

CHAPTER ONE

The Role of Data Analysis in the Lives of School Leaders

During my many years as a classroom teacher and then as a principal and superintendent of schools, I often questioned the enormous amount of time we spent in collecting numbers. Thirty to 40 minutes each morning were spent in collecting and reporting attendance. The annual state-mandated testing procedure began in early October and seemed to continue in one form or another for the entire year. But we collected our scores, sent them to the office, and never saw them again.

School districts across the nation collect and maintain many forms of educational data. Standardized test scores, average daily attendance figures, and transcript data are required by states for funding purposes. However, most schools use the collection of these data to satisfy administrative requirements rather than to assess and evaluate school improvement. Standardized test scores are generally reviewed only briefly before the local newspaper calls. Of course, this has changed somewhat since the first edition of *Schools and Data*, now that test scores are being used as a yardstick to measure teacher and principal performance. Interestingly, although we are spending more time with data and analyses, we are in most cases responding to directives and legislation (U.S. Department of Education, 2001). We are being reactive, not proactive. We must become much more proactive and move beyond the “on the surface” work with data—and investigate “below the surface”

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issues related to our data. The evidence reveals that many schools report such things as *average daily attendance* to their state departments (for reimbursement), then file the information away someplace. Educators rarely examine these data to assess *in a systematic way* the quality of teaching and learning at their schools (MPR Associates, 1998).

WHAT IS THIS THING CALLED STATISTICS?

First of all, statistics is not advanced mathematics. The majority of statistical analyses useful to the principal and teacher can be completed with a basic understanding of mathematics and involve conceptual understanding rather than complex calculations and formulas. Statistics is a set of tools designed to help *describe* the sample or population from which the data were gathered and to *explain* the possible relationship between variables.

A school principal wonders if the mathematics instruction in her school is being delivered in a manner that is not biased toward either boys or girls. In other words, Is mathematics being presented in an equitable manner at her school? A simple statistical procedure called the *Pearson correlation* can help identify any existing relationships between math scores and gender (this procedure, along with the Statistical Package for the Social Sciences [SPSS] and Excel steps to conduct it, is presented in Chapter 4). If the analysis indicates that there is a pattern of boys receiving high scores on standardized tests more than girls, the principal may want to look more closely at classroom instruction to determine if instructional strategies can be altered to address this equity issue.

A seventh grade language arts teacher is interested in knowing if there is a relationship between students' performance on the district writing assessment and their socioeconomic level. In other words, do students who come from lower socioeconomic backgrounds *really* perform at lower levels, as we are led to believe? Or, are other variables responsible for the variance in writing performance? Again, a simple correlation analysis will help *describe* the students' performance and help *explain* the relationship between the issues of performance and socioeconomic level.

Data analysis does not have to involve complex statistics. Data analysis in schools involves (1) collecting data and (2) using

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available data for the purpose of improving teaching and learning. Interesting enough, principals and teachers have it pretty easy—in most cases the collection of data has already been completed. Schools regularly collect attendance data, transcript records, quarterly and semester grades, state and national standardized test scores, and a variety of other useful data. Generally, we are interested not so much in complex statistical formulas and tests as we are in simple counts, averages, percentages, and rates. We cover more of this later.

WHAT ARE SPSS AND EXCEL?

Statistical Package for the Social Sciences and Microsoft Excel are common computer software programs that can allow people in the social sciences to analyze their data. Most educators and students in university programs have access to SPSS, and I suspect those of you in schools have access to Microsoft Excel. Good, complete versions of SPSS and Excel are reasonably priced. SPSS is now offered in a student version for \$90, and, obviously, Excel is part of the Microsoft Office Suites software loaded on most of our office and home computers. True, SPSS is a more thorough set of analysis tools, but Excel is just fine for most of the analyses we discuss and cover in *Schools and Data*. Therefore, I include examples of both programs throughout the chapters and on the accompanying Web site for the book at: <http://www.schoolsanddata.org>.

Both of these software programs can tabulate the numbers of males and females in a school, calculate average grades of the students, compare test scores by gender, determine if there is a statistically significant difference between athletes and nonathletes, compare computer-assisted instruction with other methods of delivery, and so on. SPSS and Excel display frequency distributions and cross-tabulations and calculate descriptive statistics (mean, mode, median, range, interquartile range, standard deviation) in addition to inferential statistics (chi-square, Pearson correlation, *t* tests, regression, and so on). *Schools and Data* uses both programs throughout the book for examples and illustrations. And, becoming familiar with these two software programs will not be a disadvantage to individuals who end up in schools that use other computer software programs (for example, Minitab, SAS).

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THE RATIONALE FOR USING DATA TO IMPROVE DECISION MAKING IN OUR SCHOOLS

Much research and evidence now exist indicating why school leaders must become familiar with and use existing school data to make sound educational decisions about teaching and learning (Fitch & Malcom, 1998; McNamara, 1996; Picciano, 2005; U.S. Department of Education, 2001). The National Science Foundation and the National Center for Educational Statistics have developed an information management and data-warehousing system that provides school leaders with easy-to-use access to all of their data (available at: <http://nces.ed.gov/>). The system focuses on how best to use these technologies for effective school leadership and improved decision making. Anthony Picciano (2005) from Hunter College, City University of New York, has published an excellent book entitled *Data-Driven Decision Making for Effective School Leadership*, which provides a theoretical background and practical considerations for planning and implementing data-driven decision-making processes in schools and school districts.

The question I hope this second edition of *Schools and Data* answers is, "What aspects of statistical methods should be emphasized in a basic statistics course that is designed explicitly to help school leaders (principals *and* teachers) improve their skills in problem analysis, program evaluation, evidence-based decision making, and program preparation?"

SO, WHAT'S THE PROBLEM?

Edie Holcomb's very successful book (now in its second edition), *Getting Excited About Data* (2005), discusses why data are little used in our schools and why it is so difficult to generate passion to get educators engaged:

My observations are that more than half of our teachers have graduate degrees and have taken at least one course in tests and measurements or statistics. I have four graduate degrees myself and can recall no class discussion of what to do with assessment information in planning how to help students do better. I have come to the conclusions that such courses are taught by researchers as though they are preparing researchers. As a

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result, the emphasis is on esoteric experimental design—which can't be replicated in a normal school setting. (Holcomb, 2005, p. 22)

Holcomb continues by quoting Gerald Bracey (1997), internationally recognized as one of the country's most respected experts in the understanding of education statistics:

Many of the university professors who create and use statistics are more comfortable using them than they are teaching other human beings what they mean. And in all too many instances, statistics are taught in a theoretically rarefied atmosphere replete with hard-to-understand formulas and too few examples of the daily life of education practitioners. (Holcomb, 2005, p. 22)

I agree with Holcomb and also state that the uses of data suggested in this book are not likely to meet the academic standards required in dissertations. The book's purpose is to illustrate how statistical analysis can be applied to everyday situations found in our schools. This book can be used as a refresher for all educators who have had some courses in applied statistics or research but have never found a way to use what they were taught. Let's get started.

THE USE OF STATISTICS IN THE CLASSROOM: A CASE STUDY

Karla, who taught Grades 3 and 4 mathematics at a small rural school district in southeastern Idaho, was interested in finding out if a mathematics series adopted by the district 5 years earlier was effective for all levels of students. Karla's research question was:

Though the district math program seems to be effective with middle- and low-ability students, why are the students with above-average ability not showing similar gains?

Her interest and question were based upon the belief that the district math program overemphasized computation and repetition but lacked the components of in-depth investigations and

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problem-solving experiences. To help answer her question, she collected 4 years of Iowa Test of Basic Skills (ITBS) percentile rank scores on her students. She created the following procedures:

Step 1. Rank the students into categories of high, medium, and low. Karla based her grouping on the percentile rank scores from the first-year baseline data and categorized students scoring at or above the 60th percentile as the high group, students scoring at or above the 40th but below the 60th percentile as the medium group, and students scoring below the 40th percentile as the low group.

Step 2. Create a data file. Using SPSS for Windows, Karla entered the students' ITBS percentile ranks into a new SPSS file.

Step 3. Analyze the data. With a few simple mouse clicks on her computer, she discovered that:

- a. All (100%) of her students who were rated "below average" increased their scores over the 4-year period.
- b. An unusually high number (75%) of her students who were rated "above average" revealed a general decline in their scores over the same 4-year period.

After running a few more statistical tests (descriptive) with her student data, Karla presented her findings to her principal and superintendent. She was invited to share her data analysis with the board of education. Though realizing that her analysis did not prove anything, Karla felt that the discovered pattern indicated a need for reevaluating the math program and especially her teaching methods in the classroom. Karla's conclusion to the superintendent and board was that the district math program seemed to be challenging the lower-level students by reinforcing basic skills, but the higher level of students (having already mastered the fundamentals) needed additional instruction to apply, inquire, and experiment with the numbers and mathematical concepts they already knew.

The end of the story was the implementation by Karla and her colleagues of an enrichment math program that encouraged the higher-level students to think mathematically, apply this thinking to more complex and multidimensional math problems, and communicate this thinking clearly.

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Complex statistical analysis? Not really! Sound education decision making? I would argue so!

APPLICATION ACTIVITIES

1. Take an informal tour of your building office and the central office in your school district. Make a list of all the different kinds of data your district collects (for example, standardized and performance-based test scores and attendance, dropout, and graduate rates). Make special note of the data that seem to go nowhere. In other words, how much of what your district collects is done to satisfy state and federal requirements and then is merely filed away someplace?
2. Review this statement from the Preface: “The educator’s fear of statistics probably relates to a variety of factors, but teacher and principal preparation programs must accept that the presentation of statistics in education probably lacks four important components.” What advice would you offer to those of us who are responsible for teacher and administrator preparation programs at the university level? How might we better address data analysis in our preparation programs? Do you feel that this “fear of statistics” really exists, and if so, can the fear be reduced or eliminated?
3. Access the Internet, and visit the *Schools and Data* Web site at: <http://www.schoolsanddata.org>. Become familiar with the site and the resources available to you. You are invited to communicate with the author and share your responses to the questions asked in Activity #2.