
Applying Educational Research

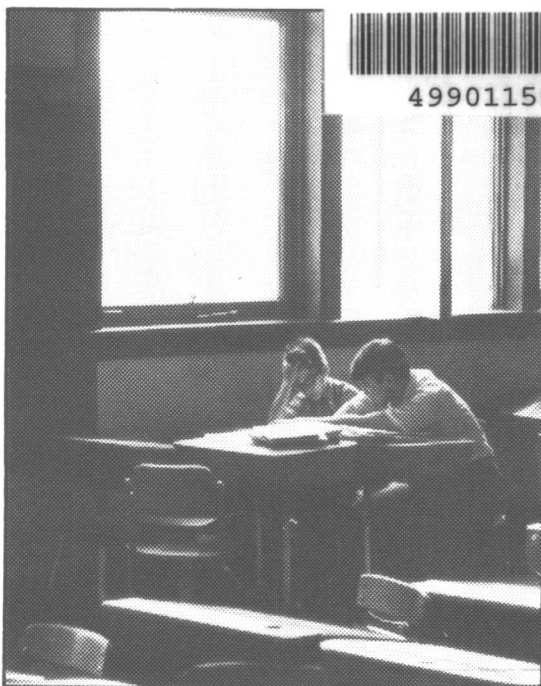
A Practical Guide
for Teachers

Walter R. Borg

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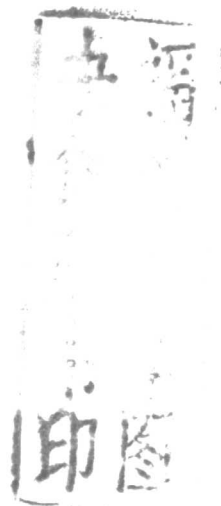
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Walter R. Borg



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APPLYING EDUCATIONAL RESEARCH
A Practical Guide for Teachers

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throughout the world.

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Chapter 1.

EDUCATIONAL RESEARCH AS A TOOL IN MAKING EDUCATIONAL DECISIONS

Overview

The main goal of the book, to make the reader an intelligent consumer of research, is discussed. To achieve this goal the learner must develop skills in locating research relevant to a given problem and must also be able to evaluate research reports and interpret the research findings. The contribution of each chapter to these skills is described.

This book helps prepare the learner to make educational decisions based upon educational research literature and action research. These two approaches are compared with personal experience and expert advice, which form the basis for most educational decisions. A few key terms related to educational research are then defined, and, finally, suggestions are made for studying this book.

Objectives

- 1.** State the main goal of this book, and describe the skills that must be mastered to achieve this goal.
- 2.** Discuss the pros and cons of personal experience, expert advice, review of educational research literature, and action research as aids in making educational decisions.
- 3.** Define twelve important terms used in educational research.
- 4.** Describe a strategy that can be used in studying this book.

The Scope of this Book

This book has been written primarily for the master's degree student in education who will not write a thesis, and for teachers and administrators in the public schools. It is not our aim to train you to be an educational researcher. Instead, our main goal is to help you become an intelligent consumer of educational research. There is a vast body of information and ideas contained in the educational research literature. In fact, there is some useful information that is relevant to virtually any practical problem or question related to education that you may encounter. If you can locate and interpret research information related to the educational problems that arise in your work, this information can give you new insights into your problems and help you make intelligent decisions.

Unfortunately, the useful information that has emerged from educational research is difficult to locate and even more difficult to interpret and relate to the practical problems that teachers and school administrators must address.

In recent years the computer has been harnessed to the task of locating sources that relate to a given educational problem. The use of computer searches of educational literature has eliminated most of the drudgery involved in manual search procedures that were necessary in the past. However, the computer is no more efficient than the search plan that is entered into the terminal. Thus, to use the computer effectively, you must learn how to develop a search plan and express this plan in terms that the computer can understand and respond to. In Chapters 2, 3, and 4 you will learn the skills you will need to define your problem, locate sources in the educational research literature that relate to it, make notes on those sources, and write your review.

Once you have located books, articles, and reports that relate to the problem or question you wish to address, you are faced with a difficult task. This is the task of reading these sources, determining how much confidence you can place in the findings, and deciding how to apply these findings to your own problem or question. Your ability to interpret educational research information is closely related to your understanding of the research process. One of the reasons that research findings have not been used more extensively in making educational decisions is that few educational practitioners know enough about the research process to interpret the typical research report. Educational researchers have reported their findings mainly for the benefit of other researchers and often have given little attention to the application of their findings to practical educational problems. The result has been a serious lack of communication between the researcher and the practitioner.

Since a knowledge of the research process is needed to interpret educational research, one solution to the communication breakdown is to help the practitioner gain the knowledge she needs.¹ For example, if a researcher selects her sample of students entirely from schools serving middle-class children, the teacher who wants to apply the research results must be aware that the sample is biased in favor of middle-class students and must be able to interpret these results in terms of her own students who come predominantly from the working class.

But a thorough knowledge of the research process requires a great deal more work and study than most teachers have time or interest to complete. Therefore, in this book we have tried to present the *minimum essentials* about

¹Since both men and women work as educational researchers and practitioners, it is appropriate to use both male and female pronouns in this book. We regard combinations such as he/she or him/her as cumbersome and have avoided them. We also have rejected using plural pronouns, such as they or them, in places where singular ones are called for. Therefore, when not referring to a specific person, we have decided to use female pronouns in the odd-numbered chapters and male pronouns in the even-numbered chapters.

the educational research process that you need in order to use research to help you in making better educational decisions. This approach is, of course, a compromise. You will not learn enough about the research process to make many of the very complex and sophisticated interpretations of research findings that could be made by an experienced educational researcher. But, we believe we can help you build a sufficient understanding of this process so that you can make reasonably valid interpretations of most of the research reports you read. Chapters 5, 6, and 7 are aimed at giving you this foundation. In Chapter 5, you will learn to evaluate the introductory section of a research report and identify possible sources of bias. You will also learn how to evaluate the researcher's objectives and hypotheses. Different kinds of samples will also be described.

All research involves measurement, and the validity of the research results is determined, to a great degree, by the accuracy of the measures that the researcher employs. Therefore, in order to interpret educational research and apply the findings to practical school problems, you must have a basic understanding of educational measurement. Chapter 6 describes the use of paper-and-pencil tests, questionnaires, interviews, and direct observations as measures in educational research.

In research, statistics are used to measure relationships or differences between the groups being studied and to help draw inferences about the populations from which the researcher's subjects were drawn. Most educational researchers have had considerable training in statistics, and most of the research reports that you will read use statistical procedures to test the researcher's hypotheses. The problem we faced in writing Chapter 7 was to devise a way to give enough of an understanding of statistics to help you interpret the findings of research reports without burdening you with the mathematics that must be learned in order to carry out a statistical analysis. Our attempted solution has been to give you a very simple introduction to some of the concepts underlying statistical theory and then list, in alphabetical order, most of the widely used statistical terms and procedures with descriptions of each in brief nontechnical language. We recommend that when you encounter a statistical term, you look it up in Chapter 7 and read the description. The procedure will surely not make you a statistician, but we hope, in most cases, it will give you some insight into how the researcher analyzed her results, why the selected statistical tool was used, and what the results mean.

Once you have gained a basic understanding of educational research, the next step is to read research articles and try to apply what you have learned to the evaluation and interpretation of these articles. Chapters 8, 9, 10, and 11 are designed to introduce you to several different kinds of research and give you some practice in reviewing research reports. We have selected only articles that are good examples of educational research. Also, the articles selected deal with topics that are of interest to most teachers and report findings that can be applied in many practical educational situations.

The educational research literature contains information that is relevant to most practical educational problems for which you may be seeking answers. However, you will encounter many problems where the information you find by searching the literature will not provide sufficient guidance for making a decision. For example, suppose you were assigned to the task of selecting a new general science textbook for seventh-graders in a large school district. Of the books available, there may be one or two new ones that have not been evaluated by researchers or science specialists. If one of these new books looks promising, you may feel that you need information about the effectiveness of the book before making a decision. In situations such as this you may decide to carry out an action research project to get more data upon which to base your decision. Action research, although using the same procedures as other kinds of educational research, is simpler and easier to conduct. While most educational research seeks to discover knowledge that can be applied to a broad range of educational situations, action research aims at gathering evidence that relates to a specific local problem. In action research, therefore, sampling bias is less likely to be a problem, a smaller number of subjects can often be used, and only the simplest kinds of statistical analysis are needed. In effect, action research provides the teacher and administrator with a way to apply the scientific method to the solution of local educational problems. In Chapter 12, you will learn the essentials that are needed to carry out action research. This chapter describes a few of the simplest research designs and also discusses sampling, measurement, and analysis procedures that are appropriate for action research projects.

Ways of Making Educational Decisions

Since many teachers and administrators have been getting along in their jobs for years without ever having read the educational research literature or conducted an action research project, you may wonder why we recommend these approaches to decision making. Most educational decisions are probably based on personal experience. Expert judgment is also widely used. Searches of the research literature and action research seem to be used much less often than the other approaches. Let's consider the pros and cons of these four decision-making approaches.

Most people find personal experience to be an attractive basis for making decisions. We are generally more comfortable with approaches we have tried ourselves as opposed to approaches that have been successful for others. Also, using personal experience as a basis for making decisions has the advantage of being quick and easy. When a decision must be immediately made, personal experience is often the only approach open to us. Also, many minor day-to-day educational decisions are too unimportant to justify the more rigorous and time-consuming methods such as searching the research literature or conducting an action research project. However, personal experi-

ence has several serious flaws as a basis for making important decisions. First, we accumulate personal experience in a very haphazard fashion. In educational situations, there is no reason to assume that the children we teach or the situations in which we teach them are representative. Thus, personal experience with unique groups of students may suggest problem solutions that will be totally ineffective with the general population. For example, in the late 1950s, after the Soviet Union had launched *Sputnik*, there was a great clamor to improve the science curriculum in American high schools. University professors, in areas such as chemistry and physics, developed new curriculums based on their university experience. In most high schools, these curriculums failed because they were too difficult for all but the brightest students. Personal experience in university teaching had not proven to be a good basis for deciding what to include in high school science courses. Another weakness of personal experience is that it is subject to errors in recall. Often our memory of past experience is faulty. If we are committed to a given approach or strategy we are more likely to remember incidents when the approach was successful than those when it failed. Also, we often overlook the fact that an approach or problem solution that we have used, such as a method of dealing with pupil misbehavior, may work for some teachers but not for others. Finally, decision making based upon personal experience ignores the knowledge and experience accumulated by others. A basic rule in decision making is that the more relevant information the decision-maker has, the more likely it is that she will make a sound decision.

Expert opinion is a better basis for decision making but still has some serious limitations. The expert usually combines her personal experience with a knowledge of some of the experience and research of others. The expert's interpretation of the work of others is almost always influenced by her own experience, and in some cases the expert only refers to the work of others when this work agrees with her own preconceived notions. In effect, the expert functions as a broker between her client and other researchers and scholars who have contributed ideas and knowledge related to the problem in question. In some cases, this is very helpful since the expert is usually better able than the practitioner to weigh and interpret the relevant evidence. However, in cases where the expert is committed to a given solution or where her experience has been gained in settings that are very different from the local situation, her advice may not lead to a sound decision.

Once the practitioner has gained the skills necessary to read and evaluate research and professional literature, she can probably get better information by going directly to the relevant research sources than by seeking the help of an expert. The practitioner has the advantage of knowing the local situation better than the expert does. Also, when a teacher or administrator evaluates the research for herself, she can be confident that all relevant information has been reviewed. If the practitioner conducts her search with an open mind, the danger of omitting or distorting a particular point of view is much less than if

she seeks the advice of an expert. In most cases, a literature search for information related to a well-defined local problem will produce information that is more recent and more relevant than one is likely to obtain from an expert. By searching the literature herself, the teacher or administrator will achieve a depth of understanding of the problem that can rarely be gained by seeking expert advice. The disadvantage of searching the literature by yourself is that a careful search involves some hard work. However, if this work produces a better solution to an important problem in your classroom, school, or district, your time has been well spent.

If a literature search does not produce a satisfactory solution to your problem, you should consider carrying out an action research project. The teacher or administrator is concerned with a specific answer to a local question and is usually not interested in generalizing the findings to broad national populations. Therefore, her action research sample need only be representative of the local population of students to whom the results will be applied. Similarly, since the practitioner is more interested in the *practical* significance of the findings rather than the *statistical* significance, most action research projects can be analyzed using the simplest statistical procedures. In fact, many action research projects need no statistical analysis at all to serve their purpose as an aid to decision making.

Action research is far better than personal experience. Most of the discoveries and progress made by Western civilization during the past 200 years have been achieved by using the scientific method to attack our problems and questions. Action research employs the scientific method to attack the problems of the educational practitioner. Scientific method is a very powerful tool which teachers and administrators should use whenever they are called upon to make important educational decisions.

Some Terms You Should Know

Before you proceed, there are a few important terms related to research that you should understand. You will probably not remember these definitions until you have encountered the terms several times in your reading. Therefore, we suggest that you occasionally review these definitions when reading later chapters. Other terms will be defined when they are first used. Statistical terms are defined in Chapter 7.

Subject An individual who is studied in a research project. In educational research the subjects are usually students or teachers, but in other fields, such as experimental psychology, the subjects often are animals, such as rats or pigeons. Subjects in educational research may also be called cases, clients, students, or pupils.

Variable Anything in the research situation that varies. For example, tests measure characteristics that vary from subject to subject, such as IQ, reading achievement, or anxiety, all of which are called variables. Height, weight, time of day, teacher enthusiasm, study habits, algebra aptitude, light intensity, diet, ethnic background, popularity, and delinquent behavior are examples of a few of the variables that have been studied in educational research. Several kinds of variables are defined later in this list.

Dependent Variable–Independent Variable In research, the dependent variable is the variable the researcher is trying to change in her research. The independent variable is the variable to which different subjects are exposed to different degrees. It is the variable that is expected to bring about a change in the dependent variable. For example, suppose that the researcher wants to study the effect of teacher praise on pupil achievement. She could select fifty teachers and randomly assign them to two groups. Teachers in the experimental group would be trained to use a large number of praise statements, while teachers in the control group would be trained to use no praise statements. After six months, pupils in all fifty classrooms would be given an achievement test to see if teacher praise affected pupil achievement. In this example, pupil achievement is the dependent variable and teacher praise is the independent variable (also called the “treatment”).

Control Group–Experimental Group The control group consists of subjects who are not given the treatment in research. The experimental group consists of subjects who are given the treatment. For example, a researcher who wanted to test the effects of a new drug on pain would divide her subjects into two groups, experimental and control. The experimental group would be given pills containing the drug, while the control group would receive either a pill made of sugar or flour (or some other substance known to have no effect on pain) or nothing. The purpose of the control group is to control for extraneous variables that could affect the subjects’ responses but have nothing to do with the new drug.

The purpose of the experimental group is to measure the effect of the treatment (or independent variable) upon the dependent variable. In our example, we would measure the effect of the drug upon pain reported by the subjects. In essence, we subtract the pain relief reported by the control group from the pain relief reported by the experimental group to estimate the effect of the drug. Without a control group, we would be unable to estimate how much of the pain relief reported by the experimental group was due to the drug and how much was due to extraneous variables.

Generalizability The degree to which we can generalize the results of a research study to the population from which the researcher’s sample was

drawn. If the researcher randomly selects a large sample from the population, then her results can be generalized within small limits of error to other samples drawn from the same population.

Hypothesis When a researcher plans a research project, she usually makes a statement which describes how she expects her research to come out, that is, what differences or relationships she expects to find. This statement is called an hypothesis.

Population-Sample The population is the defined group to which the researcher plans to generalize her research results. The researcher selects her sample from the population. For example, suppose the researcher wants to study the attitudes toward school of Chicano children in grades 4, 5, and 6 in the public schools of Texas, Arizona, and New Mexico. All children fitting into this group would be the population. Her sample would be the children whom she actually selects to participate in the study, probably not more than two or three hundred out of a population of thousands.

Statistically Significant When the researcher analyzes the results of her research, she determines, by using statistical procedures, whether the difference or relationship she found is large enough to be likely to occur again if the study were repeated using another sample from the same population. If the level of significance meets or exceeds the level selected by the researcher before conducting the research, then it is concluded that the difference or relationship is statistically significant. The researcher usually selects the .01 or .05 level of significance to test her hypothesis. If either of these levels is reached, the researcher may be confident that similar results would probably be obtained if the study were repeated using other samples drawn from the same population.²

Extraneous Variable Variable that influences the results of a research project but has nothing to do with the experimental treatment. For example, suppose we are studying the effect of high and low levels of teacher enthusiasm (the independent variable) upon pupil attention (the dependent variable). It may be that extraneous variables, such as time of day and level of outside noise, would have an effect on pupil attention if they were not controlled. These extraneous variables could distort the effects of teacher enthusiasm on pupil attention. Much of what researchers do in designing their studies is aimed at eliminating or controlling extraneous variables.

²This is a nontechnical definition that will be sufficient to interpret research at the level of this book.

The Authors' Assumptions

In this book we have tried to provide you with the *minimum* skills you will need to locate and evaluate educational research reports related to a given problem and to conduct action research. We have made certain assumptions in writing the book. Among them are the following:

1. Most readers are or will become teachers or school administrators and are not interested in becoming educational researchers.
2. Most readers will have had little or no previous instruction in research methods, educational measurement, and statistics.
3. The minimum skills needed to use educational research literature and action research as aids to decision making can be learned without extensive training in research methodology, measurement, or statistics.

To achieve our goal, we have cut away all but the bare essentials of research methods, statistics, and measurement. This means that there is virtually nothing in this book that is not important to achieving the goal of becoming an intelligent consumer of educational research literature. Thus, thorough and careful study of this book is necessary.

A Study Strategy

Let's briefly discuss a strategy for studying books of this sort that many students find effective:

1. *Read the overview and objectives.* Each chapter begins with a brief *overview* and a list of *objectives*. Both are intended to give you an idea of the scope of the chapter and to help you focus on the main concepts that you should learn. The objectives are stated in the same order that they are covered in the body of the chapter. You will find that some objectives are concerned with understanding important concepts—these usually require that you state the concept and describe or explain it. Other objectives call for applying what you have learned—these usually state the conditions under which you should be able to apply the concept. Both are important. It is a good idea to read the objectives slowly and think about each one after you read it. Some students find it helpful to read the objectives two or three times, so that they have them firmly in mind before they start reading the body of the chapter.

2. *Read the body of the chapter.* As you read the chapter, try to locate the main ideas related to each objective. Use a red pen to underline main concepts. Avoid underlining too much. Most of the content explains or discusses