thousand Oaks, CA: Sage.

This book provides ten cases of research conducted using online interviews, with data collected through text-based, videoconferencing, multi-channel meeting, and immersive 3-D environments. Each case is followed by two commentaries: the first from another expert contributor, the second from Janet Salmons as editor.

Salmons, J. (2015). *Qualitative online interviews* (2nd edition). Thousand Oaks, CA: Sage.

This text provides researchers with the guidance they need to extend the reach of their studies beyond physical boundaries. Focusing on designing, conducting, and assessing data drawn from online interviews as well as from observations, materials, and artifacts collected online, the book emphasizes the use of in-depth interviews in qualitative research or mixed-methods designs. It offers the practical information and scholarly foundations needed to make thoughtful decisions in technology-infused research.

Seidman, I. (2013). *Interviewing as qualitative research* (4th edition). New York: Teachers College Press.

This book provides step-by-step guidance for new and experienced interviewers to develop, shape, and reflect upon interviewing as a qualitative research process. Using concrete examples of interviewing techniques to illustrate the issues under discussion, this text helps readers understand the complexities of interviewing and its connections to broader issues of qualitative research. The text includes principles and methods that can be adapted to a range of interviewing approaches.

Travers, A. (2013). *A pocket guide to interviewing for research*. Wales: Five Simple Steps Publishing.

This pocket guide is for researchers who regularly interview as part of their work. It is for anyone looking to become more involved in talking directly to users and stakeholders, and drawing upon that insight as part of the design process. The author attempts to demystify the process of interviewing and help the researcher use that research to drive design decisions.

Case Study Research

Bassey, M. (1999). *Case study research in educational settings*. Philadelphia, PA: Open University Press.

The case study has long been a research tool. This book offers new insights into the case study as a tool of educational research and suggests how it can be a prime research strategy for developing educational theory that illuminates policy and enhances practice. Structured, narrative, and descriptive approaches to writing case study reports are also discussed and the value of conducting an audit is considered.

Blatter, J. and M. Haverland. (2012). *Designing case studies: Explanatory approaches in small-n research*. New York: Palgrave Macmillan.

In this text the authors explore three ways of conducting causal analysis in case studies. They draw upon established practices as well as upon recent innovations in case study methodology and integrate these insights into coherent approaches. They highlight the core features of each approach and provide advice on each step of the research process.

Gerring, J. (2007). *Case study research: Principles and practices*. Cambridge: Cambridge University Press.

This text aims to provide a general understanding of the case study method as well as specific tools for its successful implementation. These tools can be utilized in all fields where the case study method is prominent. The book provides a definition of a case study together with the strengths and weaknesses of this distinctive method, strategies for choosing cases, an experimental template for understanding research design, and the role of singular observations in case study research. This book breaks down traditional boundaries between qualitative and quantitative, experimental and non-experimental, positivist and interpretivist.

Gomm, R., M. Hammersley, and P. Foster. (Eds.). (2000). *Case study method: Key issues, key texts*. Thousand Oaks, CA: Sage.

The authors of the collected papers in this text include Robert Stake, Yvonna Lincoln, Egon Guba, Ralph Turner, and Howard Becker. The papers are grouped into two categories: intrinsic case study and generalizability, and case study and theory, in both instances offering a variety of views, summarized at the end of each section by the editors. There is an annotated bibliography that is valuable to researchers.

Hancock, D.R. and B. Algozzine. (2011). *Doing case study research: A practical guide for beginning researchers* (2nd edition). New York: Teachers College Press.

This handbook has been updated to provide researchers with a complete guide to plan and implement case studies. Starting with how to establish a rationale for conducting a systematic case study and identify literature that informs the research effort, this resource shows how to determine an appropriate research design and to conduct informative interviews, observations, and document analyses. It also describes methods for deriving meaning from and verifying the data along with communicating the results.

Merriam, S.B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass/John Wiley & Sons.

This book offers a resource guide for qualitative researchers in education, discussing data-collection techniques, data analysis, reporting, and the issues of validity, reliability, and ethics. The nature and design of qualitative research and how to design a qualitative study, including problem formation and sample selection, are covered. Differentiating case study techniques from other qualitative approaches, the book discusses concepts, theories, and techniques taken from anthropology, history, sociology, and psychology.

Rohlfing, I. (2012). *Case studies and causal inference: An integrative framework*. New York: Palgrave Macmillan.

This text provides a discussion of the case study method which develops an integrative framework for causal inference in small-n research. This framework is applied to research design tasks such as case selection and process tracing. The book presents the state-of-the-art basics and provides arguments for improving the case study method and empirical small-n research.

Stake, R.E. (1995). *The art of case study research: Perspectives on practice*. Thousand Oaks, CA: Sage.

This book presents a disciplined, qualitative exploration of case study methods by drawing from naturalistic, holistic, ethnographic, phenomenological, and biographic research methods. The author uses and annotates an actual case study to answer such basic research questions regarding case selection, application from case to case, and data interpretation. In addition, the book covers: the differences between quantitative and qualitative approaches; data gathering, including document review; coding, sorting and pattern analysis; the roles of the researcher; triangulation; and reporting. The title is well chosen. This is a clearly written account that deals with the style and culture of case study research as well as the pragmatic details. It is a practical and readable overview from an experienced researcher.

Swanborn, P. (2010). *Case study research: What, why and how?* Thousand Oaks, CA: Sage.

This text is an exploration of the many faces of case-based research methods. As well as the what, how, and why, the author also examines the when and which – always with an eye on practical applications to the design, collection, analysis, and presentation of the research. In bringing diverse notions of case study research together in one volume, this book equips researchers at all levels with the knowledge to make an informed choice of research strategy.

Yin, R.K. (2012). *Applications of case study research* (3rd edition). Thousand Oaks, CA: Sage.

Designed to help both graduate students and start-up researchers with their own case study research, this book presents 21 individual applications of the case study method together with cross-referenced discussions of key methodological issues. This application book presents and discusses new case studies from a wide array of topics offering a variety of examples or applications of case study research methods. These applications demonstrate specific techniques or principles that are integral to the case study method.

Yin, R.K. (2013). *Case study research design and methods* (5th edition). Thousand Oaks, CA: Sage.

This book covers all aspects of the case study method, from problem definition, design, and data collection, to data analysis and composition and reporting. The text offers comprehensive coverage of the design and use of the case study method as a valid research tool. It offers a clear definition of the case study method as well as discussion of design and analysis techniques. The latest edition includes exemplary case studies drawn from a wide variety of academic fields.

Reading and Writing Research Reports

Bailey, S. (2018). *Academic writing: A handbook for international students* (5th edition). London and New York: Routledge.

The five parts to this book are designed to help international students succeed in writing essays and reports for their English-language academic courses. The parts comprise the writing process, elements of writing, language issues, vocabulary for writing, and writing models. Written to deal with the specific language issues

faced by international students, this practical, user-friendly book is an invaluable guide to academic writing in English.

Berry, R. (2004). *The research project: How to write it* (5th edition). London and New York: Routledge.

Now in its fifth edition, this guide to project work continues to be an indispensable resource for all students undertaking research. Guiding the reader right through from preliminary stages to completion, the book sets out in clear and concise terms the main tasks involved in doing a research project, covering choosing a topic, using the library effectively, taking notes, shaping and composing the project, providing footnotes, documentation and a bibliography, and avoiding common pitfalls. This text includes a model example of a well-researched, clearly written paper with notes and bibliography, and a chapter on getting published in a learned journal for more advanced researchers.

Booth, W.C., G.G. Colomb, and J.M. Williams. (2009). *The craft of research* (3rd edition). Chicago, IL: The University of Chicago Press.

This book is a good resource for researchers at every level. The third edition includes an expanded discussion of the essential early stages of a research task: planning and drafting a paper. The authors have updated their section on electronic research, emphasizing the need to distinguish between trustworthy sources and less reliable sources found with a quick Web search. A chapter on warrants has also been thoroughly reviewed to make this difficult subject easier for researchers.

Bracey, G.W. (2006). *Reading educational research: How to avoid getting statistically snookered*. Portsmouth, NH: Heinemann.

The advent of the No Child Left Behind legislation led to the need for educators to be able to read and use educational research. This text covers understanding data use, the construction of scientifically based research, how variables are used, determining whether a study is meaningful for use, and assessing the data derived from standardized tests.

Dane, F.C. (2017). *Evaluating research: Methodology for people who need to read research* (2nd edition). Thousand Oaks, CA: Sage.

The key components of research across the disciplines are presented along with the skills needed to read and interpret the research. The range of topics from experimental to archival and field research allows the reader to have a comfort level in understanding the information in research articles.

Day, R.A. and B. Gastel. (2011). *How to write and publish a scientific paper* (7th edition). Cambridge: Cambridge University Press.

A clearly written guide, this publication presents a brief history of scientific writing and then succinctly takes the reader through a series of how-to chapters from preparing a title to keyboarding the manuscript. Includes details on writing book reviews, theses, conference reports, review papers, as well as how to prepare poster sessions. Appendices of unique value cover abbreviations that may be used without definition in table headings, common errors in style and spelling, and words and expression to avoid.

Farmer, E.L. and J.W. Rojewski. (2001). *Research pathways: Writing research papers, theses, and dissertations in workforce development*. Lanham, MD: University Press of America.

This handbook provides a practical approach to writing research papers. Both quantitative and qualitative research methods are covered and examples are provided for both practitioners and researchers.

Galvan, J.L. and M.C. Galvan. (2017). *Writing literature reviews: A guide for students of the social and behavioral sciences* (7th edition). New York: Routledge.

A practical guide to writing literature reviews in behavioral and social sciences, this book focuses on reviewing academic journal resources to find relevant research literature. It includes three reports that address research for psychology, the humanities, and the social sciences.

A systematic, multi-step process to write critical reviews of original research is provided. Analyzing both quantitative and qualitative research is covered, along with guidelines for style, mechanics, and language usage.

Harris, R.A. (2017). *Using sources effectively: Strengthening your writing and avoiding plagiarism* (4th edition). New York and London: Routledge/Taylor & Francis.

This text targets the two most prominent problems in current research paper writing: the increase in unintentional plagiarism and the ineffective use of research source material. Designed as a supplementary textbook, it will help every student who uses research in writing. APA and MLA citation styles have been updated throughout the text and there is material on research strategies and source selection. With dedicated sections on plagiarism, figurative language, and creative thinking, this compilation of materials is a handy resource for any student.

Harris, R.A. (2018). *Writing with clarity and style* (2nd edition). New York and London: Routledge.

This book shows how to use dozens of classical rhetorical devices to bring power, clarity, and effectiveness to your writing. Readers will also learn about writing styles, authorial personas, and sentence syntax as tools to make writing interesting and persuasive.

Authors of research papers will be supported in the development of an adaptable style for all audiences.

Hatcher, L. (2013). *Advanced statistics in research: Reading, understanding and writing up data analysis*. Saginaw, MI: Shadow Finch Media.

This text assumes that you have never taken a course in statistics and it demystifies the sophisticated statistics that stop most readers cold. It does not show how to perform statistical procedures. It rather shows how to read, understand, and interpret them, as they are typically presented in journal articles and research reports. It begins at the beginning, with research design, central tendency, variability, *z* scores, and the normal curve, and includes explanations of statistical significance, confidence intervals, and effect size.

Locke, L.F., S.J. Silverman, and W. Spirduso. (2009). *Reading and understanding research* (3rd edition). Thousand Oaks, CA: Sage.

Ideal for students, novice researchers, or professionals, this indispensable resource serves as a roadmap for readers who need to analyze and apply research findings. It helps them think critically about the credibility of what they are reading by showing them how to identify problems and develop constructive questions.

Lomand, T.C. (2017). *Social science research: A cross section of journal articles for discussion and evaluation* (7th edition). New York and London: Routledge/Taylor & Francis.

This new edition illustrates all the major methods of research used in the social sciences with research articles on contemporary topics that will hold students' interest. The lines in each article are sequentially numbered for easy reference during classroom discussions. *Twelve* new articles have been added to illustrate a wider array of research methods and to keep this popular reader up-to-date.

Lyne, L.S. (2017). *A cross section of educational research: Journal articles for discussion and evaluation* (5th edition). New York and London: Routledge/Taylor & Francis.

This collection of research articles, taken from different journals, emphasizes topics of interest to classroom teachers. The articles represent a wide variety of research, including survey research, experimental research, program evaluation, and qualitative research. This text is ideal for courses in which the primary goal is to learn how to evaluate research.

McMillan, J.C. (2008). *Educational research: Fundamentals for the consumer* (5th edition). New York: Allyn & Bacon.

Criteria for evaluating educational research to determine its overall credibility are provided, along with principles for conducting research in education. Students should learn to read, understand,

and evaluate research findings in order to inform education practice. Chapter roadmaps, concept maps, study questions, and consumer tips are included. The usual topics of experimental, quasi-experimental, qualitative, mixed methods, and action research are covered.

Modern Language Association. (2016). *MLA handbook* (8th edition). New York: Modern Language Association.

The Modern Language Association (MLA) provides a fresh look at documenting sources in the eighth edition of this handbook. In this new edition of its best-selling handbook, the MLA recommends one universal set of guidelines, which writers can apply to any type of source. Shorter and redesigned for easy use, the eighth edition guides writers through the principles behind evaluating sources for their research. It then shows them how to cite sources in their writing and create useful entries for the works-cited list.

Pan, M.L. (2017). *Preparing literature reviews: Qualitative and quantitative approaches* (5th edition). New York and London: Routledge/Taylor & Francis.

Literature reviews using both qualitative and quantitative approaches are coveredusing model literature reviews. All major steps are illustrated with numerous examples of the art and science of writing effective literature reviews. Examples drawn from a wide variety of professional journals have been added in order to keep this title up-to-date. In addition, Chapters 3 and 4 have been significantly updated to include more timely information relevant to literature searches.

Patten, M.L. (2017). *Proposing empirical research: A guide to the fundamentals* (5th edition). New York and London: Routledge.

Provides detailed, step-by-step guidance on how to write proposals for both quantitative and qualitative research. Numerous examples throughout the book and nine model proposals make it easy to understand. Three model research proposals are provided for discussion, including a proposal for single-subject research.

Pyrczak, F. (2014). *Writing empirical research reports: A basic guide for students of the social and behavioral sciences* (8th edition). New York and London: Routledge.

This book shows students how to follow the traditions in scientific writing. More than a style manual, this text takes students through the complete sequence for writing an effective research report. It includes numerous examples from published research reports, including three reports that address research for psychology, the humanities, and the social sciences.

Pyrczak, F. (2017). *Evaluating research in academic journals: A practical guide to realistic evaluation* (6th edition). New York and London: Routledge.

This supplementary guide is for students who are learning how to evaluate published reports of empirical research. Numerous excerpts from journals in the social and behavioral sciences provide examples that allow students to learn the practical aspects of evaluating research. By de-emphasizing jargon, this book allows students to begin evaluating research with confidence. This edition contains more than 60 examples from recently published research.

Rubens, P. (2001). *Science and technical writing: A manual of style* (2nd edition). New York: Routledge.

This style manual covers many aspects of scientific writing. It is particularly strong on creating usable data displays and illustrations and designing useful documents. The author has fully revised and updated his popular 1992 edition, with full, authoritative coverage of the techniques and technologies that have revolutionized electronic communications over the past eight years.

VandenBos, G.R. (Ed.). (2010). *Publication manual of the American Psychological Association* (6th edition). Washington, DC: APA.

Rules for writing research reports are provided. They are drawn from many reviews of existing literature and provide an extensive guide for writing research reports. The sixth edition adds formats of electronic and legal references along with content on methods and case study reports.

Veit, R., C. Gould, and K. Gould. (2013). *Writing, reading, and research* (9th edition). Stamford, CT: Cengage Learning.

This book covers the essential skills for developing a research paper: analytical reading, synthesizing, paraphrasing, and summarizing. Presenting the process of research in a practical sequence, including separate chapters on finding, analyzing, and integrating sources, the authors illustrate each stage of the process with examples of student and professional writing. Using a flexible and goal-oriented approach, the authors have created a text that blends the best features of a theoretically informed rhetoric, an interdisciplinary reading anthology, and a research guide.

Verdugo, E.D. (2017). *Practical problems in research methods: A casebook with questions for discussion* (5th edition). New York and London: Routledge/Taylor & Francis.

Each of the 53 cases in this book is drawn from published research literature. Each presents a practical problem faced by a researcher and the solution he or she selected. The questions for the cases encourage students to evaluate the researcher's solution and to consider alternatives. In this way, students are shown that research is a dynamic process with competing solutions.

Winkler, A.C. and J.R. Metherell. (2012). *Writing the research paper: A handbook* (8th edition). Boston, MA: Wadsworth, Cengage Learning.

This handbook provides simple, specific guidance on writing a research paper. With its easy-to-digest steps that demystify the writing process, it provides the tools needed to work independently to create well-constructed research papers. It includes comprehensive, up-to-date information conveyed in a calm and reassuring manner.

Educational Research

Ary, D., L.C. Jacobs, C. Sorensen, and A. Razavich. (2009). *Introduction to research in education* (8th edition). Belmont, CA: Wadsworth, Cengage Learning.

The stated purpose of this text is to help readers understand and evaluate the research of others, and to carry out basic research with minimal support or assistance. The various types of research prevalent in education are covered and the advantages and disadvantages of each are discussed. Guidelines for writing research proposals and ethical considerations are covered.

Best, J.W. and J.V. Kahn. (2006). *Research in education* (10th edition). Boston, MA: Pearson Education.

Designed as a research reference or as a text in an introductory research methods course, this book covers all of the basic aspects of research methods and statistics. A variety of methods are covered and a complete range of research tools, including the use of inferential statistics, is included. Only one chapter is devoted to qualitative research.

Bogdan, R.C. and S.K. Biklin. (2006). *Qualitative research for education: An introduction to theories and methods* (5th edition). Boston, MA: Allyn & Bacon.

The intent of this textbook is to provide a background for understanding the use of qualitative research in education. The authors emphasize the use of descriptive data, grounded theory, participant observation, and the study of individual comprehension of the entire field of education. The organization of the book parallels the process of doing qualitative research, and this enables the reader to use the text as a step-by-step guide in carrying out a research plan.

Boudah, D.J. (2010). *Conducting educational research: Guide to completing a major project*. Thousand Oaks, CA: Sage.

This text is a step-by-step guide to conducting a research project in education. Designed to be used during the research process, it walks readers through each step of a research project or thesis, including developing a research question, performing a literature search, developing a research plan, collecting and analyzing data, drawing conclusions, and sharing the conclusions with others. The text covers all types of research and helps readers link research questions to designs, designs to data sources, and data sources to appropriate analyses.

Briggs, A.R.J., M. Coleman, and M. Morrison. (2012). *Research methods in educational leadership and management* (3rd edition). Thousand Oaks, CA: Sage.

This classic guide is one of few research methods collections that deal specifically with educational leadership and management. The collection includes work from expert contributors, covering a wide range of specialties, and emphasizing the importance of the critically engaged practitioner. Accessible and user-friendly, the third edition has been fully revised and updated to take full account of online research.

Check, J. and R.K. Schuff. (2011). *Research methods in education*. Thousand Oaks, CA: Sage.

Research method, as an integrated set of techniques for investigating questions about the educational world, is the organizing vehicle for this text. Technique and substance are connected and readers are led to appreciate the value of both qualitative and quantitative methodologies, as well as make ethical research decisions. It weaves actual research "stories" into the presentation of research topics, and it emphasizes validity, authenticity, and practical significance as overarching research goals.

Clandinin, D.J. and F.M. Connelly. (2004). *Narrative inquiry: Experience and story in qualitative research*. San Francisco, CA: Jossey-Bass.

The use of narrative inquiry, that is, the understanding of experience as lived and as told through stories, is related to educational settings and social science research. Unlike more traditional methods, narrative inquiry successfully captures personal and human dimensions that cannot be quantified into dry facts and numerical data. New and practical ideas for conducting fieldwork, composing field notes, and conveying research results are provided.

Cohen, L., L. Manion, and K. Morrison. (2018). *Research methods in education* (8th edition). New York: Routledge/Taylor & Francis.

The whole range of methods employed by educational research at all stages is covered in this text. Its five main parts include: the context of educational research; research design; methodologies for educational research; methods of data collection; and data analysis and reporting. It offers plentiful and rich practical advice, underpinned by clear theoretical foundations, research evidence, and up-to-date references, and it raises key issues and questions for researchers planning, conducting, reporting, and evaluating research.

Coladarci, T., C.D. Cobb, E.W. Minium, and R.C. Clarke. (2014). *Fundamentals of statistical reasoning in education* (4th edition). Hoboken, NJ: John Wiley & Sons.

This is a statistics book specifically geared toward the education community. It gives educators the statistical knowledge and skills necessary for everyday classroom teaching, for running schools, and for professional development pursuits. It emphasizes conceptual development with an engaging style and clear exposition, and provides an emphasis on statistics common to local and large-scale assessment using a case study approach, which models the process of data analysis, conceptualizes the learning of challenging statistical concepts, and addresses high-stakes testing.

Conrad, C.F. and R.C. Serlin (Eds.). (2006). *The SAGE handbook for research in education: Engaging ideas and enriching inquiry.* Thousand Oaks, CA: Sage.

Selected scholars from K-12 and higher education were invited to advance a research agenda that would result in self-reflective practitioners. Narratives, vignettes, and examples are used to provide emerging approaches to research in education.

Creswell, J.W. (2014). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th edition). Boston, MA: Pearson Education.

This book offers a balanced, inclusive, integrated treatment of educational research It addresses both quantitative and qualitative approaches, with the goal of starting students on the path to doing their own research as well as evaluating the research of others. Following an overview of the nature of educational research, specific steps in the research process, from identifying a problem through reporting one's findings, are explored. Coverage closes with eight research design chapters, including experimental, correlational, survey, grounded theory, ethnography, narrative, mixed methods, and action research.

Eisner, E. (1997). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice* (2nd edition). Boston, MA: Pearson Publishing.

Qualitative research is viewed from the perspective of the arts and humanities in this book. With the premise that knowledge is made, not merely discovered, the author argues that research should be a reflection of the human mind as well as a reflection of nature. Generalizability, validity, interpretive writing, and the role of theory in educational research form the central notions of this book.

Firestone, W.A. and C. Riehl. (Eds.). (2005). *A new agenda for research in educational leadership*. New York: Teachers College Press.

The University Council for Educational Administration partnered with the American Educational Research Association to co-sponsor the writing and publication of this book. Prominent scholars in the field review current knowledge about leadership, frame new questions to generate important research in the field, and direct researchers and policy-makers to rethink how educational administration, leadership, and policy should be understood. Covering a broad range of topics, from accountability systems and school–community relationships to the education of students from diverse backgrounds, the authors submit current research to critical scrutiny in order to develop frameworks for new research that can have a significant impact upon policy and practice.

Freebody, P. (2003). *Qualitative research in education: Interaction and practice*. Thousand Oaks, CA: Sage.

A broad range of real-life examples are used to describe the different qualitative methods available to analyze educational data. The author focuses on research which documents observations that are conceptually informative, professionally useful, and ideologically productive. The complexities of educational research, including how the qualitative method works and how the outcomes may be interpreted, are covered.

Gall, M.D, J.P. Gall, and W.R. Borg. (2014). *Applying educational research: How to read, do, and use research to solve problems of practice* (7th edition). Boston, MA: Pearson Publishing.

The intent of this book is to make educational research as accessible as possible to the educational practitioner. Examples of research studies that focus on school improvement are included, and the use of research in data-based decision-making is covered. Chapters on analyzing and synthesizing research in education are intended to support the collection of diverse research on a particular topic or problem. Education research methods, including experimental, correlational, causal-comparative, descriptive and quantitative studies, are described and explained.

Gay, L.R., G.E. Mills, and P.W. Airasian. (2012). *Educational research: Competencies for analysis and applications* (10th edition). Boston, MA: Pearson Publishing.

This book is a practical text focused on the skills and procedures students need in order to become competent consumers and producers of educational research. The text uses a direct, step-by-step approach to the research process and incorporates tasks and articles throughout to provide students with the practice they need to master research steps and evaluation. This comprehensive instructional resource encompasses the full spectrum of the field, making it appropriate as a core text for an introductory course in educational research.

Glanz, J. (2006). *Fundamentals of educational research: A guide to completing a Master's thesis*. Norwood, MA: Christopher-Gordon Publishers.

Written to support the understanding of basic research principles in order to complete a research task, or to be a consumer of research writings, this text separates the various components of educational research into fundamental topics for review. The style is comfortable and in a workbook format for easy reading and use in the application of research in education.

Green, J.L., G. Camilli, and P.B. Elmore. (2012). *Handbook of complementary methods in education research* (3rd edition). New York: Routledge/Taylor & Francis.

This new volume, published for the American Educational Research Association, brings together the wide range of research methods used to study education and makes the logic of inquiry for each method clear and accessible. Each method is described in detail, including its history, its research design, the questions it addresses, ways of using the method, and ways of analyzing and reporting outcomes.

Johnson, B. and L.B. Christensen. (2013). *Educational research: Quantitative, qualitative, and mixed methods* (5th edition). Thousand Oaks, CA: Sage.

The new edition of this book is an informal and highly readable text that provides a clear and in-depth understanding of the different kinds of research – including technology-based – that are used in education today. It introduces the fundamental logic of empirical research and explores the sources of research ideas. There is a balanced examination of quantitative, qualitative, and mixed research, serving as one of the book's strongest features. While quantitative research strategies are covered extensively, the text also discusses various qualitative approaches such as ethnography, historical methods, phenomenology, grounded theory, and case studies. Sampling techniques, ethical considerations, data-collection methods, measurement, judging validity, experimental and non-experimental methods, descriptive and inferential statistics, qualitative data analysis, and report preparation are covered.

Lichtman, M. (2010). *Qualitative research in education: A user's guide* (2nd edition). Thousand Oaks, CA: Sage.

Key features of this text are that it introduces traditions and major influences in the field of qualitative research in education, focuses on specific aspects of qualitative methodology, and addresses issues related to meaning and communication leading to judgment from the research. Group and individual activities are provided to help education students plan and do qualitative research.

Lodico, M.G., D.T. Spaulding, and K.H. Voegtle. (2010). *Methods in educational research: From theory to practice* (2nd edition). Hoboken, NJ: John Wiley & Sons.

This text focuses on scientifically based methods, school accountability, and the professional demands of the twenty-first century, empowering researchers to adopt an active role in conducting research in their classrooms, districts, and the greater educational community. This edition helps students, educators, and researchers develop a broad and deep understanding of research methodologies. It includes quantitative and qualitative methodologies, logic modeling, action research, and other areas. Vignettes illustrating research tied to practice are also included.

McMillan, J.H. (2012). *Educational research: Fundamentals for the consumer* (6th edition). Boston, MA: Pearson Education.

This book is designed to enable students to become intelligent consumers of educational research and to introduce its basic principles to those who may eventually be involved in research in their work. Literature searches, problem statements and hypotheses, sampling, measurement, research categories, and statistical inferences are covered from the research consumer perspective.

McMillan, J.H. and S. Schumacher. (2009). *Research in education: Evidence-based inquiry* (7th edition). New York: Pearson-Longman.

This text provides a balanced combination of quantitative and qualitative methods, and enables students to master skills in reading, understanding, critiquing, and conducting research. Many examples and article excerpts are used throughout the text to demonstrate and highlight best practices in educational research. Evidence-based inquiry is emphasized in two ways: (1) introductory chapters focus on the added importance of data-driven decision-making; (2) methodological chapters provide explicit guidelines for conducting empirical studies.

Mertler, C.A. (2015). *Introduction to educational research*. Thousand Oaks, CA: Sage.

This text guides readers through the various steps of the research methods process to help plan and compose their first educational research project. Through comprehensive chapter content and in-text exercises, readers learn how to prepare a research plan, gather and analyze data, address research questions and hypotheses, and organize reports of their projects. The book is practical and student-friendly. The author uses a conversational writing style with non-technical language to help students clearly understand and apply research concepts with no prior familiarity with the principles, procedures, or terminology.

Mills, G.E. and L.R. Gay. (2016). *Educational research: Competencies for analysis and applications* (11th edition). New York: Pearson.

This revised text introduces research in education at the "how-to" level. The book includes stated learning outcomes, instruction, and procedures for evaluating outcomes. Readers develop expertise in research by becoming involved in the research process. The authors use a grounded approach to help a reader become both an educational researcher and a competent consumer of educational research.

Newby, P. (2014). *Research methods for education* (2nd edition). New York: Routledge/Taylor & Francis.

This text tackles the complex subject of research methods in an engaging and clear way. The book covers philosophical approaches and epistemology, as well as the practical aspects of research, such as designing questionnaires and presenting conclusions. It contains guidance on analytic procedures that require more advanced tools such as SPSS and Minitab, and it is written in a clear manner to help students feel more confident when dealing with the complexities of research.

Punch, K.F. and A. Oancea. (2014). *Introduction to research methods in education* (2nd edition). Thousand Oaks, CA: Sage.

This book introduces the research process in a range of educational contexts. In this updated second edition, there is guidance on every stage of research, with chapters on developing research questions, doing a literature review, collecting data, analyzing findings, and writing it all up.

Robinson, V. and M.K. Lai. (2005). *Practitioner research for educators*. Thousand Oaks, CA: Corwin Press.

Practitioner research is a method whereby educators learn, through their own inquiry, how to adjust their practices in ways that will improve teaching and learning. The book includes step-by-step instructions, ready-to-use tools, and examples of successful practitioner research projects. Focusing on the pragmatic aspects of embedding research into everyday practice, the authors demonstrate how to develop a manageable research question, select research methods appropriate to the question, plan and conduct a research project that is both practical and rigorous, use evidence to check the accuracy of claims, and communicate the results of the research to a range of professional audiences.

Shavelson, R.J. and L. Towne (Eds.). (2002). *Scientific research in education*. Washington, DC: National Academy Press.

The National Research Council produces reports that synthesize scientific knowledge over a wide range of areas. This report offers a comprehensive perspective of scientifically based research in education. It also shows the diversity of philosophical bases and methodological structures within education research. Suggestions for how the federal government can best support high-quality education research are provided.

Slavin, R.E. (2007). *Educational research in an age of accountability.* Boston, MA: Pearson/Allyn & Bacon.

Written in a very clear and user-friendly style, this text focuses on understanding the intent of the researcher, the procedures, and the results so that students can use appropriate research findings to inform school change. This text emphasizes how responses to the accountability movement in schools can be focused around using and understanding scientific inquiry. It balances quantitative and qualitative research methodology, and discusses action research and mixed methods in detail.

Wiersma, W. and S.G. Jurs. (2009). *Research methods in education: An introduction* (9th edition). Upper Saddle River, NJ: Pearson/Allyn & Bacon.

The text is broad in scope, covering quantitative, qualitative, and mixed-methods research methodologies as well as describing how to write research proposals and reports of completed research. The book explains the research process with emphasis on the formulation of a research question, referencing current literature in the field, using appropriate research designs, and writing and evaluating research reports. Both quantitative and qualitative research designs are described. Measurement, sampling, and statistics are presented as essential research tools.

Research Ethics

Coleman, C.H. (2005). *The ethics and regulation of research with human subjects* (2nd edition). Los Angeles, CA: LexisNexis.

This book provides a set of teaching materials that may be used in an academic course on human subject research in a broad range of professional school settings. The book is divided into three parts. Part I provides a general overview of the history of research with human subjects and the existing regulatory framework. Part II examines the key ethical and regulatory issues that arise in every research protocol, including informed consent, recruiting and paying subjects, confidentiality, and compensation for research injuries. Part III looks at special situations, including pediatric research, research with adults who lack decision-making capacity, and prison research.

Council of Science Editors. (2012). *CSE's white paper on promoting integrity in scientific journal publications*. Wheat Ridge, CO: Council of Science Editors.

An informative and useful book that discusses issues pertinent to the ethics of publication in science. Includes topics such as fraud, redundant publication, the peer review process, and lying with statistics. Retrieved from www.councilscienceeditors.org/wp-content/uploads/entire_whitepaper.pdf.

Eckstein, S. (Ed.) (2003). *Manual for research ethics committees: Centre of medical law and ethics, Kings College London* (6th edition). London: Cambridge University Press.

This text is a unique compilation of legal and ethical guidance, and for the first time the manual has been produced in one easy-to-search hardback volume. In this sixth edition there are 15 new chapters covering key issues from participation in clinical trials to cloning. It is intended for members of research ethics committees, researchers involved in research with humans, members of the pharmaceutical industry, and students of law, medicine, ethics, and philosophy. Presented in a clear and authoritative form, it incorporates the key legal and ethical guidelines. There are specially written chapters on major topics in bioethics by leading academic authors and practitioners, pharmaceutical industry associations, and professional bodies.

Emanuel, E.J., C.C. Grady, R.A. Crouch, R.K. Lie, F.G. Miller, and D.D. Wendler (Eds.). (2011). *The Oxford textbook of clinical research ethics*. Oxford: Oxford University Press.

This textbook provides a framework for analyzing the ethical aspects of research studies with human beings. Through both conceptual analysis and systematic reviews of empirical data, the contributors examine issues ranging from scientific validity, fair subject selection, risk–benefit ratio, independent review, and informed consent to focused consideration of international research ethics, conflicts of interests, and other aspects of responsible conduct of research.

Hammersley, M. and A. Traianou. (2012). *Ethics in qualitative research: Controversies and contexts*. Thousand Oaks, CA: Sage.

This book explores conflicting philosophical assumptions, the diverse social contexts in which ethical problems arise, and the complexities of handling them in practice. The authors argue that the starting point for any discussion of research ethics must be the values intrinsic to research, above all the commitment to knowledge production. However, the pursuit of inquiry is rightly constrained by external values, and the book focuses on three of these: minimizing harm, respecting autonomy, and protecting privacy.

National Academy of Sciences. (2009). *On being a scientist: A guide to responsible conduct in research* (3rd edition). Washington, DC: National Academy Press.

Since the first edition was published in 1988, more than 200,000 copies of this report have been distributed. Now this well-received booklet has been updated to incorporate the important developments in science ethics over the past six years and includes updated examples and material from the landmark volume *Responsible science* (National Academy Press, 1992). The revision offers several case studies in science ethics that pose provocative and realistic scenarios of ethical dilemmas and issues. It presents penetrating discussions of the social and historical context of science, the allocation of credit for discovery, the scientist's role in society, the issues revolving around publication, and many other aspects of scientific work. The booklet is written in a conversational style and explores the inevitable conflicts that arise when the black and white areas of science meet the gray areas of human values and biases.

Oliver, P. (2010). *The student's guide to research ethics* (2nd edition). London: McGraw-Hill.

This reader-friendly book examines the ethical issues and questions that occur in university and professional research, and will help both beginning and experienced researchers identify ethical issues when they are conducting research.

Sales, B. and S. Foldman. (2000). *Ethics in research with human participants*. Washington, DC: American Psychological Association.

The authors present the ethical principles that underlie the decision-making process in planning and implementing research with human participants. It differentiates between privacy and confidentiality, and the needs of special populations are also covered.

Sieber, J.E. and M.B. Tolich. (2012). *Planning ethically responsible research* (2nd edition). Thousand Oaks, CA: Sage.

This text guides readers through planning ethically responsible research. The authors offer invaluable, practical guidance to researchers and graduate students to understand ethical concerns within real-life research situations, satisfy federal regulations governing human research, and work with the university's Institutional Review Board (IRB). The book includes detailed instructions on development of an effective IRB protocol; methods for handling issues of consent, privacy, confidentiality, and deception; ways to assess risk and benefit to optimize research outcomes; and how to respect the needs of vulnerable research populations.

Action Research

Grady, M.P. (1998). *Qualitative and action research: A practitioner handbook*. Bloomington, IN: Phi Delta Kappa International.

This book shows how practical research may be used to alter curriculum content, instructional practices, and school policies. The author defines qualitative research, describes how to design a research project and collect data, how to analyze the data, and how to report results. He also defines action research as a specific type of qualitative research. Research in education is presented as a form of professional development for the consumer.

Greenwood, D.J. and M. Levin. (2006). *Introduction to action research: Social research for social change* (2nd edition). Thousand Oaks, CA: Sage.

A readable introductory overview of participative action research is provided. The three essential components of research, participation, and action are stressed within a cyclic process of action and reflection. Descriptions are also given of action science, human inquiry, and participative evaluation.

Herr, K. and G.L. Anderson. (2015). *The action research dissertation: A guide for students and faculty* (2nd edition). Thousand Oaks, CA: Sage.

This guide for students engaged in an action research project provides a roadmap through the complexity of the action research process as it relates to theses and dissertations. Action research dissertations are contrasted to the traditional dissertation, and the questions of validity, design, ethics, and defense are handled.

Ivankova, N.V. (2014). *Mixed methods applications in action research: From methods to community action*. Thousand Oaks, CA: Sage.

This book provides readers with the information they need to design and conduct a mixed-methods action research study in a practical and pragmatic manner. Using a multidisciplinary focus, the author provides a scholarly and applied orientation to meet the varied epistemological and professional needs of scholar practitioners. The book is applicable to broad audiences with different levels of research skills, including students learning how to conduct research in practical settings, practitioners faced with the need to address pertinent issues in their professional practices, community leaders seeking to inform policy changes, and college faculty who teach research methods.

James, E.A., M.T. Milenkiewitz, and A. Bucknam. (2008). *Participatory action research for educational leadership*. Thousand Oaks, CA: Sage.

Designed for professional learning communities in schools, this book provides an easy to read overview of the participatory action research process. Valid and reliable data-driven outcomes are stressed. Reflective practices guide the research routines presented.

Johnson, A.P. (2011). *A short guide to action research* (4th edition). Boston, MA: Pearson/Allyn & Bacon.

An introductory overview of action research offered in sufficient detail for a novice to follow. There are useful examples given. It deals only with educational action research and from a relatively traditional perspective.

Koshy, V. (2009). *Action research for improving practice: A practical guide* (2nd edition). Thousand Oaks, CA: Sage.

Whether you are a busy teacher doing further study or a time-pressed trainee teacher writing your dissertation, this concise guide takes you through the stages in carrying out action research. The

step-by-step advice shows you how to choose your topic, plan your action, gather, review, and analyze your data, and write your report or dissertation.

Mertler, C.A. (2014). *Action research: Improving schools and empowering educators* (4th edition). Thousand Oaks, CA: Sage.

Prospective and practicing teachers are introduced to the process of conducting classroom-based action research. Research techniques are integrated into teachers' everyday instructional practices to support the improvement of student learning. Each step in the process is discussed in detail using practical information for teachers to design their own action research projects.

Mills, G.E. (2014). *Action research: A guide for the teacher researcher* (5th edition). Upper Saddle River, NJ: Pearson Education.

This text provides practical, step-by-step guidance for teachers on how to do research in classrooms. It was born out of the author's own experience working with teachers and principals. The author guides future educators through the action research process via numerous concrete illustrations, positioning it as a fundamental component of teaching, alongside curriculum development, assessment, and classroom management

Reason, P. and H. Bradbury. (Eds.). (2013). *The SAGE handbook of action research: Participative inquiry and practice.* Thousand Oaks, CA: Sage.

This book represents an important leap forward for action research. The chapters are written by an array of many of the best-known writers in the action research field, though newcomers have not been neglected. Many varieties of action research are represented, as are many settings. There are four sections. "Groundings" presents the foundations. "Practices" covers some of the varieties. "Exemplars," the largest section in terms of number of papers, provides a rich collection of case studies. "Skills" identifies some of the competencies upon which action researchers draw.

Sagor, R. (2000). *Guiding school improvement with action research*. Alexandria, VA: Association for Supervision and Curriculum Development.

The version of action research given here is primarily teacher research, where a teacher uses research to understand and improve her or his own practice. It offers a variety of ways in which practitioners can research their practice, including collaborative action research. Quantitative and qualitative methods are discussed. As the author's summarized process shows, it is mostly research in the tradition of quasi-experimentation: the process is (1) selecting a focus; (2) clarifying theories; (3) identifying research questions; (4) collecting data; (5) analyzing data; (6) reporting results; and (7) taking informed action.

Sagor, R. (2011). *The action research guide book: A four-step process for educators and school teams* (2nd edition). Thousand Oaks, CA: Corwin Press.

Blending qualitative and quantitative research methods, action research is a practical tool for improvement where the school or classroom is the laboratory. Focused on school improvement, this book outlines the steps in action research, and provides tables, charts, forms, and worksheets to demystify and simplify the process. Each chapter provides concrete strategies for immediate use and allows the implementation of an action research project after reading just a few chapters. This book provides the guidance needed by individual teachers and teacher teams, preservice teachers in teacher education courses, principals, counselors, and other educators as they work toward their goal of school improvement.

Stringer, E. (2014). *Action research* (4th edition). Thousand Oaks, CA: Sage.

Emphasizing community applications of action research, this clearly written book explains how to conduct action research in very practical terms, yet it is consistent with the theoretical literature. A series of tools to use in the process are provided to assist researchers in working through the political and ethical issues that frame inquiry.

Whitehead, J. and J. McNiff. (2006). *Action research: Living theory.* Thousand Oaks, CA: Sage.

The philosophy behind doing action research and the process of carrying out a research project are defined in terms of a foundation discipline. Action research is set in an ethical yet politically engaged position for the twenty-first century. Evidence, validity, and legitimacy, and research implications are covered in the context of increasing educational knowledge.

Dissertation Research

Bloomberg, L.D. and M. Volpe. (2016). *Completing your qualitative dissertation: A road map from beginning to end* (3rd edition). Thousand Oaks, CA: Sage.

This text provides comprehensive guidance and practical tools for navigating each step in the qualitative dissertation journey, including the planning, research, and writing phases. Blending the conceptual, theoretical, and practical, the book becomes a dissertation in action, including both content and process.

Bryant, M.T. (2004). *The portable dissertation advisor.* Thousand Oaks, CA: Corwin Press.

This dissertation guide is for students who study from a distance. It includes pragmatic advice for those students who are non-traditional graduate students and who have a required dissertation to complete. The author draws upon years of experience as an advisor to provide a step-by-step approach to completing a research dissertation.

Cone, J.D. and S.L. Foster. (2006). *Dissertations and theses from start to finish: Psychology and related fields* (2nd edition). Washington, DC: American Psychological Association.

This handbook aids student writers through all the practical, logistical, and emotional stages of writing dissertations and theses. It offers guidance to students through such important steps as: defining topics; selecting faculty advisors; scheduling time to accommodate the project; and conducting, analyzing, writing, presenting, and publishing research.

Foss, S.K. (2016). *Destination dissertation: A traveler's guide to a done dissertation*. Lanham, MD: Rowman and Littlefield.

This is a guide to the successful completion of a dissertation by framing the process as a trip that may be completed in fewer than 9 months and by following 29 specific steps. The authors explain concrete and efficient processes for completing the parts of the dissertation that tend to cause the most delays: conceptualizing a topic, developing a pre-proposal, writing a literature review, writing a proposal, collecting and analyzing data, and writing the final chapter. This text is crafted for use by students in all disciplines and for both quantitative and qualitative dissertations.

Joyner, R.L., W.A. Rouse, and A.A. Glatthorn. (2013). *Writing the winning thesis or dissertation: A step-by-step guide* (4th edition). Thousand Oaks, CA: Corwin Press.

This text helps demystify the process of writing your Master's thesis or doctoral dissertation. This experience-based, practical book takes you through the process using a step-by-step approach. It provides specific models and examples for the complex writing process. Included are chapters on laying the groundwork for the thesis or dissertation, organizing and scheduling the work, peer collaboration, using technology, conducting quality research and writing a winning report, defending and publishing the research, and solving problems throughout the dissertation process.

Locke, L.F., W.W. Spirduso, and S.J. Silverman. (2014). *Proposals that work: A guide for planning dissertations and grant proposals* (6th edition). Thousand Oaks, CA: Sage.

Covering all aspects of the proposal process, from the most basic questions about form and style to the task of seeking funding, this text offers clear advice backed up with excellent examples. In the new edition, the authors have integrated a discussion of the effects of new technologies and the internet on the proposal process with URLs listed where appropriate. In addition, there is a new chapter on funding for student research and a completely rewritten chapter on qualitative research. As always, the authors have included a number of specimen proposals, two of which are completely new to this edition, to help shed light on the important issues surrounding the writing of proposals.

Mauch, J.E. and J.W. Birch. (2003). *Guide to the successful thesis and dissertation* (5th edition). New York: Marcel Dekker.

The authors provide a handbook for students and faculty reflecting the most recent trends in thesis and dissertation preparation and research, including references to university research libraries and advanced information on websites, online searches, electronic literature, and other modern computer methods crucial for the successful completion of research projects.

Piantanida, M. and N.B. Garman. (2009). *The qualitative dissertation: A guide for students and faculty* (2nd edition). Thousand Oaks, CA: Corwin Press.

Each step in the design of a qualitative research process is reviewed in the context of writing a dissertation. Helpful advice on handling issue areas and pressure points is provided for the entire dissertation process.

Pyrczak. F. (Ed.). (2000). *Completing your thesis or dissertation: Professors share their techniques and strategies*. New York and London: Routledge/Taylor & Francis.

Everyone who has written a thesis or dissertation realizes that it is a difficult task, and often times roadblocks occur that can turn the process into a tedious venture or prevent it altogether. This book provides tips, strategies, and personal anecdotes contributed by 70 professors who have been through this process. Students will appreciate the practical information contained in this book.

Roberts, C.M. (2010). *The dissertation journey: A practical and comprehensive guide to planning, writing, and defending your dissertation* (2nd edition). Thousand Oaks, CA: Corwin Press.

This text provides concise, straightforward information on the dissertation process from conceptualizing a topic to publishing the results. The author focuses on the practical aspects of writing and organizing a dissertation, as well as the psychological and emotional hurdles involved. Geared to the specific needs and concerns of doctoral students, the guidebook includes checklists and sample forms, organization and time management tips, current information on using technology, suggestions for support groups, and an in-depth list of resources for further inquiry.

Rudestam, K.E. and R.R. Newton. (2015). *Surviving your dissertation: A comprehensive guide to content and process* (4th edition). Thousand Oaks, CA: Sage.

This book covers every stage of the dissertation process, including selecting a suitable topic, conducting a literature review,

developing a research question, understanding the role of theory, selecting an appropriate methodology and research design, analyzing data, and interpreting and presenting results. In addition, it covers topics that other dissertation guides often miss, such as the many types of quantitative and qualitative research models available, the principles of good scholarly writing, how to work with committees, how to meet IRB and ethical standards, and how to overcome task and emotional blocks.

Thomas, R.M. (2003). *Blending qualitative and quantitative research methods in theses and dissertations*. Thousand Oaks, CA: Corwin Press.

This comprehensive guide offers an important resource that responds to the growing trend of combining qualitative and quantitative research methods in theses and dissertations. It thoroughly discusses a wide array of methods, the strengths and limitations of each, and how they may be effectively interwoven into various research designs. Aimed at empowering students with the information necessary to choose the best approach to fit their needs, the user-friendly text outlines numerous research options from varying viewpoints, and highlights the procedures involved in putting each method into practice.

Turabian, K.L. (2013). *A manual for writers of research papers, theses, and dissertations* (8th edition). Chicago, IL: The University of Chicago Press.

This manual begins with an overview of the steps in the research and writing process, including formulating questions, reading critically, building arguments, and revising drafts. Part II provides an overview of citation practices with detailed information on the two main scholarly citation styles: bibliography and author date. It includes an array of source types with contemporary examples, and detailed guidance on citing online resources. Also included is advice on punctuation, capitalization, spelling, abbreviations, table formatting, and the use of quotations.

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Glossary

Abstract – Summary of a longer text, especially that of an academic record of research.

Action research – Inquiry or research that deals with issues or problems that exist in a workplace and which need attention. It is usually designed and carried out by practitioners who identify the problem, collect and analyze data, and use the collected information to make data-driven decisions to improve their own practice or to improve working conditions.

ANOVA – Analysis of variance, a statistical measure of difference within and between the variance of selected variables in a quantitative dataset.

Antecedent variable – Also called the independent variable, it is the variable that is not subject to treatment, but rather held constant throughout an experiment.

Applied research – Research to solve specific, practical questions. It can be exploratory, but is usually descriptive in nature, attempting to make clear the salient features of the phenomenon under study.

Bias – Distortion in a research project caused by variables or circumstances not considered in the data collection, or in the variable itself. Also the potential for a researcher to read results inaccurately due to a predisposed prejudice.

Blind review – An evaluation of a research report done by experts in the field where the identity of the author or authors of the research is keep confidential.

Case study – One of several ways of doing social science research, a case study includes experiments, surveys, multiple histories, and analysis of archival information. Case study methods involve an in-depth, longitudinal examination of a single instance or event.

Categorical data – Numbers used as labels for datasets, or for data that have order, although intervals between the data points may not be equal.

Causal-comparative – A correlational study where causation is attributed to one or more variables.

Central tendency – A measurement device that gives meaning to the center or middle of a distribution of variable values: mean, median, and mode are three common examples.

Chi-square – A nonparametric statistical test that measures the difference between the observed data and the expected frequency of data.

Cluster sample – Technique used when "natural" groupings are evident in the population. The total population is divided into these groups (or clusters), and a sample of one or more of the entire group is selected for research.

Coefficient alpha – Also known as Cronbach's coefficient alpha, it is a reliability check for internal consistency of a measurement instrument derived by computing all possible split-half correlations from the responses. Based on the average inter-item correlation among items, the usual minimum score for a reliable index is 0.700.

Concept – An abstract idea or mental general principle with a corresponding representation in language that brings together objects, phenomena, or individuals, and identifies a relationship between or among them.

Conceptualization – To arrive at a generalization as a result of the study of theory, or of things seen or experienced that creates a measureable research task using abstract ideas.

Construct – A systematic assembly of research concepts used to create or improve a theory or framework, most often using predetermined criteria or benchmarks. A research construct is the result of systematic thought about a subject where a complex theory or subjective notion has been created and systematically put together.

Construct validity – Assurance that a data-collection device relates appropriately to all variables within the identified area of study and that the items in the instrument do measure the targeted phenomena.

Constructivism – A philosophical perspective that views all knowledge as created through iterations of systematic thought resulting in a constructed reality.

Content validity – Assurance that a data-collection device measures accurately the complete range of meanings within the area of study, or all facets of a social construct being studied.

Control variable – The variable in an experiment that is not changed in the research process, but is rather held constant in order to compare the results of any treatment or change to the experimental variable.

Correlation – The strength and direction of a linear relationship between measurable variables, often using predefined statistical tests such as the Pearson Product-Moment Correlation Coefficient or the Spearman *rho* test. Measures of correlation vary from –1 to +1, and a correlation near 0 is an indication of a weak relationship.

Correlational study – An examination of similar trends in the data of a research project, a necessary but not sufficient finding to imply causation.

Criterion validity – Assurance that a data-collection device measures accurately the external phenomena under study.

Data – Information in the form of text, characters, images, or numbers obtained in a research project.

Deductive – A form of reasoning where research expectations are based on general principles and a conclusion is reached by applying the rules of logic to the premise using previously known facts. The logic moves from the general to the specific.

Delphi technique – A research method where a panel of experts is surveyed in several iterations, each time with an anonymous summary of the previous round's results provided in order to reach consensus on the issue.

Dependent variable – The variable under study in a research project that changes based on the manipulation, or on normal changes of other variables.

Descriptive research – A method of study that illustrates and explains specific details or characteristics of the population or phenomena being studied.

Developmental research – The study of growth or change issues from an inter- or multidisciplinary point of view.

Dispersion – The scatter, spread, or distribution of research data around some measure of central tendency, such as the standard deviation from the mean value.

Dissertation – A formal thesis based on an authentic and independent research project, usually submitted to faculty at an institution of higher education as a requirement for an advanced degree.

Empirical – Research based on or characterized by observation and experimentation, and dependent on evidence that may be observed and recorded.

Epistemology – The branch of philosophy that is the study of the nature, validity, and scope of knowledge and belief.

Ethnography – Research that presents descriptions of human social circumstances or interactions, usually in textual form, or in a combination of text and quantifiable data.

Ex post facto – Research that includes making judgments about individuals or phenomena after events have occurred or circumstances have passed.

Experimentation – Research based on scientific tests or on new and untried methods where some manipulation is used to determine the effect of the treatment on the variable under study.

Extraneous variables – Variables that interact in a research project other than the selected independent variable that have an effect on the subject of the project, and that cannot be controlled or measured with any degree of accuracy.

Face validity – Assurance from one or more individuals knowledgeable in the field that a data-collection device at least looks as though it measures accurately the external phenomena under study.

Factor analysis – A statistical operation that separates a dataset into dimensions (factors) based on common trends in the data.

Field study – A research technique where the researcher is immersed in the environment being studied, and records activities and events while in that environment.

Fundamental research – Also called basic research, it is most often exploratory and has the advancement of knowledge as the primary objective. Using relationships between variables to create or improve theory, results of fundamental studies may lead to additional applied research.

Grounded theory – Based on the constant comparative method of research, it is a systematic theory-generation technique using both inductive and deductive reasoning where research hypotheses are generated based on conceptualized ideas, and based more on observation than on any other schema.

Historical – A research technique that draws upon information or events of the past for description and analysis.

Hypothesis – A conjectural statement about the nature of individuals or phenomena that is used as a basis for investigation. It is the predicted relationship between an independent and a dependent variable.

Hypothesis testing – Determining whether the expectations in the conjectural statement about research variables exist, often using statistical procedures to determine the accuracy.

Independent variables – Also called predictor variables, they are the research values that are taken as given and used by the researcher to explain or determine the research results, which is often the dependent variable.

Inductive – A form of reasoning where research expectations are based on general principles derived from specific observations. The logic moves from the specific to the general.

Inquiry – A planned and formal investigation or research process structured and carried out to determine the facts of a situation in order to augment knowledge, resolve doubt, or solve a problem.

Interval data – Research data where individual data points have a rank order, and there are defined and equal intervals between each data point so that the differences between arbitrary pairs of measurements may be used in a meaningful way.

Interval sample – Also known as "systematic" sampling, the researcher uses a rotating method to select the sample (e.g., taking every other or every tenth subject).

Intervention – A treatment used in a research project intended to produce a measurable and positive outcome.

Interview – A data-collection technique where the researcher interacts directly with research participants and asks a series of questions for the purpose of determining facts or opinions in order to generate research data.

Investigation – A detailed examination or inquiry into a subject under study.

IQ – The intelligence quotient derived by dividing a test taker's mental age by her or his chronological age. Often measured through standardized intelligence tests and reported as a standardized scale score between 55 and 150, with 100 (the mean) being considered "average" and with a standard deviation of 15.

Jury – A select group of people who are knowledgeable in the research subject used to judge the merits of the research plans or critique the results.

Likert scale – A questionnaire response scale with standard response categories for a range of items, usually represented by numerical values for the purpose of statistical analysis.

Literature – The body of published work concerned with a particular topic or subject, especially including printed or published research reports on the subject.

Measurement – Estimation, subject to error, of some physical quantity of an object, concept, or phenomenon using defined base units that make reference to specific empirical conditions.

Meta-analysis – A single study that is a published research report, including a summary or the combination of several individual studies that focus on the same research question or hypothesis.

Nominal data – Research data where individual data points are numerals, but only used as names for the research constructs, and the numerical value of the numerals is irrelevant.

Nonparametric – A statistical category for research concerned with datasets that do not have specific quantities related to the general population under study, but rather have flexible population parameters that are not fixed in advance.

Normal population – The assumption that the distribution of elements in a population is spread out according to the normal probability curve, also known as the bell-shaped curve.

Observation – The careful surveillance and recording of behavior, natural phenomena, or activity in a research project.

Operational – The structure of management and control of a research project that follows conceptualization from established theory.

Ordinal data – Research data where individual data points have a rank order and comparisons of greater and less can be made, but conventional operations such as addition or subtraction are meaningless.

Panel interview – A longitudinal research project where the same group of individuals is interviewed at specific intervals over the course of the project and multiple phenomena are observed over multiple time periods.

Paradigm – A research model of how ideas relate to one another that forms a conceptual framework and defines a scientific discipline or other epistemological context.

Parameter – A characteristic or summary value representing a general quantity that is considered to be a "true" measurement from an entire population under study.

Participant-observer – A research strategy where the researcher has an intensive involvement with people in their natural environment, often over an extended period of time.

Peer review – Also known as refereeing, the process of subjecting research results to the scrutiny of experts in the field which is used to assure that authors adhere to the standards of their disciplines.

Phenomenon – An observable event or something perceived or experienced by the human senses.

Phenomenology – The philosophical study of conscious and immediate experience used to describe a body of knowledge that draws from perceptions of things as they are and as they relate to one another.

Philosophy – The academic study of the systematic examination of concepts such as truth, existence, reality, causality, and freedom using a set of basic principles underlying a particular sphere of knowledge.

Placebo – A treatment prescribed to a patient in a medical research project that contains no medicine, but is meant to create the psychological effect of taking medicine.

Positivism – The theory that knowledge can only be acquired through direct observation and experimentation and that the only authentic knowledge is scientific knowledge.

Post-positivism – A belief that theory both shapes reality and follows it and the truth of science pertains to the study and description of phenomena as they are found in the real world.

Pre-test/post-test – A research design where subjects are exposed to the same measurement both before and after experimental treatment.

Primary source – A document or other source of information created at or near the time under study and which relates directly to the subject of study.

Probability – A statistical theory that allows researchers to draw conclusions about the likelihood of events occurring or the accuracy of conclusions drawn from the data.

Purposive sample – Also called judgmental sample, the researcher selects respondents based on intimate knowledge of the population being studied and the need to ensure that certain aspects of the population are represented in the research.

Qualitative – Research that uses textual and other non-numerical data as a basis to study human behavior and the underlying patterns of relationships.

Quantitative – Research that uses numerical representations as a basis to systematically study phenomena and their relationships.

Quasi-experimental design – Research that includes experimental treatment of variables, but under less-than-controlled circumstances and where extraneous variables may create a bias in the results.

Questionnaire – One of several methods of data collection where a set of questions is sent to a select sample of participants for response and for combined analysis.

Random sample – A group selected for participation in a research project where each member of the population has an equal chance of being selected for the study.

Rank order – Positioning research items from a collection of similar constructs or traits on an ordinal scale with a value relationship to one another.

Ratio data – Research data that include a true zero point and where individual data points have rank order, meaningful intervals, and also meaningful ratios between arbitrary pairs of numbers and where arithmetic operations of multiplication and division may be used.

Regression analysis – A statistical procedure which includes a significant causal-comparative component that allows the researcher to determine the percent of variation in one variable due to other variables in the dataset.

Reliability – The consistency of a measuring instrument which provides confidence that the researcher is able to derive the same results from repeated measurements of the same phenomenon.

Replication – Repeating the same experiment or carrying out the same research process in several iterations to assure that results are accurate and valid and to reduce error in findings.

Research – A human activity based on intellectual investigation into a subject and aimed at discovering facts, and creating, interpreting, or revising theories in order to increase human knowledge on different aspects of the world.

Research consumer – An individual who reads and interprets research reports and publications for the purpose of knowledge acquisition, or self- or professional improvement.

Research design – The plan or scheme of the overall research project where the researcher describes the interaction of the problem or issue under consideration, the information needed to analyze the issue, and the techniques used to collect and evaluate the research data.

Research methods – A commonly accepted structure to carry out a research endeavor, including, but not limited to, exploratory research that establishes and identifies new hypotheses, constructive research that develops solutions to problems, and empirical research that uses evidence to test hypotheses and derive solutions.

Sample – Units or individuals selected from a population to serve as data-collection cases or as research participants.

Scale data – Numerical data that may be applied to an interval measurement.

Science – A systematically organized body of knowledge that has been the object of careful study carried out according to accepted methodologies.

Scientific method – A specific body of techniques for investigating phenomena and acquiring new knowledge, or confirming or correcting existing knowledge, based on observable and measurable empirical evidence.

Secondary source – Textual or other documentary written accounts based on a collection of primary or other secondary sources.

Semantic differential – A data-collection device where respondents are asked to record a value statement between two bipolar words or range of words.

Split half – A technique to determine the reliability of a measurement instrument by comparing data from one half or the instrument items to the other half.

Standard deviation – A statistical measure of dispersion calculated by computing the square root of the mean of the differences of each item from the sample mean.

Standard error – The calculated difference between the estimated or measured value (statistic) and the real value (parameter). The lower the standard error, the better the estimate.

Statistic – A calculated estimate of what the actual value is for the whole population, usually derived from a research sample.

Statistical analysis – An applied mathematical measurement technique for numerical data that uses predetermined formulae to analyze data in order for the researcher to draw reasoned conclusions about the research questions.

Statistics – Estimates of population parameters, or a branch of mathematics that deals with the collection, analysis, interpretation, and presentation of numerical data.

Stratified sample – The division of a research population into homogeneous groups, or strata, for the purpose of selecting a sample.

Substantive validity – Also known as "educational" validity, it answers the question of whether or not the size of the research group (the sample) is adequate to the purpose of the study (e.g., is the group "substantial" enough to warrant conclusions?).

Survey – A device to collect quantitative information about items in a population, and an analysis of responses to a poll of a sample of a population to determine opinions, attitudes, or knowledge.

Survey research – A statistical study of a sample from a defined population done by asking questions about selected aspects of people's lives, such as age, income, opinions, attitudes, or knowledge.

Test – A series of questions, problems, or practical tasks used to measure knowledge, ability, experience, or disposition.

Test-retest – A measure of reliability derived from successive iterations of the same measurement instrument over a specified period of time, usually measured with a correlation statistic.

Theory – A conjecture, opinion, or speculation about a set of facts, propositions, or principles analyzed in relation to one another and used to explain phenomena.

Thesis – A dissertation based on original work, especially as work toward an academic degree.

Time series – A statistical procedure that studies a sequence of data points measured at successive times spaced at uniform time intervals to either comprehend the theory of the data points, or, most often, to make forecasts about the phenomenon under study.

Treatment – The act of manipulating members of a research sample by subjecting a new process or agent to the elements in order to determine the effects of the manipulation.

Triangulation – The use of more than one method in a research study with a goal of double-checking, or triple-checking, the results so that the researcher can be more confident with the result if different research methods lead to the same conclusion.

Validity – Confidence that the research method and the techniques used to collect data actually measure what they purported to measure, and that the conclusions or descriptions of the subject or topic under consideration that are found or drawn by the researcher are accurate, reasonable, or justifiable.

Variable – A measurable attribute in a research project whose value may fluctuate over a wide range over time or over individuals, and whose change may influence or cause a change in another population parameter.

Variable effect – The condition of the phenomenon or factor being studied due to introduced or observed change. Also a measure of the strength of the relationship of two variables, often referred to as effect size, which identifies the magnitude of the results beyond the question of significance.

Variance – A statistical measure of the spread or variation of a group of numbers in a sample, equal to the square of the standard deviation.

Appendix

Edgewood College Doctoral Program Dissertation Template

The purpose of this document is to guide students as they write their five-chapter dissertation. The template includes the components of a traditional five-chapter dissertation, provides a description of each component, and is formatted using APA guidelines. We recommend that students write their drafts of each chapter within this template. The font, margins, headings, pagination, and references are in alignment with the format requirements established by our program. If you are using this template and you are not an Edgewood College doctoral student, we recommend that you determine the formatting and style guidelines required by your home institution.

As you use this template, be aware that there are comments embedded in each of the sections. The comments may be found under the corresponding section in this format.

Page 1

TITLE IN ALL CAPS

ONE-THIRD OF THE WAY DOWN FROM THE TOP OF THE PAGE, CENTERED AND DOUBLE-SPACED

[Note: Double-check the spelling of your title. Spell check does not work when using all capital letters.]

By Your W. Name (Centered both vertically and horizontally, upper and lower case)

A dissertation submitted in partial fulfillment
of the requirements for the degree of
DOCTOR OF EDUCATION
at
EDGEWOOD COLLEGE
20XX

Page 2

Copyrighted by Your Name, 20XX

Page 3

Abstract

An abstract is between 150 and 250 words, with no indents, double-spaced. It must be accurate, non-evaluative, coherent and readable, and concise (VandenBos, 2010, pp. 25–27). Please do not complete this section until you have completed Chapter 5.

Elements of the abstract should include the following:

- State the problem under investigation (one sentence).
- Describe the purpose of the research and the research question (one sentence).
- Describe the participants and include demographic information and the research site if applicable.
- Describe the essential and interesting features of the method giving careful consideration to key terms.
- State the key findings (two sentences).
- Include the implications and recommendations in one to two sentences (VandenBos, 2010, p. 26).

Page 4

Acknowledgments

The acknowledgments are optional. If you choose to write an acknowledgments page, it should be double-spaced with half-inch indents. Acknowledgments give credit to people or institutions that provided significant help in the writing or research of your dissertation. This section is academic in nature as opposed to personal.

Page 5

Dedication

The dedication is also optional. If you choose to write a dedication page, the format is similar to the acknowledgments page. Some authors choose to dedicate the work to a person or persons who were deeply important in helping them in their personal or professional life. The dedication page is more personal in nature, although the writing style is still formal and academic.

Page 6 and following

CONTENTS

Begin on a new page

List of Tables

[Note: Make sure the table number and its title appear without italics on the same line in the List of Tables and List of Figures. You treat the List of Tables and the List of Figures the same way as the Table of Contents; that is, you right click on the List of Tables or the List of Figures, select update field, and then update the entire table to update your lists.]

Begin on a new page

List of Figures

Begin on a new page

Chapter 1 Introduction to the Study

Chapter 1 should give the reader a clear indication of the purpose and the scope of the study. Throughout the chapter you will describe the question, problem, or issue, as well as the context in which the study will take place, and why it is important to address (American Educational Research Association (AERA), 2006). In the introduction to Chapter 1, give a detailed overview of what is known about the problem within the literature: describe the problem, moving from general to specific ideas and evidence. In addition, identify the gap in the literature that needs to be addressed by the research.

Problem Statement

Following an introductory discussion of the major issues contained in the problem, write a clear, succinct articulation of the problem. All the key components of the problem statement should be addressed prior to this section. The problem statement section is a way for readers to quickly understand the focus of your study and the question, problem, or issue being addressed. Generally, it will contain information summarizing the main components of the problem, issue, or question, discuss the context of the study, including the population and region you will study, and describe the approach to finding a solution. See Appendix A for an example of a problem statement.

Note: Your appendix will contain information that will be of interest to the reader, but does not need to go in the body of your dissertation. Begin the text of the appendix flush left, with no indent. Follow the description by indented paragraphs.

Purpose Statement

The next section should contain the purpose statement. The purpose statement should begin with two to three sentences describing the purpose of the study and the chosen method. This statement is followed by three to five sentences that state your research question(s) in a specific and clear way. Any terms that need to be defined should follow your research question(s). Restate the chosen method in slightly more detail and provide a rationale for using the particular method for your research question(s) at the end of the purpose statement. See Appendix B for an example of a purpose statement.

Theoretical/Conceptual Framework

Briefly describe your theoretical or conceptual framework or perspectives here. Start with the general principles of the theory or conceptual framework you are using, and explain how your theoretical framework is appropriate for your study. You will be going into more detail in Chapter 2.

Significance of the Study

The significance of the study describes both the scope of the study and the relevance. It should indicate how your study will revise or extend existing knowledge, and what use may be made of the knowledge you produce.

Summary

A summary should cover the main points included in each of the headings. Consider creating a sentence from each of your headings, summarizing the main content of that section. Place the sentences in the same order and then revise for coherence. It should not include citations, and it should be one to two paragraphs in length.

Begin on a new page

Chapter 2 Literature Review

The purpose of the literature review is to critically evaluate the research that has already been published, germane to your research topic. A good literature review defines and clarifies the problem; summarizes previous investigations to inform the reader of the state of research; identifies relations, contradictions, gaps, and inconsistencies in the literature; and suggests the next step or steps in solving the problem (VandenBos, 2010, p. 10). Start with the general context of a topic, move to specific domains in the literature for each subtopic in the study, then briefly discuss the literature gap at the end of the literature review, and suggest the next step in solving the problem. You may refer to the *Program Handbook* (pp. 58–59) for additional ideas (Edgewood College, 2012).

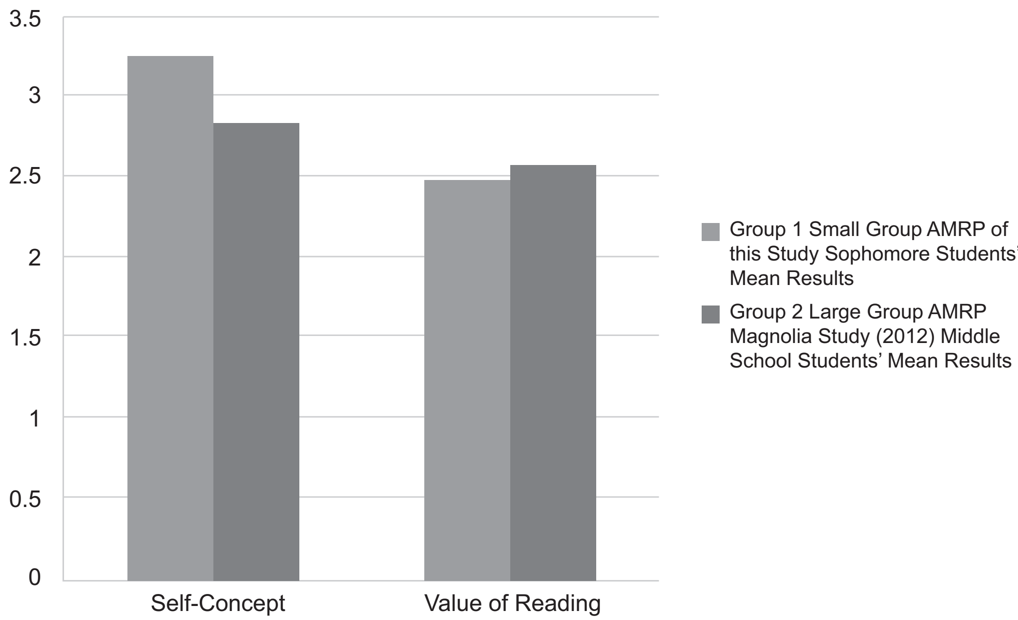

Figure A.1 Comparison of Mean Results on AMRP

Note: It is important to describe specific domains in the literature, and to apply the correct heading to them. Subheadings (e.g., Summary) should have a heading 2 style attached to them. Sub-subheadings should have a heading 3 style attached to them and be followed on the same line with your content (see APA (VandenBos, 2010, p. 62) for heading levels and the correct formatting of them).

You will most likely use both tables and figures within your document. Figure A.1 is an illustration that is correctly captioned. Use the Burke convention as you write. This convention means that you *introduce* your table, figure, or quote. You then *present* the table, figure, or quote. Next you *discuss the salient points* of that table, figure, or quote. See the *APA manual* (VandenBos, 2010, pp. 150–167) for more information.

According to the *APA manual* (VandenBos, 2010, p. 152), figures include graphs, charts, maps, drawings, and photographs whose type, lines, labels, and symbols, etc. are large enough to be read with ease.

Note: There are two steps to complete when adding a table or figure. First, save your table or figure as a jpeg file. Insert this image into your dissertation. Second, "caption" your table or figure. You do this step by right clicking on the entire figure or the entire table (not just one cell). Then, under the References tab, select "Insert Caption." In the top box you title your table or figure. Do not use italics. Under Options and Label choose whether your item is a Table or Figure. If necessary, choose Position as Above

Table/Figure. Then click OK. If you do not follow these steps your table or figure will not appear in the List of Tables or the List of Figures. The steps are as follows:

- Select table or figure
- References
  - Insert Caption
    - Type in title of Table/Figure
      - Options
        - Label
          - Table or Figure
            - Position Above

Summary

A summary should cover the main points included under each of the headings. It should not include citations, and it should be one to two paragraphs in length.

Begin on a new page

Chapter 3 Method

Your introduction should briefly state the purpose of the study. This introduction should be approximately three sentences in length and describe the method along with type of data collection.

Participants

Elements of this section include a description of the participants, description of the research setting, and sampling strategies. If you are not using human subjects, then you will not have a participants heading.

Measure(s)/Protocol(s)

Note: Choose either Measure(s) for a quantitative study; use Protocols for a qualitative study.

For a quantitative study, start with the source of your measure(s). Use the variable name as a subheading in this Measure(s) section. Describe your outcome measurement (dependent variable) first, followed by your predictor measure (independent variable), and then include any covariate measurement(s). If you are developing your own measure, include the reference to the theoretical framework on which it is based, and include the process you followed for validating the instrument (e.g., mapping survey items to constructs and piloting). If you are using a measure that has already been developed and validated, include a reference to the source of the measure and your rationale for using this pre-existing tool. Next, describe each subscale and provide one sample item per subscale. Include the range of possible scores. Finally, you should include reliability here.

For a qualitative study, describe your interview, observation, or focus group structure and questions. If you have developed your own interview questions, observation rubrics, or focus group structure and questions, describe the process you used to create them and refer to the theoretical framework. If you are using pre-existing interview questions, observation rubrics, or focus group questions, include a reference to that source. In all cases, state the rationale for your choice. (e.g., explain why you chose interviews over focus groups).

For a mixed-methods study, describe both Measure and Protocol sections.

Note: For both qualitative and quantitative studies, include the source of your measurement in this section. Describe where you got the measurement from or how you developed it. If you did not develop the tool yourself, you will need to get permission from the author to use the measurement, and you will also need copyright permission to publish it in your dissertation.

Procedure

State your participant recruitment and data-collection procedure step by step. This section should answer the following questions: What document(s) did you disseminate before the formal data collection to inform potential participants about your study? What is the timeline for data collection? Communicate IRB approval status, and if applicable, the approval from the data-collection site. Did you obtain IRB approval? If not, what is the timeline for getting IRB approval? In what way will the consent form be obtained? Are you offering an incentive? If so, what is it? How are the data collected? What is the response rate of your survey?

Data Analysis (Plan)

Note: For your proposal, you will need to include the word plan (without the parentheses). Prior to your defense, you will use Data Analysis as your heading.

Consider arranging this section using your research question(s) as headings. The analysis should be driven by the research question. For both quantitative and qualitative studies follow each research question with the analysis method (e.g., t-test, correlation, regression, grounded theory, constant comparative analysis, or content analysis), the rationale for using this analysis method, and the procedure of analysis. Indicate which software package (e.g., SPSS, NVivo) you will use for each research question. For quantitative studies, state the research hypothesis for each research question, explain your research hypothesis, and include any necessary references.

Summary

A summary should cover the main points included in each of the headings. It should not include citations, and it should be one to two paragraphs in length.

Begin on a new page

Chapter 4 Results

Start with a brief (one page maximum) summary of Chapters 1 to 3 as your introduction. Refer to the *Program Handbook* for more information on Chapter 4 (Edgewood College, 2012).

Preliminary Results

Provide an overview of the data. For quantitative studies, these preliminary results may include missingness of the data, and an identification of the appropriate statistical analysis method to address missingness. Another element that may need to be addressed is the normality of the data (e.g., skewness and kurtosis). Explain how these characteristics determined the appropriate method to analyze your data. You may need to describe the correlations among key variables.

For qualitative studies, an overview of the data may include a description of the interviewees, the research site(s), and characteristics of the data, including any unusual or problematic features you needed to address to adequately analyze your data.

For mixed-methods studies, include preliminary results for each component of your method.

Results

Organize this section according to your research question(s). Be sure to describe your results without restating the research design. However, if you uncover unanticipated results, it is important to describe and detail those results as well.

Table A.1 is an example of a table. For details on formatting tables, a helpful checklist is provided in the *APA manual* (VandenBos, 2010, p. 150).

Table A.1 Sample Table

Variables	*1*	*2*	*3*	*4*
1. Decision LVS	–			
2. Reflection LVS	0.26	–		
3. Transparency AL	0.34	0.22	–	
4. Internalized Moral Perspective AL	0.50	0.46	0.37	–

Note. If you need to make a notation, make it here.

Note: Table A.1 is an example of a table, correctly captioned. Please note that the numbers and titles of both tables and figures are not in italics and are on the same line. This convention differs slightly from APA style. When you insert and/or update your Table of Tables and Table of Figures, not having italics and having the title and the table number on the same line eliminates problems you would otherwise encounter.

Another helpful hint: if you look under the Home tab, Paragraph section, you will see a paragraph icon. If you click on it, you will see all of the editors' marks: spaces, tabs, section breaks, etc. This feature can be very helpful when you are trying to format something or make it look a certain way.

Summary

A summary should cover the main points included under each of the headings. It should not include citations, and it should be one to two paragraphs in length.

Begin on a new page

Chapter 5 Conclusions and Recommendations

Provide an introduction by briefly summarizing your results section.

Key Conclusions

Based on your results from Chapter 4, describe the conclusions you derived. Remember: conclusions are derived from the data.

Implications

Describe the implications of your conclusions. You may include the theoretical implications as well as the empirical implications.

Recommendations

Describe the recommendations for stakeholders, recommendations for policy, and/or recommendations for future research

Limitations

It is important for readers to know the limiting factors and the delimiting factors in the study. These would include circumstances or factors that could not be controlled in the study.

Summary

A summary should cover the main points included under each of the headings. It should not include citations, and it should be one to two paragraphs in length.

Begin on a new page

References

American Educational Research Association. (2006). Standards for reporting on empirical social science research in AERA publications. *Educational Researcher*, 6, 33–40.
Burke, P. (2009). *The elements of inquiry: A guide for consumers and producers of research*. Glendale, CA: Pyrczak.
Edgewood College. (2012). *Education leadership doctoral program handbook*. Madison, WI: Author.
VandenBos, G.R. (Ed.). *Publication manual of the American Psychological Association* (6th edition). Washington, DC: APA.

Use your RefWorks and Write-n-Cite to complete this section. All references cited in the body of your dissertation need to be included here. Be sure you do not add a reference that is not in the body, or a citation in the body and not in the reference list. You should remember to place all your references in alphabetical order. Set the first line margin flush left, all other lines indented one-half inch. Follow the detailed instructions on creating references in your *APA manual* (VandenBos, 2010, pp. 193–215).

Begin on a new page

Appendix A

Note: If you have only one appendix, label it Appendix. If you have more than one, as this example illustrates, label them Appendix A, Appendix B, etc. in the order in which they are mentioned in the text. Each appendix appears on a new page, and each appendix has a level 1 heading style applied to Appendix A, Appendix B, etc.

Problem Statement Example

The following is an example of a clear purpose statement, provided by Dr. Ting-Lan Ma:

> Peer victimization is a universal phenomenon and was reported in 16 European countries, Canada, Japan, China, Taiwan, Australia, and New Zealand and in the developing world (Chen & Astor, 2010; Smith & Brain, 2000). [*Note*: Identification of general problem.] In Taiwan, the problem of peer victimization recently received enormous attention by Taiwan's administrative institution. This attention follows a

severe victimization situation that took place in Tauyuan Ba-Dei middle school in 2010 that resulted in several teachers and students getting threatened by student bullies. Researchers in Taiwan are eager to adopt intervention and prevention models developed in the U.S. because the issue has been studied longer and more extensively in the U.S. (Swearer & Doll, 2011). [*Note*: Specific population and region under influence.]

Though several correlates of peer victimization in Taiwan such as gender and age differences are demonstrated to be similar to those identified in the U.S. (Chen & Astor, 2010), fundamental questions remained unsolved as to whether peers who witnessed peer victimization demonstrated help behaviors in a similar way between United States and Taiwan. [*Note*: Gap/deficiencies in the literature.] It is important that a mixed-method study be conducted to compare cultural differences and similarities in peer witnesses' helping behavior toward victims across the United States and Taiwan. [*Note*: Proposed solution.]

Appendix B

Purpose Statement

The following is an example of a clear purpose statement provided by Dr. Ting-Lan Ma:

> The purpose of the study is to identify cultural differences and similarities in early adolescents' coping strategies in response to peer victimization at school in both Taiwan and the United States. [*Note*: this section explains the purpose of the study.] Using a mixed-method approach, the specific research questions addressed in this study are: (1) Do early adolescents in Taiwan endorse coping strategies outlined by Causey and Dubow (1992) more or less than their U.S. counterparts? (2) In what way is culture reflected in adolescents' social cognitions used in the coping process in response to actual peer victimization experiences for both Taiwanese and U.S. early adolescents? [*Note*: this sentence identifies the method and states the research questions.] This study will use a quantitative approach to answer the first question because cultural comparisons can be made on an existing measure of coping *responses*. I believe that the second question is better approached by a qualitative procedure because I seek to conduct an initial exploration into how the adolescent coping *process* is permeated by cultural values. [*Note*: rationale for use of mixed methods is explained.]

Appendix C

Approvals

Please note that you may need an appendix for your approvals. If your study requires an IRB approval process, you will need to include a letter from Edgewood College indicating approval of your study. Likewise, you must add needed copyright permissions. For example, if you used another author's figure you must have permission to publish it, and that permission should be included in an appendix. You may include all of those permissions in an appendix entitled "Approvals."

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