THE USE OF ELECTRONIC TECHNOLOGY BY HIGH SCHOOL PRINCIPALS IN VIRGINIA

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(ABSTRACT)

This study identified the amount of progress high school principals in Virginia have made in the use of electronic technology since 1989, and how the following variables have affected computer use by principals: training, access to hardware and software, top-management support, number of years of administrative experience, Local Composite Index (fiscal capacity), size of student enrollment, time, attitudes, home computer use, and laptop use.

The entire population of high school principals in the Commonwealth of Virginia was surveyed; a 76.7% return rate was attained. Descriptive statistics were used to report the results of the study and to make comparisons to the results of Armistead in 1989.

The principals reported their technological strengths to be (in order of importance): printing, retrieving information from the student database, word processing, using a modem, using electronic mail, accessing information on CD-ROM, conducting an Internet search, and creating a master schedule using a computer program.

Weaknesses appeared in five areas: using a digital camera, using a program for budgeting and cost projections, creating and presenting an electronic slide show, using a spreadsheet to manipulate information, and creating a database.

In the years since 1989, marked progress has been made in home computer use, use of electronic mail, use of a modem, and activation of a printer. Smaller gains were made in the areas of creating graphs and charts, using a program for budgeting and cost projections, using a computer program to create a master schedule, and using a computer spreadsheet. The skill level regarding creating a database declined.

Variables which appeared to have affected the use of electronic technology include the following: Local Composite Index (fiscal capacity), size of school population, years of administrative experience, home computer use, laptop use, training, beliefs, and confidence levels regarding computer use.

The 1997 baseline data should be used for future comparisons. Variables which affected principals' use of electronic technology that could be manipulated to increase use were time, training, and use of a laptop. Educators should use this information to continue to increase the use of electronic technology among high school principals in Virginia.

Dedication

I dedicate this work to my husband, Don. Without his patience, understanding, support, and willingness to many times play the role of both parents, this would never have come to fruition. Much love and many thanks!

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CHAPTER 1

THE PROBLEM

Background

In 1989, Armistead surveyed Virginia's high school principals to identify their levels of administrative computer use. Since that time, major strides have been made in the area of technology.

The Internet has become available to schools nationwide and to people in their own homes. A world of information is now readily accessible.

> The World Wide Web began at the CERN, the Swiss high-energy physics laboratory in 1989. While it had many scientific and research oriented uses, it was not until the 'web browser,' Mosaic, was released in 1992 that the Web began to draw much widespread attention. The use of a browser allowed the computer to translate the esoteric UNIX-based commands into a graphical representation... This allowed for home use of technology and information that was previously limited to academics and the scientific community. (Brauch & Patt, 1996, p.2)

President Bill Clinton has identified as a priority the connection of every school in the United States to the National Information Infrastructure (NII) which includes connection to the Internet by the year 2000 (Glennan, 1996). Other federal legislation such as the *Goals 2000: Educate America Act* and the reauthorized *Elementary and Secondary Education Act/Improving America's Schools Act* also places emphasis on educational technology. To facilitate the connection, Clinton has included a request for $2 billion in "technology literacy grants over the next five years" ("Clinton, Gore Announce", 1997). In his 1996 State of the Union Address, President Clinton stated:

> In our schools, every classroom in America must be connected to the information superhighway, with computers and good software, and well-trained teachers. We are working with the telecommunications industry, educators and parents to connect...every classroom

> and every library in the entire United States by the year 2000. I ask Congress to support this educational technology initiative so that we can make sure this national partnership succeeds. (Clinton, 1996)

Virginia has risen to the challenge of meeting high technological expectations. In 1996, two documents were created: Virginia's Technology Standards for Instructional Personnel and Virginia's Six Year Educational Technology Plan (1996-2002). These two documents will play a significant role in the use and development of technology in Virginia.

The Technology Standards for Instructional Personnel include expectations for:

- operating a computer system and utilizing software;
- applying terminology appropriately;
- applying productivity tools for personal use;
- using electronic technologies to access and exchange information;
- identifying, locating, evaluating, and using appropriate instructional technology-based resources to support Virginia's Standards of Learning and other instructional objectives;
- using educational technologies for data collection, information management, problem solving, decision making, communications, and presentations within the curriculum;
- planning and integrating lessons to meet the diverse needs of learners;
- demonstrating knowledge of ethical and legal issues relating to the use of technology.

If principals are expected to be instructional leaders and supervisors and evaluators of teachers, then principals must also master these state standards.

Virginia's Six-Year Educational Technology Plan includes five major goals:

- To integrate voice, video and data networks capable of providing communications at the school, district, and national levels.
- To improve teacher and student access to technological resources in classrooms and other learning centers through equitable distribution of grants, equipment, software, and technical assistance.
- The Virginia Department of Education and school districts will establish training programs and incentives to enhance teaching and learning through the use of educational technologies.

- Educators and administrators will have access to technologies that provide for the maintenance, reporting, and analysis of student and administrative data.
- A system of ongoing evaluation will be established for state and local school assessment of technology applications, teacher preparation, and training.

Administrators should pay close attention to these Virginia goals, particularly the fourth goal which involves administrative services. The strategies to accomplish this goal include the adoption of a comprehensive, standardized software package to support student and administrative data management, analysis, and reporting. This software package is scheduled to be completed in spring 1998, which means that administrators will need to be trained to use this new software package so that they can maximize its potential.

On April 19, 1997, President Clinton celebrated the second annual *Net Day* by dedicating $11.8 million to connect schools to the Internet ("Clinton, Gore Announce," 1997). On May 7, 1997, Vice President Al Gore released a statement announcing that the Federal Communications Commission (FCC) unanimously agreed to approve discount education rates for schools and libraries to facilitate their connection to the information superhighway. This move by the FCC will add schools to the 65% of United States public schools that already had access to the Internet as of the fall of 1996, which included three-fourths of all secondary schools (Heaviside, Riggins, & Farris, 1996).

The Commonwealth of Virginia and the nation are pursuing high standards of technology in education. If administrators are effectively going to lead their schools into the 21st century, they must be technologically literate. This study has identified the current level of the use of electronic technology for administrative purposes by Virginia's high school principals.

Statement of the Problem

Administrators are faced with the challenge of learning to use technology to enhance their job performance, while also being responsible for evaluating teachers' use of instructional technology and supervising the preparation of students to meet the Virginia Standards of Learning in the area of technology.

Purpose of the Study

The purposes of this study are (1) to determine the current level of computer use among high school principals in Virginia as compared to their level of use in 1989 and (2) to identify the variables which may have affected the adoption of technological innovations.

Research Questions

- How much progress have high school principals made in the area of computer use in the last nine years?

- How do the following variables relate to computer use by principals:
  - Local Composite Index (fiscal capacity),
  - Student Population Size (as measured by Average Daily Membership as of September 30, 1997),
  - Number of years of administrative experience,
  - Dates of survey return,

  - Home Computer Use,
  - Laptop Use,
  - Inservice Training,
  - Formal Training,
  - Belief that the computer is a practical tool for high school principals,
  - Confidence in ability to learn to use the computer,
  - Confidence in ability to evaluate teachers' instructional use of technology.

Researcher's Thesis

It is hypothesized that the data will show that there have been considerable gains in the original areas addressed by the 1989 study (including the ability to do the following: accomplish a word processing task; use a computer spreadsheet; create a database; create graphs and charts; use a program for budgeting and cost projections; develop a master schedule through use of a computer; use software to enter data related to expenses, enrollment, personnel, etc. for administrative decision making; use commands necessary to activate a printer; use a modem; function as a member of an electronic mail network; report the comfort level of using a computer for administrative purposes). A further hypothesis is that the data will show general inexperience in the newly-added areas of technology (including the ability to create and present an electronic slide show, use a digital camera, send an electronic fax, access information from a CD-ROM, and search the Internet).

Significance of the Study

Principals must be instructional leaders and role models for expected behaviors, while making informed financial decisions. The principal's effective use of computers should:

- save time on managerial tasks, thus creating more time for instructional matters;
- communicate to teachers and students that technology is an important component of learning;
- and enhance knowledge about hardware and software to improve purchasing decisions.

Because a portion of the survey instrument used in this study was administered originally in February 1989, it

proved worthwhile for the assessment of progress that high school principals in Virginia have made in the area of computer use. The 1989 results created baseline data; the 1997 results allow for a comparison to the 1989 baseline as well as create a new data baseline regarding the most recent technologies. The 1997 baseline data are now available for future comparisons.

Specific variables which potentially could affect principals' computer use were explored. This aspect of the study was significant, because these variables can be manipulated to increase computer usage.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

Electronic technology is a reality: in school, in business, and in life. The high school principals' job can be significantly and positively affected by the effective use of technology. As Ely (1995) states, "Technology...is our friend--a process or tool that can be used to solve problems to make our lives more satisfying" (p. 3).

The area of technology and its capabilities have grown immensely in the last decade; therefore, it has received more attention in journals, state reports, and dissertations nationwide. Literature is reviewed in this chapter which addresses the reasons principals should be technologically literate, includes information on Roger's diffusion of innovations theory, explains factors which may affect principals' adoption of computers, reviews the Virginia study which will be updated, and includes implications of the new technological skill requirements for principal preparation programs.

The Need for Technologically-Literate Principals

Administrative Uses of Computers

One great advantage of using computers is increased personal productivity. For instance paperwork that once took hours to complete using a typewriter can now be completed and edited on a computer in a fraction of the time. "Letters of appreciation, sympathy, school news, policy statements, recommendations, and commendations" are much more easily planned and constructed using data files of form letters (Furman & Zibrida, 1990, p.31). Budgets can be calculated and maintained using a spreadsheet, which is "actually an intellectual tool for analysis, prediction, interpretation, and even arithmetic or advanced mathematics applications" (Marsh, 1993, p. 24). Student discipline and scheduling can be recorded in a database. Written correspondence and interaction with colleagues and central office personnel can be accomplished through e-mail. Parent newsletters can be created and enhanced through the use of scanners and color printers. The ability to communicate with the school can be increased through the use of the Internet.

School administrators constantly are seeking ways to have more time to devote to classroom observations, conferences with staff and students, and curricular areas of concern; being able to finish more work in less time would afford principals this extra time to devote to these activities (Donatucci, 1995). "The administrative uses of

microcomputers fall into four broad categories: data management, data analysis, word processing, and communications" (Ellis, 1984, p. 1).

Instructional Leader

Because of the demand for a technologically literate American citizenry, principals must ensure that schools are preparing students for the globally-competitive workforce. "Principals cannot succeed, however, by using management and leadership strategies that do not support the integration of information technology" (Bennett, 1996, p.58). Principals need to be aware of the possibilities of technology use within the classroom, encourage students and teachers to explore the capabilities of technology, and model its use. The Carnegie Foundation (1996)report Breaking Ranks: Changing an American Institution lists as one of nine purposes of high schools that high schools "must lay a foundation for students to be able to participate comfortably in an increasingly technological society" (p.56).

In 1992, there was one computer per thirteen students in America's schools. By 1995, that ratio improved to one computer per nine students (Gonzalez, 1995). In the 1995 State of the Union Address, President Bill Clinton stated that "We are moving from an Industrial Age built on gears and sweat to an Information Age demanding skills and learning and flexibility." If school principals intend to lead their schools into this "Information Age," then they, too, must embrace and employ the technology of today and tomorrow.

To illustrate the world-wide importance of administrative computer use, Telem and Buvitski (1995) of Tel-Aviv University studied the effects of information technology on schools in Israel. Seven high school principals were interviewed extensively in regard to the School Management Information System which had been in schools for one year at the time of the study. Questionnaires and document analysis also were used to gather data. Results indicated that the principals believed their roles in the schools had been significantly affected due to the ease of information management, retrieval, and analysis. The most significant changes in the principal's role were reported in the area of instructional processes due to the newfound ability to analyze student achievement, specifically student grades. American principals also can reap these benefits as instructional leaders.

Change Agent

Principals are potential key change agents within their schools. If teachers are hesitant to embrace technology and integrate its use into the curriculum, the principal can communicate clearly that, although it may take time and be

uncomfortable at first, the integration of technology is of the utmost importance to the mission of offering a quality education to the students. The beliefs that are communicated and the actions which are modeled by the school principal will play a vital role in the use of technology for teaching and learning (Bennett, 1996).

Site-Based Manager

With site-based management comes new and increased responsibilities for the school principal, which means that there is a greater than ever need for access to information. Computer use allows principals to collect and analyze data from their own school buildings to make data-driven decisions. They may also look much farther than their own schools to learn about educational innovations and progress around the world. Loulou (1996) suggests that principals use the Internet's resources to access organizations, school districts, and state departments of education which are posting important and useful materials that any computer user may access.

As Lumsden (1992) points out, "with the advent of decentralization, it is becoming less common for principals to simply execute decisions and implement solutions handed down from above" (p. 2). Principals, however, do not always have the background knowledge to examine issues thoroughly. Therefore, they must know how to access information and maximize their own efficiency. Computers can assist them tremendously.

Bennett (1996) notes that with increased financial responsibilities, principals must be "wise leaders and wise shoppers" (p.64). The decisions governing the purchase of technology and specifically which pieces of hardware and software are purchased often reside with the principals, and they must be capable of making those decisions based on reliable information.

In describing the principal's role in inspiring teachers to use technology, Harris (1994) states that "a crucial key to technology innovation is budgetary decision making" (p. 2). When allocating school funds to purchase technology for office or school-wide use, the principal needs to be able to make informed decisions.

Creator of School Climate

One of the principal's major responsibilities involves the establishment of a positive school climate. Touchton's study (1992) entitled Climate in Georgia Middle Schools and Computer Use by Principals explores the relationship of school climate and principals' computer use. Nearly two-thirds of middle school principals in Georgia responded to the Computer Uses and School Climate survey which Touchton administered. Of the three null hypotheses tested through use of ANOVA and Chi square, Touchton was able to reject two

hypotheses at the .05 alpha level of significance. The two areas which were significantly and positively affected by the principal's computer use were the communication of a clear school mission and positive home-school relations. These are two areas which are traditional priorities for school principals.

In 1994, Pfenning studied the relationship between administrative computing and instructional climate. Pearson Product Moment correlation coefficients and t-tests were employed to analyze the data. Through the use of a survey instrument, data were collected from a sample of 805 principals in New Jersey.

The results indicated a moderate relationship existed between the principal's use of the computer for financial applications and the school's climate. This statistically significant correlation remained consistent for the entire sample. Touchton and Pfenning concluded that the principal's computer use has a positive effect on the school's climate.

The Diffusion of Innovations

Everett M. Rogers, known for his work on the diffusion of innovations, was first intrigued by the topic as a child growing up on a farm in Iowa. He was puzzled about the reasons some farmers quickly adopted new farming technology while others either declined or were slow to adopt (Burroughs, 1996).

When the administrative use of computers among high school principals in Virginia is examined, it is important to study the diffusion of innovations research. Harris (1994) points out three elements in Rogers' work which apply to teachers' adoption of telecomputing tools. These three elements can also be applied to administrative computer use. They include:

- A critical mass--a group of adopters who are able to diffuse the information about the innovation and thereby encourage others to adopt.
- The degree of use--the level of use which offers more information than just the adopter or non-adopter status.
- Tools for re-invention--an innovation will be changed by the adopter during implementation to serve the adopter's needs more fully.

Each of these three elements becomes relevant whenever administrators consider computer use.

Casey (1995) discussed reasons why educators have failed to adopt computer technology. He explained that "the principal needs to understand deeply the uses of computing...(and) should be a fluent user of computing for his/her own work" (p. 2). If this does not happen, not only are the administrators stifled in their use of computers, but their schools also may be stifled.

In order to make decisions about their personal adoption of computers for administrative purposes, principals experience each stage in Rogers' (1995) five stage decision-making model:

- gaining knowledge of an innovative idea;
- forming an attitude of persuasion toward the innovation;
- adopting or rejecting;
- implementing the new idea;
- confirming the decision to implement.

During these five stages, the principals acquire the following information about computers and their functions: (1) acknowledge the positive effects of adopting the innovation; (2) make the decision to either adopt or reject the use of the innovation; (3) try it; and (4) confirm that the decision to adopt was sound.

Rogers (1995) identifies that 2.5% of the population are classified as innovators, 13.5% as early adopters, 34% as early majority, 34% as late majority, and 16% as laggards, with each category becoming slower in adoption. Parker (1996) states that training is a major factor for early majority, late majority, and laggard adopters. These are the categories of personnel who wait the longest to adopt an innovation. It is likely that school principals also reside in one of these three categories of personnel.

The Status of the Diffusion of Computer Innovations

The administrative use of computers varies among countries, states, cities, school districts, and individual schools. Several studies have reported that principals use computers primarily for word processing.

In 1993 Mikulcik considered the topic of middle and junior high school principals' administrative computer use. In this descriptive study, 83% of the sample responded to the questionnaire. Those respondents who scored at or above the 50th percentile were then selected for an additional segment of the study administered through telephone interviews. Ninety percent of the respondents reported using the computer daily. Mikulcik indicated that principals use the computer for correspondence (75.8% reported high use)and communication tools primarily (51.72% reported high use for newsletters, handbooks, and publications). Other areas of use which were reported include monitoring student progress (44.83% reported high use)and record keeping; 65.52% reported using computers for teacher and student scheduling. The majority of principals (57%) indicated that they used Apple Macintosh computers predominantly, and 100% reported being self-taught. College classes and computer training workshops were attended by 24% of the respondents.

A study with similar findings was done by Perra in 1992. Perra indicated that in schools the most common activity related to computers was word processing. Perra

noted that school management software was being introduced in schools for purposes of enrollment records and student demographic reports. Needs articulated included more equipment; networking with the library, classrooms, and administrative software; training; technical support; and current software. The major barriers to computer use were identified as attitudes and financial resources. Perra concluded that "the schools visited for the purposes of this study appear to have implemented a high degree of computerization in their teaching and administrative responsibilities" (p. 58).

A 1990 study by Lamon and Sanner identified the status of secondary school principals' computer use in Oregon. A random stratified sample of 94 secondary principals was used which yielded a 64% response rate. Results indicated that 73% of principals did not own a personal computer, and of those who did, 75% chose the same brand computer which they used at school. The Oregon principals reported that the most common daily computer activity involved word processing. Seventy-eight percent of principals said they retrieved administrative information directly from a computer. Sixty-four percent said they used the computer to write memos, letters, or reports. Sixty-six percent said they have used an instructional program that could be used by students. Nearly forty-six percent reported having less than 10 hours of formal computer training. The results of this study also indicated that the average school allocated three to six percent of its instructional equipment and materials budget for computer hardware in 1990.

Other studies reveal much less computer use among principals. A statewide survey was administered to secondary principals in Kentucky in order to analyze administrative computer use(Witten, 1990). One hundred fifty-four respondents' answers were analyzed using descriptive statistics.

- 13.6% reported using a computer at home;
- 20.7% reported having received computer training;
- 62% reported using computers for student scheduling;
- 51% reported using computers for attendance records;
- 72% reported using computers for Kentucky Essential Skills Testing;
- 25.3% reported using computers to record personnel leave;
- 15.5% reported being very committed to administrative computer use;
- 56.4% reported being somewhat committed to administrative computer use;
- 27.9% reported not being committed to administrative computer use.

It was clear in 1990 that the majority of Kentucky's secondary principals were not using computers for administrative management functions within the schools.

The status of the diffusion of computer use by school principals is varied, although it appears that those who do use computers regularly use them predominantly for correspondence and word processing.

Factors Which May Affect the Diffusion of Computer Use Among School Principals

Training

Training has been identified in several studies as a major factor which may affect administrative computer use. One of these studies was conducted by Preston (1994), who used a survey instrument and a Myers-Briggs Type Indicator in New York to study the relationship of individual and organizational characteristics to computer use among public school administrators. Data gathered from 273 respondents in 29 school districts in three suburban New York counties were analyzed using a Pearson correlation, ANOVA, and multiple regression statistics. Central office administrators and secondary principals indicated a higher degree of computer use than other groups. Preston indicated that, if a school district is seeking to expand administrative computer use, the usefulness of the computer should be emphasized, training should be provided, and ample opportunities should be allotted to use the computer.

A case study conducted by Morrow (1996) in California, which involved six technology-rich middle schools, reiterated the need for training. After collecting and analyzing data gathered from interviews, focus groups, and archival data, Morrow concluded that principals play a significant role in leading schools in the development and implementation of technology. Morrow recommends that principals pursue training and technical expertise in order to effectively create a vision and mission for the area of technology, because it plays such a vital role in the future of classrooms and schools.

A recommendation by respondents for more and better computer training was also a result of Norton's (1994) study. This study involved 108 secondary school administrators, reflecting a 50% survey return rate. Thirty-nine percent of the respondents reported a high comfort level with respect to computer use, and overall, 78% indicated either moderate or high comfort levels when using computers. Norton reported that Utah's secondary principals were using computers on a frequent basis; 66% were using computers on a daily basis primarily for word processing (70%) and database applications (51%). Although, Norton concluded that computer use is widespread in Utah with 81% of the respondents reporting their use from three to five

times weekly, on an open-ended question about training, the respondents overwhelmingly indicated the need for more training.

Training for principals primarily has been in a single session and “is often quickly forgotten--especially when the school secretary is computer literate” (Donatucci, 1995, p.14). Principals, similar to other learners, do not digest new information and skills unless they practice them on a regular basis. A long-term series of technology training sessions seems to be a better choice for school systems who wish to expand the technological literacy rate of school principals.

“Five factors have been identified that, if addressed, will make teachers more likely to adopt computer technology” (Hope, 1996, p.2). Perhaps these factors also pertain to administrators and should be carefully considered by school districts who wish to encourage computer use among administrators. The five factors are: “ease of implementation, access to technology, collaboration, training, and sufficient time” to practice computer use (Hope, 1996, p.2).

The findings of a 1995 Education Technology Survey conducted by Malarkey-Taylor Associates, Inc. in Washington, DC which focused on determining usage, attitudes, and barriers to five major areas of educational technology supported the need for training. Three hundred principals were surveyed along with 600 teachers and media coordinators, and 100 school district administrators. Findings included that principals underestimated the use of technology by teachers and students in their buildings and the major barrier to the usage of technology by the respondents was the lack of training.

Further, a 1994 case study by Gentry focused on the levels of administrative computer use in six districts. Findings included the fact that mature-use districts, those with more seasoned technology users with higher levels of computer expertise, were more likely to offer both formal and informal training to school administrators. Researchers recommend further training which may prove to be helpful in increasing administrative computer use.

The Indiana Training Model

The Indiana Department of Education in has taken an aggressive step toward providing technology training for all school principals in the state. The Principals’ Technology Leadership Training Program provides principals with “four days of professional staff development over the course of a year” (Rockman & Robinson, 1993, p.1). Each principal is exposed to a variety of software programs and computer hardware as well as receiving a $500 technology incentive stipend. Principals get hands-on experience with common

software packages as well as digital cameras, scanners, video systems, administrative packages, instructional programs, and other school programs.

Early participants in the Indiana program participated in interviews to determine what kind of technological progress had been made as a result of the training. Principals reported a lower degree of fear or anxiety about computers and feeling more "conversant...(able) to talk 'sensibly' with teachers, with vendors, and school boards" (Rockman & Robinson, 1993, p. 6). Participants reported becoming more efficient, improving their communications (especially newsletters) with parents and teachers, becoming adept at keeping teacher evaluations and student discipline in electronic files, and being able to use multimedia software to enhance public presentations.

The principals also returned to their schools and presented training for teachers. In this way principals encourage teachers to use technology in classroom instruction while modeling its effectiveness. This modeling seemed especially important for smaller schools.

Training is a factor which should be closely observed in relation to administrative computer use.

Access to User-Friendly Hardware and Software

Having access to user-friendly hardware and software can affect whether a principal chooses to adopt computer technology. In New York, Ross (1993) conducted a market survey to explore the possibilities of creating software specifically designed to meet the administrative needs of high school principals. Ross developed the Automated Admissions Program software package as a result of his study which allowed principals to manipulate student data more effectively and efficiently.

In 1995, Coutts, of the University of Akron, studied the attitudinal and demographic factors influencing the adoption of computer technology by school principals in Ohio. He administered a survey to a random sample of 1,000 of Ohio's principals; 49% of whom responded. Coutts then conducted a multiple linear regression to measure the relationship of predictors to the adoption of computer technology of school principals. At an alpha level of .05, one factor that was found to contribute positively to a principal's computer adoption was computer availability (R^2=.2574; F ratio=39.731). Ohio's principals have been required to report data electronically to the Ohio Department of Education since 1990, which Coutts notes, may have given them a slight advantage over other principals nationwide. Riggs (1993) also found a relationship between the availability of computers and the likelihood of principals using them (T-value=4.25; 2-tailed probability=.000).

Clearly, if principals do not have access to computer hardware and software, adopting the technology will be more difficult.

Top-Level Management Support

"Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, 5). The support of top-level management can encourage principals to explore the uses of computer technology. In Larose and Hoag's study (1996) of 233 businesses from a midwestern state in regard to adoption of Internet use, top-management support was identified as being significant in distinguishing adopters from non-adopters($r=.28$, $F=14$, $p<.01$), but that innovation clusters (if users had adopted other technological innovations) were more highly related to using the Internet.

Demographics

Several researchers have studied whether certain demographic variables influence computer adoption by principals. A 1994 study conducted by Booker, indicated that in the state of Alabama, certain demographic variables affected the perceptions of middle and elementary school principals with respect to the practicality of computers as management tools. Booker forwarded a questionnaire to every elementary and middle school principal in Alabama. He then used descriptive statistics to analyze the data which indicated that having less than ten years of administrative experience had a positive effect on principals' computer use.

A 1993 study conducted by Riggs of Indiana University asked the question: why do school administrators adopt computers for administrative purposes? Riggs surveyed a random sample of 100 of Indiana's 350 secondary school principals; 81 responded. Riggs then conducted a series of t-tests which revealed that there was significance at the .05 level in regard to a positive attitude (T-value=-16.64; 2-tailed probability=.000), a large student enrollment (T-value=2.71; 2-tailed probability=.008), and formal and informal training (the adoptive principals had "more than twice the mean frequency response to training than the non-adoptive principals") (p. 70). Other demographic variables such as age, years of experience, geographic location, and state guidelines had no relationship to whether a principal chose to adopt the use of computers for administrative purposes.

Likewise, in Florida, Knee (1996) conducted a study in which he examined certain principal characteristics in relation to the degree to which computer technology was integrated in the classroom. Knee found no significant relationships between the degree to which technology was integrated in the classroom and the principal's computer use

(r=.07, p>.05); principal's years of experience (r=.25, p>.05); and principal's gender (r=.12, p>.05). Knee suggests that for further study the principal's management or leadership role should be researched in relation to the integration of technology into classroom instruction.

Similarly, Mullins (1996) conducted a study in which administrative computer use was analyzed according to certain demographic variables such as race, age, highest degree earned, years of administrative experience, and school enrollment. In Georgia's middle schools, no significant differences were identified where these variables were concerned with respect to the level of use, satisfaction, or knowledge of administrative computer application.

Coutts (1995) also found that the factors that were not found to be significant regarding the principals' adoption of computers included age, sex, prior training, years of experience, and professional setting.

Booker (1994) found a significant difference between number of years experience and an administrator's perception of the practicality of computer use (F=4.39, p=.0016). Those with more experience felt computers were less practical. The greatest difference was found between those with 1-5 years of administrative experience and those with 16-20 years of experience. Booker's study included all middle and elementary principals in Alabama; 682 respondents returned the survey for a return rate of 62%.

Rogers (1995) makes several generalizations about how demographic factors influence a person's rate of adoption:

> The relatively earlier adopters in a social system are no different from later adopters in age, but they have more years of formal education, are more likely to be literate, have higher social status, a greater degree of upward social mobility, and larger-sized units, like farms, companies, schools, and so on. (p. 279)

Size of Student Population (ADM)

Researchers also have studied whether principals in larger schools are more likely to adopt computers than those in small or medium schools. Booker's study (1994), which utilized a one-way ANOVA with an alpha level of .05, showed that those principals who worked in larger schools had the highest perception of the usefulness of computers for administrative tasks (F=6.62, p=.0001). Overall, 59% of the principals reported using computers for attendance--34.82% of the smaller schools and 63.86% of the larger schools. Riggs' (1993) study also revealed that principals of larger schools are more likely to be computer users than principals

of small or medium schools (T-value=2.71; 2-tailed probability=.008).

Time

Time is both a positive and negative factor when considering the computer use of principals. It takes an investment of time to master basic computer operations and to become acquainted with processes involving the computer. On the other hand, the computer may be a considerable time-saver once the principal has institutionalized its use for managerial purposes. Preston (1994) recommended that principals be allotted ample time to use the computers in order to become computer literate.

Attitudes

Studies have indicated that if principals are confident in their ability to grasp the computer and believed that the computer is a practical tool for administrators, they are more likely to use the computer.

Maher (1994) conducted a study which focused on principals' attitudes, training, and computer experience. He surveyed all 737 of Ohio's high school principals and analyzed the data gathered through use of a MANOVA design, two one-way ANOVA tests, and a Scheffe post-hoc test. Maher obtained a 57.9% return rate. The results indicated at an alpha level of .05, that if principals were comfortable with word processing, they were more likely to use word processing, e-mail, and programs on CD-ROM on a frequent basis, as well as have a positive attitude toward computers (F ratio=46.3605, p=.0000). Seventy percent of the respondents had attended one or more training workshops. Over 60% reported using word processing software on a weekly basis. Electronic mail was used less; 40% reported use weekly and 20% monthly. Over 70% said they used a CD-Rom once a year or less. Maher noted that principals' levels of computer self-efficacy were strongly related to their use of computers.

Childers (1991) of the University of New Orleans used a sample of 208 K-12 administrators from across seven states in her study entitled, Selected Predictors of Educational Administrators' Computer Anxiety and Attitudes Toward Computers. She employed the use of Maurer and Simonson's Computer Anxiety Index, Zoltan and Chapanis' semantic differential scale, Fiedler's Least Preferred Co-Worker scale, and Bern's Sex Role Inventory. A multiple regression analysis was then conducted. Childers found that gender was not a significant variable in relation to computer attitudes or anxiety. Age predicted computer anxiety but not computer attitudes.

In Childers' study, the respondents indicated the following:

- 21% reported becoming nervous “by just thinking about computers;”
- 69% indicated that they have learned to be computer users;
- 36% sometimes felt intimidated when they had to use a computer;
- 70% of the respondents reported having a computer available at work, but only 42% actually used the computer;
- 11% of the administrators reported high levels of computer anxiety.

In Riggs’ (1993) study which identified reasons that school administrators adopt computers for administrative purposes, he found that the belief that principals should be expected to try computer technology in new areas contributed significantly to principals’ adoption of the computer (T-value=-13.53; 2-tailed probability=.000). Coutts (1995) had similar findings with regard to the importance of the administrator’s attitude toward the practicality or usefulness of the computer (R^2=.2028; F ratio=23.5630).

The Status of Administrative Computer Use in Virginia

For purposes of this study, Virginia’s high school principals were surveyed. A similar study was done in 1989 by Armistead of Virginia Polytechnic Institute and State University. Armistead surveyed Virginia’s high school principals and analyzed the data using descriptive statistics. This study indicated that in 1989, 90% of Virginia’s high school principals were using computers for administrative purposes with 84% of those using the computer for three years or less. Nearly eighty-two percent of the respondents indicated that their computers were purchased with central office funds. Over forty-two percent of the high school principals in Virginia owned a personal computer in 1989, while 56.4% did not.

The principals used a Likert scale to rate themselves as very comfortable, comfortable, wary, uncomfortable, extremely uncomfortable, or no response to each question. The results are as follows:

- 31.4% of the respondents were comfortable with a word processing task;
- 31.9% were comfortable using a spreadsheet to manipulate information;
- 32.8% were comfortable creating a database;
- 19.4% were comfortable creating graphs or charts;
- 19.9% were comfortable using a program for budgeting and cost projections;
- 25.4% were very comfortable developing a master schedule using the computer;
- 32.8% were very comfortable activating a printer to secure a hard copy;

- 13.4% were very comfortable using a modem;
- 8.7% were very comfortable functioning as a member of an electronic mail network.
- 14.8% rated themselves as very uncomfortable--require too much assistance to feel “on top” of the procedure/s--regarding their overall level of comfort with the process of utilizing a computer for administrative purposes.
- 61.5% of the respondents reported having completed a formal computer course with 51.8% reporting that they attended an inservice training session sponsored by the school division.
- 65.7% of the respondents indicated that using the computer for administrative purposes had improved the quality and accuracy of their work, while 15.2% indicated very little difference.
- 71% of the senior high principals felt that the computer saved them between one and five hours per week which they devoted to classroom observations, planning, instructional improvement, general supervision, individual conferences, curriculum, and student scheduling. Armistead concluded that Virginia’s high school principals were in definite need of training in order to facilitate their use of technology.

The Effects of New Technological Skill Requirements on Principal Preparation Programs

Universities around the nation are recognizing that principal preparation programs need to provide instruction in areas of technology in order to produce the most capable graduates. Leading the way is Morrison of the University of North Carolina at Chapel Hill. His Social Context of Educational Leadership class has been designed to allow students to explore educationally-relevant issues while simultaneously becoming experienced technology users. Morrison’s masters degree and doctoral students are required to use and search the Internet and World Wide Web; use multimedia presentation software to make effective slide show presentations by using computer software and a television monitor or an LCD panel on the overhead projector; use a listserv to facilitate communication; use electronic mail effectively; and post their biographical sketches on the World Wide Web.

The class at UNC Chapel Hill has received mixed reviews from students. Such a high degree of technological immersion is difficult and extremely time consuming for many of the students, although they admit that technological skills are vital to their success as administrators. Classes which involve an intense use of technology may become more common as institutions of higher education continue to respond to the needs of current and future administrators.

Curriculum Changes

In 1993, Lester conducted a study to identify what skills or courses were necessary to prepare administrators for the year 2000. Eighty Long Island, New York administrators were interviewed by telephone. The high school principals listed a course in computers as the second greatest priority for administrators in the year 2000; the first priority was group dynamics. Middle/junior high school principals also listed a computer course as a top priority. Computer technology was identified most frequently as a necessary skill for principals in the year 2000 by the secondary principals who were interviewed. These results support technological instruction in principal preparation programs.

One way to integrate technology into principal preparation programs is to include “problem-based learning (PBL), which simulates the kinds of dilemmas typically faced by principals” so that they can gain administrative experience through a series of computer modules (Lumsden, 1993, p.1). Modules of this type could incorporate use of the student database as well as electronic communication. Aspiring principals may begin to receive more training in areas of technological importance to enhance their administrative preparation.

CHAPTER 3

METHODOLOGY

Introduction

This causal-comparative study involved the collection and analysis of data pursuant to computer use among high school principals in Virginia.

Subjects

In order to gather data about administrative computer use, the entire population of high school principals in the Commonwealth of Virginia were surveyed. The names of these principals were found on the Virginia Department of Education Internet website which maintains an updated list complete with principal's name, address, and the grade configuration of each public school in Virginia. These principals were employed in schools of all sizes in various geographic (urban, suburban, and rural) locations.

Of the 271 surveys mailed, 208 were returned (76.7%). As the surveys were returned, each was dated. At the conclusion of data collection, early responses were compared with late responses. Since they were consistent, it was concluded that the responses were representative of the entire population. If the late respondents were different from the early respondents, it would have been assumed that those principals who did not respond would have responded like the late respondents (Lehman, 1963).

Instrumentation

After adapting Armistead's 1988 survey instrument to align with Virginia's Standards for Instructional Personnel and finalizing the version of the questionnaire, content validity and reliability studies were conducted in order to ensure the integrity of the survey instrument (Appendix A). Two focus groups of school administrators took the instrument at different times to ensure consistent, reliable responses and gather feedback. The participants were asked to provide input regarding both the clarity and content of the instrument by completing the instrument itself as well as an additional chart on which respondents were able to rate clarity, belongingness in domains, and refer to citations in the literature for each of the items (Appendix B). Suggestions regarding instructions for the instrument as well as format were incorporated into the final version of the survey questionnaire.

Procedures

The surveys were mailed first class, complete with cover letter, an offer to share the results with anyone who

was interested, and stamped, prior-addressed return envelopes.

Surveys were initially mailed on October 10, 1997. A second mailing of the complete packet to all non-respondents took place on October 29, 1997. Completed surveys were returned from October 15, 1997 until November 19, 1997.

Operationalization of Terms

For the purposes of this study high schools were defined as regular, public schools which housed the twelfth grade. Principals were the lead administrators in their buildings. The use of electronic technology included use of hardware, software, and peripherals. Computers included personal microcomputers and laptop computers (Macintoshes, IBMs, or IBM clones).

Statistical Analyses

Descriptive statistics were used to report the results of each of the survey questions in number and percentage form. For those questions which were identical to the 1989 survey, a comparison of the results were made and a distribution of the diffusion of the formerly-present technology was graphed. (See Figure 1 for a graphic depiction). A distribution of the new technology (since 1989) was also graphed to illustrate the difference between the administrative use of the older technology and the newer technology.

Factors which have contributed or potentially could contribute to raising principals' comfort level in regard to computer use were also descriptively analyzed.

The Statistical Package for Social Sciences computer program was used to analyze the data. The data were analyzed in their entirety for frequencies, means, and standard deviations. Data for the survey questions which were identical to the 1989 survey questions by Armistead were disaggregated. Data were also analyzed according to categories of Local Composite Index (fiscal capacity); size of the school's student population (measured by Average Daily Membership as of September 30, 1997); years of administrative experience; dates of survey return; home computer use; laptop use; inservice training attendance; formal training attendance; belief that the computer is a practical tool for high school principals; confidence in ability to learn to use the computer; and confidence in ability to evaluate teachers' instructional use of technology.

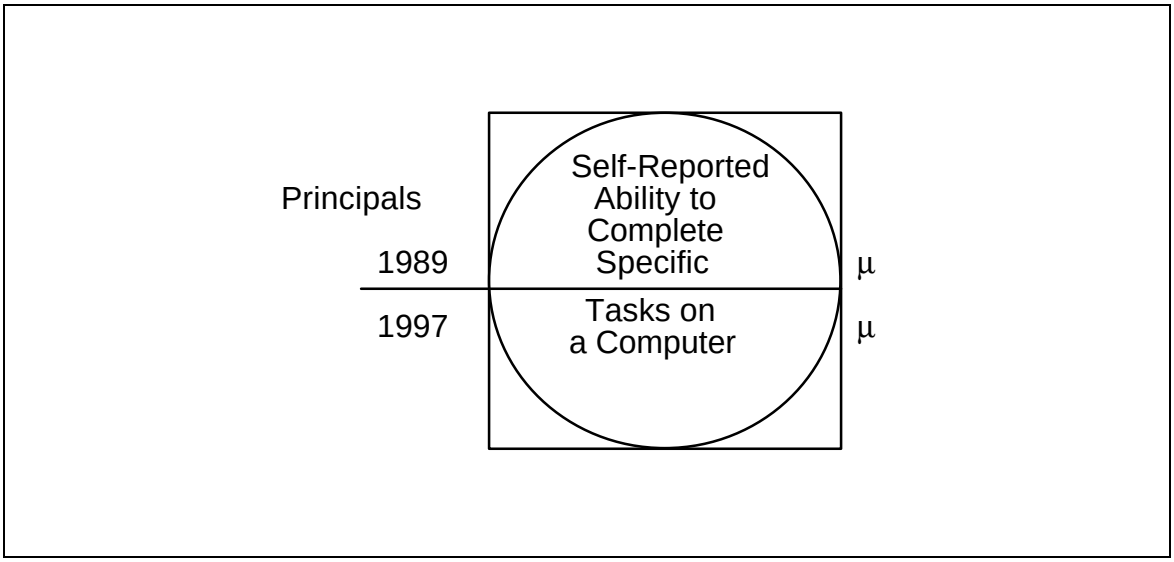

Figure 1. Graphic depiction of research design.

CHAPTER 4

RESULTS

Introduction

The results are reported for the entire survey, in comparison to the 1989 results for those questions which were included in the Armistead study, and disaggregated according to specific categories. These categories include Local Composite Index (fiscal capacity), size of the school's student population (measured by Average Daily Membership as of September 30, 1997), years of administrative experience, dates of survey return, home computer use, laptop use, inservice training attendance, formal training attendance, belief that the computer is a practical tool for high school principals, confidence in ability to learn to use the computer, and confidence in ability to evaluate teachers' instructional use of technology.

General Results

Computer Platforms and Home Computer Ownership and Use

The overall results of this study, as shown in Tables 1-5, indicate that the IBM computer platform is most widely used by the respondents. Table 1 shows that home computer use is high. Slightly more administrators use a computer at home than own a home computer which may be explained by those who report using laptops.

1989 and 1997
Home Computer Ownership

There have been definite gains in the area of home computer ownership during the last decade. Home computer ownership among high school principals in Virginia increased 34.4% from 1989 to 1997.

Factors Contributing to Raising the Level of Computer Use

The number one factor identified by Virginia's high school principals which would contribute to raising the level of computer use was time to devote to practicing your computer skills (Table 2). The second highest factor identified was training. Ranking third was software that is easy to use; 51.4% indicated that this would very much contribute to their computer use. Other factors were access to software, access to hardware, and support from top-level

Table 1

Ownership and Use of Computers by High School Principals in Virginia, 1997 and 1989

Computer ownership and use	1997 n	1997 %	1989 n	1989 %
Computer platform(s) used for administrative purposes	205		*	
Apple/Macintosh	15	7.2	*	*
IBM or IBM compatible	157	75.5	*	*
Both Apple/Macintosh and IBM/IBM compatible	33	15.9	*	*
None	0	0.0	*	*
No response	3	1.4	*	*
Home computer ownership	202		214	
Yes	160	76.9	92	42.5
No	42	20.2	122	56.4
No response	6	2.9	2	0.9
Home computer use	200		*	
Yes	162	77.9	*	*
No	38	18.3	*	*
No response	8	3.8	*	*
Laptop use	200		*	
Yes	83	39.9	*	*
No	117	56.3	*	*
No response	8	3.8	*	*

* Data were not included in 1989 study.

Table 2

Extent that Factors Would Contribute to Use of Electronic Technology by High School Principals in Virginia, 1997

Extent that factors would contribute to raising level of computer use	n	%	M	SD
Training	198		2.52	0.594
1 Not at all	10	4.8		
2 Some	75	36.1		
3 Very much	113	54.3		
No response	10	4.8		
Access to hardware	193		2.16	0.736
1 Not at all	39	18.8		
2 Some	84	40.4		
3 Very much	70	33.7		
No response	15	7.2		
Access to software	191		2.31	0.708
1 Not at all	27	13.0		
2 Some	77	37.0		
3 Very much	87	41.8		
No response	17	8.2		
Software that is easy to use	196		2.42	0.694
1 Not at all	23	11.1		
2 Some	66	31.7		
3 Very much	107	51.4		
No response	12	5.8		
Time to devote to practicing your computer skills	200		2.55	0.655
1 Not at all	18	8.7		
2 Some	54	26.0		
3 Very much	128	61.5		
No response	8	3.8		
Support from top-level management	196		2.08	0.726
1 Not at all	44	21.2		
2 Some	92	44.2		
3 Very much	60	28.8		
No response	12	5.8		

management which ranked fourth, fifth, and sixth respectively.

Confidence in Abilities and Beliefs in a Computer's Practicality

Overwhelmingly, Virginia's high school principals have confidence in their ability to learn how to use a computer as shown in Table 3. It is also clear that the respondents believe that the computer is a practical tool for high school principals.

When the respondents were asked to rate their confidence in their ability to evaluate teachers' instructional use of technology, the results were not as positive. Still, more than half reported very much confidence in their ability.

Levels of Comfort Regarding Specific Skills

Of the skills surveyed, respondents reported being the most comfortable with using commands necessary to activate a printer to secure a hard copy with nearly two-thirds reporting that they were very comfortable with the procedure. The skill that the respondents reported as their second strength was retrieving information from the student database (Table 4).

Survey question 21 asked the respondents to indicate the name of their school division's database. No answer was given by 79 of the respondents; Columbia was listed as the most common database used (56 responses), and SASI ranked third with 18 responses. All other responses had 7 or fewer responses.

Word processing ranked third among the respondents' strengths. More than half of the respondents indicated being very comfortable with accomplishing a word processing task.

The data showed that sending an electronic fax was also a strong skill; however, the data on this question should be viewed with caution. It is apparent that the respondents did not understand the difference between an electronic fax, one that uses no paper or facsimile machine but is sent directly from a computer using a modem line, and a traditional fax sent manually by feeding sheets of paper through a facsimile machine. The discrepancy is noted, because a smaller percentage of the respondents reported being very comfortable with using a modem.

Thus, functioning as a member of an electronic mail network ranked fourth among the skills rated as very comfortable with nearly four-fifths of the respondents indicating that they were either comfortable or very comfortable with the skill. The mean scores for using e-mail and for using a modem ranked solidly in the comfortable range.

Table 3

Confidence and Beliefs about Computer Use of High School Principals in Virginia, 1997

Confidence and Beliefs	n	%	M	SD
Confidence in ability to learn how to use a computer	200		2.79	0.463
1 Not at all	5	2.4		
2 Some	31	14.9		
3 Very much	164	78.8		
No response	8	3.8		
Belief that the computer is a practical tool for high school principals	201		2.87	0.346
1 Not at all	1	0.5		
2 Some	23	11.1		
3 Very much	177	85.1		
No response	7	3.4		
Confidence in my ability to evaluate teachers' instructional use of technology	200		2.52	0.593
1 Not at all	10	4.8		
2 Some	6	36.5		
3 Very much	114	54.8		
No response	8	3.8		

Table 4

Levels of Comfort with Computer Skills of High School Principals in Virginia, 1997 and 1989

Level of comfort with skills	1997				1989			
	n	%	M	SD	n	%	M	S
Use a computer to accomplish a word processing task.	204		3.41	0.792	212		*	
1 Very uncomfortable	5	2.4			22	10.1		
2 Uncomfortable	24	11.5			65	30.0		
3 Comfortable	57	27.4			68	31.4		
4 Very comfortable	118	56.7			57	26.3		
No access	3	1.4			*	*		
No response	1	0.5			4	1.8		
Use a computer spreadsheet to manipulate information.	203		2.53	0.971	207		*	
1 Very uncomfortable	29	13.9			27	12.5		
2 Uncomfortable	77	37.0			86	39.8		
3 Comfortable	56	26.9			69	31.9		
4 Very comfortable	41	19.7			25	11.5		
No access	4	1.9			*	*		
No response	1	0.5			9	4.1		
Create your own database.	203		2.46	1.006	208		*	
1 Very uncomfortable	39	18.8			22	10.1		
2 Uncomfortable	69	33.2			72	33.2		
3 Comfortable	57	27.4			71	32.8		
4 Very comfortable	38	18.3			43	19.9		
No access	4	1.9			*	*		
No response	1	0.5			8	3.7		
Use commands necessary to activate a printer to secure a hard copy.	205		3.50	0.802	211		*	
1 Very uncomfortable	10	4.8			14	6.4		
2 Uncomfortable	10	4.8			49	22.6		
3 Comfortable	52	25.0			77	35.6		
4 Very comfortable	133	63.9			71	32.8		
No access	3	1.4			*	*		
No response	0	0.0			5	2.3		
Create graphs and charts.	204		2.60	0.954	202		*	
1 Very uncomfortable	27	13.0			51	23.6		
2 Uncomfortable	68	32.7			94	43.4		
3 Comfortable	68	32.7			42	19.4		
4 Very comfortable	41	19.7			15	6.9		
No access	4	1.9			*	*		
No response	0	0.0			14	6.4		

Table 4 (Continued)

Levels of Comfort with Computer Skills of High School Principals in Virginia, 1997 and 1989

Level of comfort with skills	1997				1989			
	n	%	M	SD	n	%	M	S
Use a program for budgeting and cost projections.	200		2.44	0.944	195		*	
1 Very uncomfortable	32	15.4			36	16.6		
2 Uncomfortable	79	38.0			99	45.7		
3 Comfortable	57	27.4			43	19.9		
4 Very comfortable	32	15.4			17	7.8		
No access	6	2.9			*	*		
No response	2	0.9			21	9.7		
Create a master schedule using a computer program.	197		2.91	1.027	205		*	
1 Very uncomfortable	24	11.5			23	10.6		
2 Uncomfortable	40	19.2			50	23.0		
3 Comfortable	61	29.3			75	35.6		
4 Very comfortable	72	34.6			55	25.4		
No access	8	3.8			*	*		
No response	3	1.5			11	5.0		
Use a modem.	200		3.06	0.967	197		*	
1 Very uncomfortable	17	8.2			29	13.4		
2 Uncomfortable	36	17.3			88	40.6		
3 Comfortable	64	30.8			51	23.6		
4 Very comfortable	83	39.9			29	13.4		
No access	5	2.4			*	*		
No response	3	1.4			19	8.7		
Use a digital camera.	186		2.27	1.021	*		*	
1 Very uncomfortable	48	23.1			*	*		
2 Uncomfortable	69	33.2			*	*		
3 Comfortable	39	18.8			*	*		
4 Very comfortable	30	14.4			*	*		
No access	19	9.1			*	*		
No response	3	1.5			*	*		
Send an electronic fax.	207		3.39	0.879	*		*	
1 Very uncomfortable	11	5.3			*	*		
2 Uncomfortable	22	10.6			*	*		
3 Comfortable	49	23.6			*	*		
4 Very comfortable	125	60.1			*	*		
No access	0	0.0			*	*		
No response	1	0.5			*	*		

Table 4 (Continued)

Levels of Comfort with Computer Skills of High School Principals in Virginia, 1997 and 1989

Level of comfort with skills	1997				1989			
	n	%	M	SD	n	%	M	S
Retrieve information from the student database.	203		3.46	0.753	*		*	
1 Very uncomfortable	6	2.9			*	*		
2 Uncomfortable	14	6.7			*	*		
3 Comfortable	62	29.8			*	*		
4 Very comfortable	121	58.2			*	*		
No access	2	0.9			*	*		
No response	3	1.5			*	*		
Function as a member of an electronic mail network.	204		3.25	0.869	186		*	
1 Very uncomfortable	9	4.3			35	16.2		
2 Uncomfortable	30	14.4			87	40.2		
3 Comfortable	64	30.8			45	20.8		
4 Very comfortable	101	48.6			19	8.7		
No access	4	1.9			*	*		
No response	0	0.0			30	13.8		
Use a search engine to create an Internet search.	194		2.99	1.015	*		*	
1 Very uncomfortable	18	8.7			*	*		
2 Uncomfortable	46	22.1			*	*		
3 Comfortable	49	23.6			*	*		
4 Very comfortable	81	38.9			*	*		
No access	10	4.8			*	*		
No response	4	1.9			*	*		
Create and present an electronic slide show using a television monitor or LCD panel.	196		2.39	1.040	*		*	
1 Very uncomfortable	44	21.2			*	*		
2 Uncomfortable	68	32.7			*	*		
3 Comfortable	46	22.1			*	*		
4 Very comfortable	38	18.3			*	*		
No access	9	4.3			*	*		
No response	3	1.5			*	*		

Table 4 (Continued)

Levels of Comfort with Computer Skills of High School Principals in Virginia, 1997 and 1989

Level of comfort with skills	1997				1989			
	n	%	M	SD	n	%	M	S
Access information on a CD-ROM.	203		3.07	0.93	*		*	
1 Very uncomfortable	16	7.7			*	*		
2 Uncomfortable	32	15.4			*	*		
3 Comfortable	75	36.1			*	*		
4 Very comfortable	80	38.5			*	*		
No access	2	0.9			*	*		
No response	3	1.5			*	*		

*Data were not included in 1989 study.

Also among the strengths of the respondents were using a search engine to create an Internet search, accessing information on a CD-ROM, and creating a master schedule.

Weaknesses were reported to be in several areas which included using a digital camera; using a program for budgeting and cost projections; creating and presenting an electronic slide show using a television monitor or LCD panel; using a computer spreadsheet to manipulate information; and creating a database.

Creating graphs and charts is a skill with which approximately half of Virginia's high school principals were comfortable or very comfortable, while the other half were uncomfortable or very uncomfortable. This skill was not a clear strength or weakness.

1989 and 1997
Levels of Comfort Regarding Specific Skills

The greatest gain from 1989 to 1997 was in the area of functioning as a member of an electronic mail network. A related area of gain involved using a modem. Since 1989, there has been a 26.5% gain in "very comfortable" responses.

There was also a sizable gain in using commands necessary to activate a printer to secure a hard copy. Word processing skills also improved dramatically. Gains were also recorded in the areas of creating graphs and charts and using a program for budgeting and cost projections.

Several areas showed little or no gain from 1989 to 1997. Included in these were creating a master schedule and using a computer spreadsheet to manipulate information.

One area showed a lower skill level in 1997 than in 1989. This is the skill involving creating a database. The creation of databases is still a challenge for Virginia's high school principals.

Overall, approximately half of the 1989 high school principals in Virginia rated themselves as being comfortable or very comfortable regarding the use of computers for administrative purposes. The 1997 principals improved their self-perceptions with more than 90% being comfortable with the ability to use computers for administrative purposes.

Abilities, Use, and Effects of Electronic Technology

Respondents rated their comfort levels high on the ability to practice the responsible use of technology (regarding copyrights and site licenses) as shown in Table 5. The ability to use computers for administrative purposes rated in the comfortable to very comfortable range.

Computer Training

Nearly three-fourths of the respondents reported having received formal computer training. The most common training avenue for high school principals was clearly inservice

Table 5

Use, Training, and Effects of Electronic Technology by High School Principals in Virginia, 1997 and 1989

Ability levels	1997 n	1997 %	1997 M	1997 SD	1989 n	1989 %	1989 M	1989 SD
Practice the responsible use of technology (regarding copyrights and site licenses)	204		3.25	0.84	*		*	*
1 Very uncomfortable	10	4.8			*	*		
2 Uncomfortable	22	10.6			*	*		
3 Comfortable	77	37.0			*	*		
4 Very comfortable	95	45.7			*	*		
No response	4	1.9			*	*		
Use computers for administrative purposes	205		3.50	0.623	200		*	*
1 Very uncomfortable	1	0.5			32	14.8		
2 Uncomfortable	11	5.3			45	20.8		
3 Comfortable	76	36.5			76	35.1		
4 Very comfortable	117	56.3			47	21.7		
No response	3	1.4			16	7.3		

Training indicators	1997 n	1997 %	1989 n	1989 %
Completion of a formal computer course	208		216	
Yes	154	74.0	133	61.5
No	54	26.0	83	38.4
No response	0	0.0	0	0.0
Type of formal computer class				
Undergraduate	44	21.2	33	24.8
Graduate	45	21.6	55	41.3
Inservice training	140	67.3	69	51.8
Non-school computer classes	32	15.4	9	6.7
Computer-company representatives	32	15.4	16	12.0

Effects	1997 n	1997 %	1989 n	1989 %
The use of computers for administrative purposes has:				
Freed me from routine paperwork.	82	39.4	95	43.9
Improved the quality and accuracy of my work.	142	68.3	142	65.7
Made very little difference	51	24.5	33	15.2
Consumed time I would have spent elsewhere.	30	14.4	9	4.1

Table 5 (Continued)

Use, Training, and Effects of Electronic Technology by High School Principals in Virginia, 1997 and 1989

Effects	1997 n	1997 %	1989 n	1989 %
Decreased time spent on paperwork?	205		216	
Yes	85	40.9	71	32.9
No	120	57.7	145	67.1
No response	3	1.4	0	0.0

*Data were not included in 1989 study.

training. Undergraduate and graduate training ranked as the second most common type of training, and non-school computer classes or classes conducted by computer company representatives ranked as the third most common type of training.

1989 and 1997
Computer Training

More 1997 principals reported having completed a formal computer course than 1989 principals. Most of the training received continues to be inservice training, as indicated by both groups.

Effects of Computer Use

Overwhelmingly, the respondents indicated that the use of computers for administrative purposes has improved the quality and accuracy of their work. Slightly more than one-third of the respondents indicated that the use of computers has freed them from routine paperwork; one-fourth indicated that the use of computers had made little difference, and even fewer indicated that the use of computers has consumed time they would have spent elsewhere.

The computer has not decreased the time spent by high school principals on paperwork as confirmed by more than half of the respondents. However, the remaining respondents believed that computer use has decreased the time spent on paperwork.

1989 and 1997
Effects of Computer Use

The number of high school principals who indicated that the use of computers for administrative purposes improved the quality and accuracy of their work remained fairly constant from 1989 to 1997. The number of high school principals in Virginia who believed that the use of computers has freed them from routine paperwork dropped from nearly 5% from 1989 to 1997. The number of high school principals who believed that the use of computers has made little difference increased nearly 10% from 1997. The number who indicated that the use of computers has consumed me they would have spent elsewhere also increased 10% from 1989 to 1997. When asked if computer use had decreased the time spent on paperwork, the 1989 principals indicated a negative response as did the 1997 principals.

Responses to Open-Ended Question

The final question on the survey asked, “Are there other comments that you would like to make about the administrative use of computers?” These comments were divided into domains which included support issues, secretarial/support staff, uses of technology, training issues, positive comments which support the use of

electronic technology for administrative purposes, and general comments (Table 6).

Support Issues

The six comments made in the domain of support issues predominantly communicated the need for technical support for computer hardware. There appeared to be one system, Alexandria, which, unlike the others, was not in need of technical support.

Secretarial/Support Staff

This domain includes four comments that centered around secretarial assistance. The principals communicated that their secretaries' talents made their interaction with electronic technology less necessary. From these principals' responses, there appeared to be significant reliance upon secretaries for computer work.

Uses of Technology

The uses of technology articulated in the eight comments in this category were communication, recordkeeping, creation of support materials for administrators, and research. Of the four comments about communication, electronic mail was indicated in all four as being extremely time-consuming. The other comments in this domain were positive comments.

Training Issues

The three comments in this domain suggest that training in the use of electronic technology is needed by principals. It was suggested that all administrators have a required course in technology as part of administrative preparation.

Positive Comments Supportive of Technology

The respondents who contributed to this domain of five comments were convinced that technology is an essential part of a principal's job. They reported that computers have had a positive effect on the job of the principal.

General Comments

The single comment recorded in this domain involved a principal who had switched from using a MacIntosh computer to an IBM.

Specific, Disaggregated Results

Local Composite Index and Use of Electronic Technology

The Local Composite Index (LCI) for each of the returned surveys was grouped into one of four categories: .0000-.2000; .2001-.4000; .4001-.6000; .6001-.8000. (The highest/wealthiest LCI rating is .8000, because no school district receives less than 20% state support in Virginia.) Data for each survey question were analyzed based on these four groups (Table 7).

There are certain questions for which LCI appeared to play a role, while LCI appeared to have no impact on other questions. Laptop use was one area in which LCI appeared to make a difference. The wealthiest school districts reported

Table 6

Other Comments Made About the Administrative Use of Computers by Survey Respondents

Domains	Comments
Support issues	Support is needed for existing computers.
	Alexandria is at the top in terms of technology support.
	The use of computers in great, but there needs to be the necessary support resources in place to assist with trouble-shooting, etc.
	The support system for technology in our school is very weak. Keeping computers running, network problems, and insufficient staff development hinder our progress.
	If I am to continue to use them, I will need to learn to be a troubleshooter, since we do not value maintenance in my system.
	Most of my teachers, as well as my fellow administrators, would love to further their computer skills and use of computers in everyday work routines. The time involved and rapid pace of change along with costs of updates and upgrades is mindboggling.
Secretarial/support staff	My secretary is computer literate and a tremendous help to me in this area.
	My secretary does letters, etc. I only use my computers for discipline.

Table 6 (Continued)

Other Comments Made About the Administrative Use of Computers by Survey Respondents

Domains	Comments
Secretarial/support staff (continued)	I complete more of my own word processing now rather than giving everything to a secretary. On questions 11 through 27 I have support staff who accomplish these functions at the 4 levels.
Uses of technology	Technology makes me spend more time at the desk with e-mail, voice mail, word processing, etc. E-mail entries initiate communication, but it also allows access. I have more e-mail to clear daily than I have paperwork. I believe these are useful tools, but they are not a replacement for a human voice or mind. They should be utilized when applicable, but should not drive our instructional program. There are lots of specialized programs to handle routine communications (attendance calling, group messages, etc.). E-mail results in far more paperwork and requests from central office than traditional mail and the telephone ever did. Unfortunately, now we get both sets of mail. 1) Daily attendance 2) Discipline (students) 3) Daily attendance (teachers).

Table 6 (Continued)

Other Comments Made About the Administrative Use of Computers by Survey Respondents

Domains	Comments
Uses of technology (continued)	Easier to make “sensible” items--calendars, reports, letters.
	E-mail has greatly increased the time-use problem. Questions that normally would go to an assistant principal instead go to me--too many with direct access.
	Internet is a great help for research.
Training issues	I taught myself in a manner frequently referred to as “hunt and peck” or “fiddling around.” Thus today, I find I can help myself, but I also lose a lot of time trying to resolve self-imposed problems.
	Very helpful--would love to learn more.
	It should be required that all students in administration be required to take a computer class as a part of a degree program.
Positive comments supportive of technology use	It has helped me a lot on a daily basis.
	Any principal who says that administrators do not need to be technologically competent should have their roles as instructional leaders interpreted to them.

Table 6 (Continued)

Other Comments Made About the Administrative Use of Computers by Survey Respondents

Domains	Comments
Positive comments supportive of technology use (continued)	"A must"--essential to an efficient office.
	Documentation of employees is a must. The use of a lap top has given me quick access to documents.
	The use of computers has drastically improved the quality and meaning of our work.
General comments	I am new to the PC and Columbia. However, I worked with Mac in my old position along with a program called SIMS and found it very easy to use.