THE USE OF COMPUTERS BY ELEMENTARY SCHOOL PRINCIPALS

by

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ABSTRACT

This was an investigation of the use of computers by elementary school principals. The independent variables were socio-demographic characteristics, attitude toward computers, and beliefs about the outcomes of computer applications. The dependent variables were hardware and software proficiency, administrative proficiency, instructional proficiency, and overall proficiency.

A random sample of 400 elementary school principals in the United States and the District of Columbia was drawn from a national database developed by Quality Education Data. The sample had 228 females and 172 males. Data were collected with a questionnaire that was mailed to the sample. Two hundred fifty-three questionnaires were returned. One survey was blank and unusable.

Data were analyzed with correlation coefficients, t-tests, and one-way analyses of variance followed by Scheffé's post-hoc comparisons. Exploratory analyses with chi-square tests were used to determine if a profile of "high tech" elementary principals could be identified.

Elementary principals used the computer on a daily basis for a variety of administrative and instructional tasks. The more proficient users had more favorable attitudes toward the use of computers, used the Internet more frequently and for more tasks, and believed that computers made a difference in the time spent on and the quality of their work. Formal training was related to all four types of proficiency.

Socio-demographic variables not associated with proficiency in using computers were gender, ownership of a home computer, ethnicity, age, years of administrative experience, and highest degree held. Males and females, minorities and whites, and older and younger principals were equally proficient. Years of experience and degree did not distinguish more proficient from less proficient users.

A socio-demographic profile of "high tech" principals was not found; however, "high tech" principals (personal digital assistant users) reported higher levels of Internet use, higher levels of all four types of proficiency at alpha = .10, and a more favorable attitude toward computers. The use of the latest technologies by principals appears to be a good predictor of the proficiency of principals in using technology generally.

DEDICATION

This study is dedicated to my husband, Curtis, my daughter, Sonya, my son, Curtis, son-in-law Desmond and my beautiful granddaughter, Taylor and grandson, Christian. They have been my support, strength, and inspiration on my journey to achieving this degree.

ACKNOWLEDGEMENTS

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CHAPTER I

THE PROBLEM

The purpose of this introduction is to discuss the effects of computers on society, education, students, and school principals. Technological advances with computers have changed the way information and data are obtained and used. These advances have expanded the sources of information and the avenues for communicating it.

Our society experienced increased productivity when shifting from an agricultural to an industrial economy. The Industrial Revolution was an evolutionary process in which productivity increased through the use of machines. In an effort to increase the output of work, it became necessary to increase the speed of work. The computer, with its increased speed, met the need and is viewed as a remarkable machine of achievement (Zuboff, 1988).

The computer revolution created a society where change is constant. Analysts Maley (1985), Papert (1993), and Reich (1991) concluded:

1. Computers and computer-controlled equipment have penetrated every aspect of our lives---homes, factories, and offices (Papert, 1993).
2. [During] … the 21st century, millions of jobs will involve laser technology and robotics (Maley, 1985).
3. Computers are radically transforming a host of other occupations (Reich, 1991).

The computer revolution presents Americans with new realities. Computers are an integral part of society, and they produce high and sustained growth for the nation. Innovations such as fax machines, modems and high speed internet connections, cell phones, computers, and handheld devices link people to each other and to global markets.

Rapid advances in electronic innovations have opened new worlds of inquiry and communication. Cellular and digital telephones; interactive, digital, and compact videos; electronic and voice mail; electronic databases; and teleconferencing have changed the way people communicate world-wide (Johnson & Bartleson, 1999). The pace of these rapid changes in technology alters our daily lives and offers opportunities to expand our place in the universe.

Statement of the Problem

The purpose of this study was to investigate the use of computers by elementary school principals. Principals must be able to use computers for instructional and administrative purposes. Many school districts communicate vital information daily to administrators and supervisors, and they expect communications, reports, and other documents to be transmitted in the same way. Data bases are kept on computers, and principals are expected to access these bases in their daily instructional and administrative decisions. Computers are essential to the operation of the modern elementary school. This study is a documentation of how well elementary principals across the nation are accommodating to and using the technology that is available to them. Familiarity with computer hardware and software is essential and fundamental for school management. Principals must assess hardware costs and capabilities, software availability and compatibility, and hardware quality. They must be able to match equipment and materials with the priorities of the school (Ross, 1996).

Successful adoption of computers is important for school principals who must use computers and model their use for their staff (Tiede, 1992). If this modeling is successful, the

staff may then model the use of computers for students. Modeling is a process principals engage in as a part of their instructional leadership role.

Significance of the Study

Computer use by elementary principals has proceeded at a moderate rate (D'Amico, 2001). This study is expected to add to the literature on the current use of computers by elementary school principals. Principals should have the ability to effectively use technology as a communication tool, a management tool, and a decision-making tool. Word processing, email, spreadsheets, database software, and presentation software are tools that can assist in school communication (Blake, 2000). The effective use of these tools can help principals increase their instructional and managerial efficiency.

Information from this study will be useful to principals by identifying specific computer skills and knowledge principals possess nationally. Principals can then compare their skills with those others possess to see where they stand and what they might need to become current in the use of technology in their work.

In this study, the specific variables that affect computer use by elementary principals were investigated. The results show the relationships between elementary principals' socio-demographic variables and their proficiency in using computers. The types of proficiencies assessed were: instructional proficiency, hardware and software proficiency, administrative proficiency, and overall proficiency.

Research Question

One research question guided this research:

How and why does the proficiency of elementary school principals vary in the following areas:

a. Computer hardware and software proficiency.
b. Instructional proficiency.
c. Administrative proficiency.
d. Overall proficiency.

Definition of Terms

For the purpose of this study, key terms are defined in Table 1.

Summary

The purpose of this study was to investigate the use of computers by elementary school principals. Computers are changing schools as much as they are changing other areas of society (Thomas, 1999). School leaders can make better decisions to improve schools by using information that has been made available through the use of today's computers (Betz, 2000). Principals who possess a sufficient level of computer competence are able to practice computer leadership to assist schools in fully using computers in the 21st century (Blake, 2000).

Table 1

Definitions and Coding for the Variables Used in the Analyses

Variable	Conceptual definition	Operational definition[a]	Coding
Administrative experience	Number of years of administrative experience of any kind	Item 1	1=1-5 years, 2=6-10 years, 3=11 years or more
Gender	Sex of respondent	Item 2	1=Male, 2=Female
Age	Chronological age	Item 3	Original coding: 1=30 years or less, 2=31-40 years, 3=41-50 years, 4=51-60 years, 5=61 years or over Recoding: 2=≤40 years of age, 3=41-50 years of age, 4=≥51 years of age
Highest degree	Highest degree earned	Item 4	Original coding: 1=Bachelor's Degree, 2=Master's Degree, 3=Certificate of Advanced Study or Educational Specialist Degree (Ed.S.), 4=Doctorate (Ed.D. or Ph.D.) Recoding: 2=Bachelor's or Master's Degree, 3=Certificate of Advanced Study or Educational Specialist Degree (Ed.S.), 4=Doctorate (Ed.D. or Ph.D.)
Own a computer	Ownership of a home computer	Item 5	1=Yes, 2=No

(table continues)

3

Table 1 (continued)

Variable	Conceptual definition	Operational definition	Coding
Ethnicity	Race of respondent	Item 6	Original coding: 1=American Indian or Alaskan Native, 2=Asian or Pacific Islander, 3=African American, not Hispanic Origin, 4=Hispanic, 5=White, not of Hispanic Origin, 6=Other Recoding: 1=Minority, 2=White
Use of a computer	Use of a computer	Item 7	1=Yes, 2=No
Types of computer used	Type of computer hardware used	Item 8	1=Laptop, 2=Desktop, 3=Personal digital assistant (hand held), 4=Centrally located workstation (0=No, 1=Yes)
Frequency of use for administrative purposes	Frequency of using a computer for administrative purposes	Item 9	1=Daily, 2=Weekly, 3=Monthly, 4=Seldom Only two categories with responses: 1=Daily, 2=Weekly
Internet proficiency	Ability to use the Internet for various purposes	Sum of yes responses to items 10-16	Sum of Yes responses to items 10-16
Hardware and software proficiency	Proficiency in using hardware and software	Mean of items 19-27	Mean of items 19-27 based on 1=Beginner, 2=Intermediate, 3=Advanced
Instructional proficiency	Proficiency in using computers for instructional purposes	Mean of items 29-38	Mean of items 29-38 based on 1=Beginner, 2=Intermediate, 3=Advanced. The fourth code (4=Do not use a computer for this task) was not used in the calculation of the mean.

(table continues)

Table 1 (continued)

Variable	Conceptual definition	Operational definition	Coding
Administrative proficiency	Proficiency in using computers for administrative purposes	Mean of items 40-49	Mean of items 40-49 based on 1=Beginner, 2=Intermediate, 3=Advanced. The fourth code (4=Do not use a computer for this task) was not used in the calculation of the mean.
Computer training	Completed a formal computer course	Item 51	1=Yes, 2=No
Computer training	Number of professional courses in technology completed	Item 52	Original coding: 1=1, 2=2-4, 3=5 or more, 4=0 Recoding: 0=0, 1=1 course, 2=2-4 courses, 3=5 or more courses
Computer training	Type of formal computer class or course completed	Item 53	1=Undergraduate, 2=Graduate, 3=Inservice training, 4=Non-school computer classes, 5=Presented by a company representative
Overall proficiency	Respondents' self-reported rating of overall proficiency in using computers	Item 18	1=Beginner, 2=Intermediate, 3=Advanced

Table 1 (continued)

Variable	Conceptual definition	Operational definition	Coding
Effects of computer use	Effects of using computers on efficiency and quality of work	Item 54 1=Freed me from routine paperwork so I have more time to devote to other tasks. 2=Improved the quality and accuracy of my work. 3=Made very little difference in terms of either increasing time for other tasks or improving the quality of my work. 4=Consumed time I previously would have spent in conferences, in the hall, or in classrooms.	0=No, 1=Yes (for each item)
Effects of computer use on time spent on paperwork	Decrease in the amount of time spent on paperwork	Item 55	1=Yes, 2=No
Time saved by using the computer	Time now available per week for other tasks	Item 56	Number of hours per week
Attitude toward computers	Feelings about computers in general	Mean of items 57-62	Original coding: 1=Extremely comfortable, 2=Moderately comfortable, 3=Comfortable, 4=Uncomfortable Recoding: Mean of 57-62 based on 1=Uncomfortable, 2=Comfortable, 3=Moderately comfortable, 4=Extremely comfortable

[a] The items are in the questionnaire in Appendix D.

CHAPTER II

**A REVIEW OF THE LITERATURE ON ELEMENTARY PRINCIPALS AND THEIR
USE OF COMPUTERS**

This is a review of literature related to the use of computers by elementary principals. Literature on the historical role of the principal in schools, the current role of the principal and the value of computers in that role, Virginia's standards of performance for using computers in the administration of schools, the selection and use of computers by principals in the administration of schools, the training of principals for using computers, and the planning that principals do for the use of technology in their schools was reviewed. The instrument used in this study was developed from the information gathered in this review of the literature.

The Historical Role of the Principal in Schools

In colonial times, most schools were small, one-room buildings with one teacher responsible for both teaching and the smooth functioning of the facility. The teacher taught class and performed such administrative tasks as record keeping, cleaning the building, taking care of the equipment, and securing necessary supplies. Increased duties and consolidation of schools signaled a need for a change in the administrative staffing of schools (Beck & Murphy, 1993).

The teaching principal position was established as a result of the rapid growth of cities and the increased numbers of children attending school. The teaching principal was responsible for keeping the school facility safe and in good working condition. Maintenance of the building was a part of the teaching principal's duties. Problems were reported to a board of trustees if the teaching principal was unable to solve them (Knezevich, 1984). Increased enrollment and attendance forced schools to expand classes and course offerings (Knezevich). The increase in the student population and the expansion of classes contributed to new management problems for the teaching principal.

Control and management of school affairs became increasingly difficult and a major task for the teaching principal. The teaching and regulating of classes, making curriculum changes to accommodate all students, and handling building needs forced many changes in the role of the teaching principal (Snyder & Peterson, 1970). These changes led to the development of the principalship as it is known today.

The role of the principal became more complex as society changed. The duties of reporting information, organizing activities, caring for equipment, keeping records, and involving parents in the school were added to the role of the principal (Snyder & Peterson, 1970). Involving parents in the school helped strengthen and bond the relationship between home and school. Parents became a vital link to improving schools.

Many changes have affected the role of the principal. Problems and pressures from society, federal and state mandates, school boards, superintendents, teachers, and parents have placed demands on principals. These problems and pressures come to principals on a continuous basis and impact their leadership (Mikulcik, 1993).

The jobs of leading, managing, supervising teachers, and working with students continue to be components of the role of principals (MacNeil & Delafield, 1998). Computers are a help to principals as they handle this complex role. Computers can assist principals in the daily operation and management of school affairs.

Data-Based Management in Schools

Data-based management systems can aid principals in managerial tasks. The systems allow principals to handle work involved with running schools by making informed decisions using the data. School boards, citizens, and policymakers expect principals to use data to guide decision-making. The collection and analysis of data are the keys to improvement in schools (Wade, 2001). Today, almost every school principal uses data as a guiding force to make decisions. Daily decisions about curriculum, student grouping, and student achievement have data at their foundation (Hopkins, 2004).

Principals are responsible for managing the finances, personnel, and inventories in schools (Gurr, 2001). Computers can be a great asset for these management tasks by increasing efficiency. Data-based systems allow management tasks to be carried out in less time and with more accuracy (Johnson, 1997).

Data-based systems for instructional management serve as a means of revitalizing the process of continuous school improvement (Cafolla & Schoon, 2001). In an attempt to restructure and redesign the school and the school's culture, continuous and automatic gathering of information to make various decisions is needed. Decisions about curriculum, state standards, assessments, resources, performance evaluations, and outcomes can be handled using the computer. How the information is used to support educational and instructional decision-making is important.

Data-based systems allow principals to enter, process, and report data when needed. Student data-bases are critical in the management of schools (Blake, 2000). The continuous addition of student information requires more data to be collected, verified, updated, and reported. Information such as grades, schedules, attendance, discipline, test scores, addresses, parent/guardian information, and health information are included in the student data-base. Schools must establish, maintain, and secure an accurate database.

Statistical data on school programs can provide principals with evidence of the success or failure of the educational program (Wade, 2001). With data, principals can identify problem areas in a school's program. Data reveal strengths and weaknesses in knowledge and skill areas and provide meaningful guidance on how problems can be solved. Data entered and stored in a data-base can help a school monitor and analyze the performance of programs.

Blake (2000) investigated the technological competence of school-based administrators in Florida Schools. A majority of the school administrators (97.9%) indicated that they had exclusive use of a computer for work. The high level of computer access for the administrators was a positive sign that the importance of computers as management and instructional tools was understood by people making decisions.

Principals are expected to be key leaders of increasingly self-managed schools (Gurr, 2001). Changes have taken place in leadership and decision-making, work demands, human resource management, accountability, and planning. Information and data are important features of these changes. Data-based management systems are sophisticated systems that collect a great variety of data and automatically process the data into useful information for school leaders (Hopkins, 2004). This information can be used to drive school change.

The Current Role of the Principal and the Value of Computers

Principals are continuously influenced by the demands of their jobs. The computer can assist in acquiring and evaluating information as principals manage work-related problems. Computers can lead to adequate and intelligent solutions for on-the-job problems.

Principals must have access to information and new knowledge to make informed decisions and to solve problems. As leaders, principals must know and utilize computers for accessing and finding information and for creating and communicating new knowledge (Valdez, 2004). Access to this information and knowledge helps principals develop processes for effective decision-making and problem solving which result in better accountability.

Principals must process large quantities of information. Computers can immediately provide principals with information. The ability to access student files and grades, arrange class schedules, track discipline problems, and evaluate teachers is valuable to principals (Valdez, 2004). Frequent and immediate access to data improves the ability of principals to make effective decisions.

Principals must correspond with large numbers of people. Word processing can help principals improve written communication with parents and staff. The ability to save, delete, correct, and print timely correspondence is an advantage (MacNeil & Delafield, 1998). Word processing or desktop publishing can improve the appearance of correspondence with artistic designs or graphics.

Principals can use technology for administrative functions. Weekly memos to staff members, schedule changes, lesson plans, and meeting minutes can be handled by email (Starr, 2001). School news can be broadcast over the school cable system. A school webpage can provide a description of the school and its mission, school highlights, and upcoming events (Starr).

Computers can have a positive impact on the productivity of principals as managers and instructional leaders and can be perceived as a valuable tool. A favorable attitude contributes to computer adoption by principals (Riggs, 1993). Riggs studied influences that had a positive effect on secondary administrators' adoption of computers for administrative functions. The population was 350 principals in Indiana schools. A random sample of 100 principals took part in the study. The return was 70%. Principals who used computers to perform administrative functions were considered adopters (60%). Adopters had a more favorable attitude toward computer use than non-adopters.

Virginia's Standards of Performance for Using Computers in the Administration of Schools

In its Six-Year Educational Technology Plan, the state of Virginia identified eight standards for the proficiency of principals in using technology. These standards, recommended by the Technology Task Force (1996), are the performance criteria all instructional personnel, including principals, must meet as a part of their responsibilities in becoming computer literate. Principals are expected to:

1. Operate a computer system and utilize software.
2. Apply knowledge of terms associated with educational computing and technology programs.
3. Apply productivity tools for professional use.
4. Use electronic technologies to access and exchange information.
5. Identify, locate, evaluate, and use appropriate instructional technology-based resources to support the Standards of Learning and other instructional objectives.
6. Use educational technologies for data collection, information management, problem-solving, decision making, communication, and presentations.

7. Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.
8. Demonstrate knowledge of ethical and legal issues relating to the use of technology. (Technology Standards for Instructional Personnel, Code of Virginia, § 22.1-16, 1998)

Several items on the questionnaire used in this study relate to the standards. Standards one and two—(1) operate a computer system and utilize software and (2) apply knowledge of terms associated with educational computing and technology programs—are on the questionnaire under hardware and software use as the following: (1) Use a computer to accomplish a word processing task; (2) Use commands necessary to activate a printer to secure a hard copy; (3) Use a computer to run specific programs; (4) Use a modem; (5) Access information and download pictures on a CD-ROM; (6) Use a digital camera to take pictures; (7) Set up a computer and peripheral devices; (8) Use a scanner to scan data, graphics, and photos; and (9) Evaluate software for administrative purposes.

The "Administrative Proficiency" section on the questionnaire includes items on whether principals can apply productivity tools for professional use (Standards 3, 4, 6, and 8). The items are (1) Create your own database, (2) Use a program for developing budgets and cost projections, (3) Retrieve information from a student database, (4) Create and present an electronic slide show using presentation software, (5) Practice the responsible use of technology (regarding copyrights and site licenses), (6) Create and enhance transparencies with the use of a scanner, (7) Use word processing software for professional work, (8) Use and create spreadsheets for a variety of tasks, (9) Use presentation software, and (10) Use a program to disaggregate and analyze information for solving problems.

The use of electronic technologies to access and exchange information (Standard 4) is included under "Internet Use" on the survey. Respondents indicated if (1) their computer at home was connected to the Internet, (2) their computer at school was connected to the Internet, (3) they used the Internet for administrative purposes, (4) they used the Internet to send email, (5) they used a search engine to conduct Internet searches, (6) they used a web browser to explore resources, and (7) they were able to configure a browser.

The "Instructional Proficiency" section on the questionnaire relates to principals using educational technologies for data collection, information management, problem solving, decision making, communication, and presentations (Standard 6). Instructional uses on the survey are (1) Record observations in the classroom, (2) Monitor student achievement for specific objectives, (3) Monitor students' grades, (4) Create a master schedule, (5) Write up classroom evaluations, (6) Monitor achievement data, (7) Record discipline referrals, (8) Locate curriculum resources, (9) Develop or write curriculum, and (10) Create graphs and charts.

Performance standards can lead to computer literacy. Clearly defined standards provide a reference point for defining specifics of what principals should know and be able to do to become effective users of technology (Collaborative for Technology Standards for School Administrators, 2001). Competence is a key to the use of computers by principals on a daily basis. In Virginia, each school division is responsible for implementing a system for monitoring and certifying that the standards have been met. Principals prepare a PowerPoint presentation, a spreadsheet, a word processing document, and attend several classes.

In the year 2000, forty-five states had in place or had created state standards in the area of technology (Slowinski, 2000). In conjunction with these initiatives, several states had passed mandates requiring teachers and principals to demonstrate technology competence. The

movement toward standards and accountability set the stage for other states to create similar mandates (Slowinski).

President Bush outlined his technology and education plans for higher standards, accountability, and annual student assessments in the No Child Left Behind Act of 2001 (2002). The Bush technology plan is brief, but President Bush outlined five proposals, including consolidating technology grant programs and e-rate funds into performance-based grant programs. He wanted to reduce paperwork, increase flexibility in allocation of funds, and grant schools money for Internet filters.

The No Child Left Behind Act of 2001 (2002) has significantly raised expectations for states, local educational agencies, and schools. The purpose of the legislation was to build on high quality accountability systems that States have in place for assessments and accountability (Paige, 2002). All states have made efforts to develop and implement high quality accountability systems based on challenging standards and assessments and high expectations for students.

Accountability is central to the success of the No Child Left Behind Act of 2001 (2002). States must establish a definition of "adequate yearly progress" (AYP) to use each year to determine the achievement of each school district and school. Schools are held accountable for the achievement of students. This is a core goal in the act.

States were required to submit definitions of "adequate yearly progress" beginning 2003. The NCLB Act (2002) set the following minimum requirements for statewide accountability systems:

1. A single statewide accountability system is applied to all public schools and LEAs (local education agencies).
2. All public school students are included in the state accountability system.
3. A state's definition of AYP is based on expectations for growth in student achievement that is continuous and substantial, such that all students are proficient in reading and math no later than 2013-2014.
4. A state makes annual decisions about the achievement of all public schools and LEAs.
5. All public schools and LEAs are held accountable for the achievement of individual subgroups.
6. A state's definition of AYP is based primarily on the state's academic assessments.
7. A state's definition of AYP includes graduation rates for high schools and an additional indicator selected by the state for middle and elementary schools (such as attendance rates).
8. AYP is based on separate reading/language arts and math achievement objectives.
9. A state's accountability system is statistically valid and reliable.
10. For a school to make AYP, a state ensures that it assessed at least 95% of students in each subgroup. (p. 4)

The Interstate School Leaders Licensure Consortium (Blake, 2000) recognized the importance of technological competence for school principals and established the following competencies for principals:

1. The administrator has knowledge and understanding of:
   a. Information sources, data collection, and data analysis strategies.
   b. Current technologies that support management functions.
2. The administrator facilitates, processes, and engages in activities ensuring that:

a. Assessment data related to student learning are used to develop the school vision and goals.
b. Technologies are used in teaching and learning.
c. A variety of sources of information are used to make decisions.
d. Student learning is assessed using a variety of techniques.
e. Multiple sources of information for performance are used by staff and students.
f. Organizational systems are regularly monitored and modified as needed. (p. 62)

The standards for technology focus on the role of leadership in enhancing learning and school operations through the use of technology (Collaborative for Technology Standards for School Administrators, 2001). The Virginia Standards describe what school principals need to be effective users of technology in schools. The assumption of the developers of these standards is that principals should be competent users of information and technology tools that are common to information-age leaders.

The Principal's Role in Managing Data Related to the No Child Left Behind Act

The principalship is probably the single most powerful force for improving school effectiveness and accountability (Archer, 2004). The effective schools movement began to establish links between principals who focused on instruction and statistically significant improvement for students in schools (Fullan, 2002). A focus on accountability with emphasis on student and school improvement imposed new demands on principals (Boris-Schacter & Langer, 2002).

Virginia's accountability system under NCLB establishes guidelines for every school and local education agency. The accountability system encompasses school-wide student performance. Each public school is required to make adequate yearly progress under the state accountability system. Elementary school principals must be able to disaggregate data based on three annual targets that will be applied to all public schools and local education agencies (Virginia Board of Education, 2005). These targets or goals include:

1. One set of annual measurable objectives for reading/language arts.
2. One set of annual measurable objectives for mathematics.
3. One set of annual measurable objectives for attendance and science. (p. 13)

The current accountability system requires a certain percentage of students school-wide to score at least at the proficient level on statewide assessments in mathematics, science, English and history or the social sciences for schools to be eligible to receive one of two accreditation ratings. The accreditation ratings include:

- A combined accreditation pass rate of at least 75 percent on English tests in grades 3 and 5 is now required for full accreditation. Elementary schools also must achieve an accreditation pass rate of at least 70 percent in mathematics and in grade 5 science and grade 5 history, and pass rates of at least 50 percent in grade 3 science and grade 3 history. Previously, the science and history scores of students in grade 3 counted only if they improved the school's rating.
- The provisional accreditation categories for ratings earned during 1999-2000 through 2002-2003 no longer exist. Schools are now either fully accredited or accredited with warning, except in the cases of alternative schools with approved or pending alternative accreditation plans. (Virginia Board of Education, 2004b, p. 17)

Principals must interpret Standards of Learning data by downloading information from the data disaggregator or some other accountability system used by the school district. AYP information on student achievement at each proficiency level on the state academic assessments is disaggregated by race, ethnicity, gender, disability status, migrant status, English proficiency, and economic disadvantagement. Data are not disaggregated if a number of students (50) in a category (disabled, migrant, limited English proficient, economically disadvantaged) is insufficient to yield statistically reliable information (Virginia Board of Education, 2005).

Accountability Information Management Systems for Virginia

Accountability information management systems provide assessment information to schools and school districts. To meet the NCLB federal requirements, web-based accountability systems were required to be implemented (Pearson Educational Measurement, 2005). The system had to provide access to data and decision support tools via the Web to state, division, and school educators, policy-makers, legislators and others, parents and the public; ensure compliance with state and federal laws that protect the confidentiality of student information; improve educational decision-making; provide longitudinal analysis of individual progress; and provide multiple years of disaggregated student data. Virginia's Educational Information Management System (Pearson Educational Measurement, 2005) is available to assist principals.

Staff development for principals is a part of the implementation of a management system (Hargreaves & Fink, 2003). Principals must be able to interpret data, read reports, use decision support tools, and review information that show gaps in student mastery and retention.

The use of a data disaggregator has become essential as a decision-making tool. The disaggregator can help a principal at a school site regardless of location and demographics. The principal can pinpoint student achievement gaps by subject, reporting category, and skill. He or she can identify curricular and instructional areas that need attention. Intervention programs and strategies can be provided to teachers for each student. A principal can assess which students have demonstrated mastery and which need remedial attention.

The Selection and Use of Computers by Principals in the Administration of Schools

The purpose of this section is to discuss the selection of hardware and software, the use of computers in decision-making, the use of computers in instructional evaluation, and the use of computers to retrieve and send information over the Internet. The effective selection and use of computers by elementary school principals are essential in the administration of schools.

The Selection of Hardware and Software

Knowledge of computer hardware and software is important for principals. Principals must decide what administrative and instructional functions they want to perform with computers before making purchases. Decisions about hardware and software purchases must be made together to assure compatibility.

Software for the computer allows principals to perform certain functions and create specific documents such as text documents, spreadsheets, and graphs. The identification of the tasks principals want to accomplish should determine the type of software needed (Creighton, 2001). A decision as to what applications are fundamental to a school's program is important. Types of software programs may be confusing if principals are not familiar with the programs. A software program with certain specifications must have a computer that handles those specifications.

Understanding the types of software available is essential. Software programs that analyze test data; calculate scores; compare test scores; and summarize, organize and simplify data can assist principals in their day-to-day decisions. The effective use of software allows principals to gain meaningful information (Creighton, 2001).

Evaluation of hardware is essential when purchasing. Input, output, and peripheral devices are hardware components to be considered (Mullins, 1996). Knowledge of the different parts of a computer system is essential before the purchase is made.

Peripherals are added to the basic computer. Components such as a monitor, CD ROM drive, CD Burners, DVD drive, and speakers may be built into the design of the computer or they may be purchased separately. Peripherals can enhance the capability of computers.

Printers are peripherals that will produce an image on paper (Charp, 1999). Dot matrix, ink jet, and laser are major types of printers. Principals should select printers that serve the needs of their schools. Price, printer capability, and the cost of ink cartridges or toner should be considered when making the purchase.

Cost is an important consideration when purchasing a computer unit. Funds should be available to purchase quality equipment. Inexpensive hardware may not meet the needs of the principal and may not handle most software specifications (Shields, 2001). Adequate funding of hardware and software can keep principals up to date with innovations and resources (Hopkins, 2002). Reliability should be a factor when purchasing.

Principals should utilize good judgment in selecting appropriate hardware and software. Selection should reflect the goals and objectives of the school. A request for previewing software programs is a fundamental prerequisite before purchases take place (McNabb, 1999). Programs should be user friendly and compatible with standard programs used in the school district.

Principals must keep abreast of new technologies to make informed decisions when purchasing hardware and software. As technology keeps changing, new software and hardware become available (Valdez, 2004). Knowledge of the new software and hardware helps principals choose equipment appropriate for improving management and instructional tasks.

Competence in operating a computer and in utilizing software may improve the quality and efficiency of administrative performance in schools. Improved quality could lead to improved decision-making. The ability to access information using the proper computer tools allows principals the opportunity to obtain data that are critical in supporting the goals and objectives of the school.

The Use of Computers in Decision Making

School administrators in the Information Age and the Age of Technology must possess computing capabilities (Brazell, 2003). Computers give principals the capability to evaluate options before making decisions. Good decision making involves getting the information and data required to increase accountability and enhance management.

Computers help with budgeting and financial accountability. Budget projections and accounting data can be easily calculated and manipulated (Hopkins, 2004). With these capabilities, principals use less time for these functions.

When computers first arrived, their initial selling point was their word processing capabilities—inputting, revising, collating, and distributing vast quantities of information. Software packages were designed explicitly to assist principals in using time more efficiently and in making decisions regarding resource allocations (Betz, 2000). The use of software for word processing has changed. An integrated management system that combines database

programs, spreadsheets, word processing, graphics, pictures, and communications emerged (Rose, 2001).

There are many ways principals use computers for management, among them are word processing, electronic mail, data management, and information gathering. Word processing applications are used to create documents and slides. Corrections to the documents are made through editing, deleting, recomposing, revising, combining, and rearranging information for viewing and presenting before the final product is printed (Johnson, D., 2005). Documents can be saved and retrieved as needed. The computer enables principals to create and save correspondence without retyping the entire document each time. A wide array of formats can be used to produce flawless copies.

Presentation software can be useful to principals. Presentation software such as PowerPoint conveys important information at meetings using graphs, charts, and pictures (Tooms, Acomb, & McGlothlin, 2004). Presentation software has a format that is interesting, easy to read, and of a high quality. The presentation software is a valuable tool in improving communication in a formal setting.

Program applications link computers to other technological tools for the purpose of exchanging information. Principals can use electronic mail to generate information that can be sent and received using the Internet. A paper copy of the information can be produced from the email. Information can be distributed and received worldwide as well as within schools (Stegall, 1998).

Data can be stored, analyzed, retrieved, and manipulated with data management systems. Management programs such as Microsoft Office and Microsoft Workplace have systems that give principals the capability of accessing data when needed (Starr, 2001). The ability to enter data that can be accessed instantly is an advantage to principals. Data on attendance, grades, and class schedules can be collected and adjusted quickly. Numbers can be adjusted and calculated promptly as new data are entered (Collins, 1991; MacNeil & Delafield, 1998).

Computer networks are instrumental in helping principals manage schools. Network access offers principals the opportunity to receive information and data from a variety of sources. The option of connecting the computer to various networks gives principals another means of gathering information using different databases. Data can be sent and received. Access to the Internet can assist with research, and a wide range of data can be used for administrative tasks and purposes (Blake, 2000).

Internet access using search engines and navigation tools allows principals to communicate with staff and collect, analyze, and share data for instructional and educational decision-making (Hopkins, 2004). Access to the Internet can assist principals in obtaining information when making decisions about instructional materials and support, educational and professional development opportunities, and educational grants.

As administrative and instructional leaders in schools, it is essential that principals model computer use for faculty and students. The modeling of effective computer use may increase the desire of the staff and students to become effective computer users (Anderson & Anderson, 2001). Principals participating in the Indiana Principals' Technology Leadership Training Program (Rockman & Robinson, 1993) felt it was important for students and teachers to see principals "playing" with computers. The principals noted that it was important to become role models if they expected teachers and students to use computers. A willingness by principals to support the use of computers in school must be modeled through concrete actions of principals (Vesh, 2003). This is especially true for new technologies.

Principals can use the computer to enhance the principal's role in the educational process. The use of computer tools and applications may help streamline record keeping and administrative tasks. Frequent computer use can reduce workloads and free up time to allow principals to perform other instructional and administrative tasks (Wade, 2001).

The Use of Computers in Instruction

Principals perform instructional tasks as instructional leaders. The evaluation of teachers' instructional performance is a part of the principal's responsibility. Evaluations can help determine whether the goals and objectives of the curriculum and the technology plan are being met (McNabb, 1999).

A computerized grading system is a valuable benefit to principals (Miller, 2000). Grades can be calculated, sorted, and summarized. The submission of grades and a printed report can be generated quickly. Once the grades are entered, the data can be stored, retrieved, and sent from any location to be used as necessary.

Lesson plans can be created using the computer. A copy of the plan can be forwarded electronically to the principal. Comments and suggestions can be written on the plan, saved, and submitted to the teacher. Changes to the plan can be edited, deleted, retyped, saved, and resubmitted to the principal (Roland, 2003/2004).

Computer-generated test questions can be saved and retrieved for evaluation. A paper copy can be produced and forwarded to the principal. The copies are clearer and easier to read and score (Archer, 2004). More recent revisions permit tests to be taken and scored electronically. Results are automatically stored. Summary reports are prepared with a few key strokes (Archer).

Report cards, attendance reports, test results, and transcripts are generated daily at the school level (Miller, 2000). A computerized grading system provides quick turnaround between the time grades are submitted and reports are printed. In a case of urgency for the final grade reports, the computer can process the grades and print reports in a matter of hours (Shields, 2001).

The use of computers for student scheduling, automated test scoring, and library inventory can save principals time and allow them to obtain information quickly and efficiently (McKenzie, 2003). Access to information is vital to the school principal when data are required for various reports. Principals must have access to and provide critical data for instructional budgets, attendance, enrollment projections, class schedules, and emergency contacts (Tooms, et al., 2004).

Instructional Management Systems

Instructional management systems use technology for tracking student progress to improve instruction and assessment (Cafolla & Schoon, 2001). The implementation of an instructional management system allows principals to align state standards with curriculum, instruction, and assessment. Such a system provides data to measure student progress on state, local, and national goals and objectives.

An instructional management system serves as a means of revitalizing the process of continuous school improvement (Elias, Cafolla, & Schoon, 2000). In describing the system used in Palm Beach County, Florida, the authors explained, "The system allows for the acquisition and use of information for data-based decision-making" (Elias, et al., 2000, p. 125). These systems allow principals to gather, manage, and analyze data for changing and improving

curriculum (Rose, 2001). Immediate access to information and data gives principals tremendous resources for communicating efficiently, documenting events, and maintaining accountability (Rose).

Instructional management systems must have large storage capacity, fast connections, graphical interfaces, and other advances that are user friendly (Hopkins, 2004). "The software for the systems should be designed to the maximum extent around the habits and needs of the principals" (p. 2). Principals should fully utilize the software to promote standards within the school, track student and school progress, report information, and analyze and evaluate results.

The Use of Computers to Retrieve and Send Information Over the Internet

The Internet has dramatically changed the way our society accesses information and resources. The Internet is a set of interconnected networks that share a common address. Commercial networks such as Netscape, Internet Explorer, and America Online serve as means of accessing remote databases, bulletin boards, electronic magazines, and newsletters that can help principals search for and collect needed facts (Barker, 1995). Since Barker's time, the Internet has expanded search capabilities, especially through Google. Information is widely available; however, the quality of that information varies greatly. "Buyer beware" is advice all principals need to heed.

New applications make the Internet easily available to principals. The use of the Internet to look for information using application software such as Netscape Navigator or Microsoft's Internet Explorer allows principals to link to Internet sites that contain text, graphics, and other media. The Internet and web browsers allow principals to research and locate information and data from around the world (Bliss & Heintzman, 2003).

Principals can network, communicate, and collaborate utilizing electronic mail, distribution lists, and newsgroups (Van Horn, 1995). Information is exchanged through numerous types of databases and file transfers using a multitude of search tools. File exchanges make it possible for principals to copy and transfer files from one computer system to another (Hopkins, 2002; Rose, 2001).

Principals are required to communicate with a wide variety of audiences on matters such as current educational research, policy issues, and curriculum assessments. The Internet presents principals with another approach for accessing resources. Information can be gathered, organized, and presented when needed (Shoemaker, 1997). This information can help principals make informed decisions on policies and issues by communicating globally with schools and other principals.

Principals are sometimes overwhelmed by the demands of their jobs. Internet use in the workplace can help principals change the way information is accessed and communicated. In this era of information technology principals must keep in tune with the challenges and opportunities the Internet has to offer (Vesh, 2003).

Internet access has become increasingly important for principals in schools. The type of network connections and the speed at which principals are able to connect to the Internet have changed since the mid 1990's (Lonergan, 2000). Many principals have dedicated, high speed connections to the Internet while at school. These connections allow principals to access all types of resources and increase information available to them.

The Internet can be used to support and reshape decisions that require actions that are interrelated and interconnected (Archer, 2004). The World Wide Web can help build new partnerships of collaboration between principals and districts. In the questionnaire used in this

study, principals are asked about Internet connections at home and school, their use of the Internet to send email, and their use of search engines to conduct Internet searches. Respondents are asked to list their purposes for using the Internet.

The Training of Principals for Using Computers

Competence in using computers requires a positive attitude, practice time, and staff development in computer use (Starr, 2001). A plan for training should focus on the needs of principals. Consistent and continuous training can raise the proficiency of principals.

Principals receive training in four ways: in-service programs or workshops, college courses, self-teaching methods, and conferences (Celata, 1998). In a study of 36 elementary principals in northeastern Illinois it was found that most principals received training through a self-teaching method (Tiede, 1992). The percentage of elementary principals self-taught was 44.4% or 16 out of 36 respondents. The percentage of respondents receiving formal training through a workshop program was 25% or 9 out of 36 respondents.

Approximately two-thirds of secondary principals (67.3%) in Virginia received training through in-service programs (Celata, 1998). Nearly ten years earlier, a little over 51% of the secondary principals in Virginia received training through in-service programs (Armistead, 1989). Graduate courses in computers ranked as the second most common type of training for secondary principals in 1989 (41%) (Armistead) and in 1997 (21%) (Celata). The two researchers concluded that a majority of secondary principals in Virginia received most of their training in computer use through in-service programs provided by the school district.

An example of a statewide effort to train principals is the Indiana Principals' Technology Leadership Training Program (Rockman & Robinson, 1993). Early in the 1990's, Indiana focused training on computer programs that principals had access to and were expected to use for administrative purposes. Approximately 400 school principals in the state participated. The training took place on four days during the school year. During training, principals were exposed to a variety of software and hardware and received a $500 technology incentive stipend. The principals agreed that this training increased personal growth and gave them an opportunity to learn something new. Training improved management and administrative skills, which helped principals become more organized and efficient.

Technology training allows principals to use applications that increase productivity. Training should help principals identify computer needs beyond the basic computer skills. Training in computer use should help principals become proficient users to meet the challenges they face in a changing technological society (Peterson, 2002).

Technology training programs for principals were few (Nikovits, 1997) in the mid-1990s. Most programs focused on the use of hardware and software. Little attention was placed on obtaining the knowledge and skills needed to make instructional and fiscal decisions, learning applications to foster productivity, and evaluating computer education programs for practice in the classroom.

Training affects principals' use of computers. Riggs (1993) studied the adoption of computers for administrative functions by secondary principals in Indiana. The results indicate that secondary principals who utilized computers in their schools were more than twice as likely to have had formal training than the principals who did not utilize computers in their schools. Formal training may be a factor in determining attitudes toward computer adoptions.

Effective and extensive training is needed to use a new tool or strategy (Lim, 1999). One way to learn to use a computer is to practice and work with it. Lim identified other ways to

provide technology training: after school mini sessions, full-day or half-day in-services, and summer training.

Respondents to the questionnaire used in this study were asked if they had completed a formal computer course, the number of professional technology courses completed, the type of formal computer class or course completed, and, if they had no formal training, how they learned to use the computer.

Laptop Computers

Laptop computers can be used as a desktop computer with connections to a color monitor, full-sized keyboard, printer, and other peripherals (Rose, 2001). Laptops provide flexibility that helps principals to become more productive and efficient. Principals can record notes immediately instead of entering notes on paper. Teacher observations can be recorded in the classroom on a notebook-sized unit (Shields, 2001).

The smaller sized computer takes up little space. The unit is stored in a desk or drawer. It can be used away from the office. Laptops have a battery backup that comes in handy in travel situations. The capability and versatility of the units can help principals use time effectively by creating and editing documents, finding online information, installing and storing pictures and images, and downloading data and applications (Roschelle, 2003).

The increased and continuing improvements in portable computing make laptops an attractive option for principals. Mobile wireless computers have become bargains in cost and flexibility (Miller, 2003). Laptops are easy to set up and learn to use. They deliver access to the world, provide flexibility, enhance collaboration, and provide immediate recording of data.

The sampled elementary principals were asked if they used a laptop computer.

Personal Digital Assistants

Personal Digital Assistants (PDAs) are handheld computers that are versatile and serve as organizers for personal information (McFadden, 2001). The tiny units can be expanded using a variety of peripheral devices. External keyboards facilitate data entry and allow the PDA to be used as a word processor (Johnson, D.G., 2005). Modems, wireless networks, and high-speed connections provide access to the Internet and phone networks for sending and receiving data and messages (Dean, 2001).

Principals use PDAs to organize meetings and write agendas. Information can be sent to staff members as a memo. The information is shared quickly, enhancing collaboration. Reports, figures, and other types of data can be stored (Roland, 2003/2004). Important documents and forms can be sent to a printer directly from the personal digital assistant (Hooft, 2003). Personal digital assistants can be useful for communication, inventory, record keeping, and tracking equipment.

These technologically advanced handheld computers are more affordable, more mobile, more accessible, readily available, and have limitless possibilities (Tooms, et al., 2004). Handhelds can help principals become efficient and organized when maintaining instructional records, transferring information between work and home, conducting classroom observations, managing and accessing data, and distributing information (Hooft, 2003). The devices are available with attachable keyboards, voice recorders, Internet access, and user sensitive writing screens (Brazell, 2003).

The sampled elementary school principals were asked if they used a personal digital assistant (PDA). A PDA user was considered a "high tech" user of technology and one who

would score higher on the measures of proficiency. These relationships were explored in the analyses.

The Planning That Principals Do for the Use of Technology in Their Schools

Technology planning by principals is important. A planning committee, mission statement, vision, goals, and evaluation are components of a successful plan. The plan is a comprehensive view of how technology supports the instructional process and what the school hopes to achieve using technology. A thoughtful technology plan should include how technology will be used and implemented effectively in schools (Barnett, 2001).

An organized planning committee in the school is a first step in planning for technology. The committee may include the principal, district coordinator, and several teachers. The committee creates a plan for implementation. Realistic and clearly stated objectives and strategies that align with the district-wide school improvement plan should be included (Massachusetts Department of Education, 2004-2007).

The role that technology will play in the school is a part of the school's vision. Technology vision statements express the value and need for technology within the school. The statements describe how technology will be used and how staff will use it for data-driven decision making, increased productivity, and planning (Barnett, 2001). A vision of the role technology plays in the school district gives the individual school a sense of direction for establishing priorities. Vision statements are used as a foundation for a formal technology mission statement (Barker & Hall, 1996).

A mission statement is written to show the relationship of technology to learning (Archbald, 2001). The statement expresses the school's values and beliefs about technology and learning. A mission statement creates a means of communicating to staff, parents, and community about how technology is envisioned within the school and the district (Nagy, 1996).

Barnett (2001) suggested a ten-step planning process:
1. Create a vision statement.
2. Involve stakeholders.
3. Gather data to determine where you are in order to plan for the future.
4. Review the research to find out about the use of technology.
5. Integrate technology into the curriculum.
6. Commit to professional development.
7. Ensure a sound infrastructure that will support and maintain the technology.
8. Allocate appropriate funding and budget.
9. Plan for ongoing monitoring and assessment.
10. Plan for tomorrow to allow for new technologies. (p. 1)

As instructional leaders, principals should have a plan developed for integrating technology into the instructional program (Brockmeier, Sermon & Hope, 2005). Technology refers to more than computers. It should include an array of new technologies such as video, digital cameras, handheld computers, and other devices still in development. Technology planning (Florida Department of Education, 2004) should include the following steps:
1. Creation of a vision statement that describes how students will be using technology. Statements should indicate how teachers and the staff will use technology for data-driven decision making, increased productivity, and planning.
2. Involvement of all stakeholders to give them an opportunity to have input into the goals of the plan.

3. Gather data to understand where the school is in order to plan for the future.
4. Review what the research says about the impact of technology on student learning.
5. Integrate technology into the curriculum. The content standards and the technology being used should match.
6. Commit to professional development by providing appropriate training for effective use of technology.
7. Ensure a sound infrastructure is in place to have appropriate resources to support and maintain networks and equipment.
8. Allocate appropriate funding and budget in line with the district or school's financial resources.
9. Plan for ongoing monitoring and assessment with benchmarks and timelines.
10. Plan for future technology to allow for new and promising practices and technologies. (p. 10)

Slowinski (2000) suggested that full integration of a technology plan within a school should "(1) be advantageous to teachers, (2) be compatible with needs and expectations, (3) be simple to use, (4) be easily tried without a huge commitment to change, and (5) be observable and modeled by staff who embrace technology" (p. 2). Principals must be prepared to embrace technology and integrate technology into the school. Principals should concentrate on building a school culture in which teachers use technology in teaching and learning.

The effects of technology in schools are identified through assessment. An assessment plan can help identify successful and unsuccessful activities when using technology, help maintain alignment of established priorities, help establish timelines for monitoring performance, and help target areas that need revisions. The assessment plan must be continuously evaluated and adjusted to take advantage of new technology resources, priorities, and interests of the school (Mehlinger, 1997).

Technology cannot exist in isolation within the school. Technology must be made an integral part of the instructional process. Factors that help technology succeed include (1) evidence of a detailed technology plan, (2) training of the principal and teachers, (3) support from the principal, (4) support from the community, and (5) support from the school system (Kosakowski, 1998).

The principal's leadership is vital to the successful planning of technology. It is through this leadership that the needs of the school are identified and communicated (Todd, 1999). The principal should lead the school to fully embrace the concept and vision of technology. The school is the vital place associated with successful implementation of technology (Tooms, et al., 2004). Principals help determine the role computers play as the technology plan is implemented.

Summary

Literature reviewed indicated a need for principals to be proficient in utilizing the computer to assist in administrative and instructional functions (Blake, 2000; Celata, 1998; Lim, 1999; Starr, 2001; Wade, 2001). The main topics covered were the historical role of the principal in schools, data-based management in schools, the current role of the principal and the value of computers, Virginia's standards of performance for using computers in the administration of schools, the principal's role in managing data related to the No Child Left Behind Act, the selection and use of computers by principals in the administration of schools, the selection of hardware and software, the use of computers in decision-making, the use of computers in instruction, instructional management systems, the use of computers to retrieve and send

information over the Internet, the training of principals for using computers, laptop computers, personal digital assistants, and the planning that principals do for the use of technology in their schools.

CHAPTER III

METHODOLOGY

The methodology is described in this chapter. The population and sample, questionnaire development and testing, data collection procedures, and data analysis procedures are described.

Population

The population was public school elementary principals in a national data bank maintained by Quality Education Data in 2002. An elementary principal was a person who supervised any grades kindergarten through eight. The bank contained the names of elementary school principals in the 50 states and the District of Columbia who responded to Quality Education Data's request for information in 2002. The database had 53,978 elementary school principals. The number of females in the database was 30,755 (57.0%), and the number of males was 23,223 (43.0%).

Sample

Officials at Quality Education Data drew a random sample of 400 elementary school principals. The sample of 400 was based on guidelines for sample size recommended by Krejcie and Morgan (1970).

Proportional stratification by gender was requested to ensure that males and females were included in the sample in a representative manner. The sample had 228 (57.0%) females and 172 (43.0%) males. Grade spans and enrollment ranges for the schools of the sampled principals are in Table 2.

Four hundred questionnaires were mailed. Two hundred fifty-three (63.3%) questionnaires were returned. The number of early returns received by the return date (January 21, 2003) was 138 for a return of 34.5%. The number of late returns received after the return date was 115 for an additional return of 28.8%. Two hundred fifty-two questionnaires were usable (63.0%). One questionnaire was blank and unusable. There were 106 males (42.1%) and 143 (56.7%) females in the usable responses. Three people did not record their gender.

Table 2
The Sample of Public Elementary School Principals by Grade Span and Enrollment

Grade span	Enrollment							Total
	Under 100	100-299	300-499	500-749	750-999	1000-1499	1500+	
PK-K	2	5	3	1	0	0		11
K-1	1	4	7	4	1	0		17
K-3	8	66	116	85	26	8		309
K-6	8	17	9	5	5	3		47
K-8	1	11	2	1	0	1		16
Total	20	103	137	96	32	12		400

Instrumentation

A questionnaire was developed and tested for content validity and reliability. The content for the questionnaire came primarily from the review of the literature and previous surveys.

Development of the Questionnaire

Nine domains were identified for the survey. Four domains were based on the domains from Celata's (1998) survey, and five domains were based on the review of literature on computer use by principals. Questionnaire items were adopted from Celata's 1998 questionnaire and from other survey instruments on the use of computers by school administrators (Armistead, 1989; Mikulcik, 1993; Molindo, 1997; Mullins, 1996; Preston, 1994; Riggs, 1993; Shoemaker, 1997; Technology Task Force, 1996; Tiede, 1992).

The domain "demographic information" was taken from the surveys of Celata (1998), Mikulcik (1993), Mullins (1996), and Tiede (1992). Two questions (What is your age? What is the highest degree you have earned?) were added to acquire more specific information. Six questions were in the domain. The principals were asked to indicate their total years of administrative experience, gender, age, highest degree earned, home computer ownership, and ethnicity (see Appendix D).

The questions under the domain "administrative use of computers" were taken from the surveys of Celata (1998) and Armistead (1989). Principals indicated whether they used computers for administrative functions, the type of computer platforms used, and how often computers were used for administrative purposes. Three questions were in the domain.

The domain "Internet use" came from the review of literature and a review of surveys by Shoemaker (1997) and Molindo (1997). Principals indicated if their computer at home was connected to the Internet, if their computer at school was connected to the Internet, if the Internet was used, if the Internet was used to send email, if a web browser or search engine was used to conduct Internet searches, if they could configure a browser to manage various functions, and any other administrative purposes for which the Internet was used. This domain had eight items.

The domain "hardware and software use (proficiency)" was based on a review of surveys by Celata (1998) and Armistead (1989) and on the Virginia Technology Standards for Instructional Personnel (Technology Task Force, 1996). Principals described their level of proficiency using the computer. They were asked to indicate their level of expertise in operating a computer and using software. The items included use of hardware and software to accomplish a word-processing task, to activate a printer, and to run specific programs; to operate a modem; to take and process digital pictures; to operate a scanner; and to access information on a CD-ROM. Further, they were asked if they could set up a computer and peripheral devices and evaluate software for administrative purposes. They were asked to list other uses as well.

The domain "instructional proficiency" came from a review of surveys by Celata (1998), Mullins (1996), and Mikulcik (1993). Principals indicated their level of proficiency in several instructional tasks. These tasks included recording observations in the classroom, monitoring student achievement for specific objectives, monitoring students' grades, creating master schedules, writing classroom evaluations, monitoring achievement data, recording discipline referrals, locating curriculum resources, developing or writing curriculum, and creating graphs and charts.

The domain "administrative proficiency" was based on questionnaire items from Celata (1998), Armistead (1989), and from the Virginia Technology Standards for Instructional Personnel (Technology Task Force, 1996). Principals indicated proficiency using spreadsheets,

creating databases, developing budgets and cost projections, retrieving information from a student database, creating and presenting electronic slide shows, creating and enhancing transparencies using a scanner, using word processing software for professional work, using programs for disaggregating and analyzing data, using presentation software, and practicing the responsible use of technology regarding copyrights and site licenses. They were asked to list any other uses not listed.

The domain "training" came from surveys by Riggs (1993), Preston (1994), and Mikulcik (1993). The principals were asked if a formal class or course was taken to acquire proficiency and how many professional courses in technology they had completed. If courses were not taken, principals were asked to report how they learned to use the computer. If they had taken courses, they were asked to report the type of computer course or class completed.

The domain "effects of computer use" came from survey instruments by Armistead (1989), Celata (1998), and Preston (1994). The principals indicated how their use of time has been changed by the computer. Space was provided to write the amount of decreased time spent on paperwork and the number of hours per week released for other tasks. Other questions relating to the effects of computer use by principals included whether computer use freed the principal from routine paperwork, improved the quality and accuracy of work, made little difference in the amount of time or quality of work, or consumed time that would be spent on conferences, in the halls, or in classroom observations. A blank was left for other responses.

The domain "attitude toward computers" came from a review of survey instruments by Armistead (1989) and Celata (1998). The principals indicated on a four-point scale their level of comfort with statements about computers. The six items included statements on computers relieving the tedium of administrative work, enhancing learning in classrooms, making teachers' lives easier, improving school and community communications, enriching the curriculum, and improving the lives of nearly everyone. Space was left for any comment principals wanted to make about their use of computers.

Content Validity of the Questionnaire

The review process for content validity involved five different groups reviewing the survey to determine comprehensiveness of content and proper domain placement and clarity of items. Once a draft of the questionnaire was prepared by the researcher, it was administered to fifteen reviewers to see if the items adequately represented questions on the use of computers by elementary school principals. The reviewers were administrators in a doctoral program at Virginia Tech. The reviewers suggested that the researcher continue to review other surveys and literature for additional questions.

A second group of six school administrators took the survey at two different times to ensure consistent, reliable responses and to gather feedback. The participants provided input regarding clarity by indicating whether each item was (1) not clear at all, delete; (2) somewhat clear, revise; or (3) very clear. The process helped determine the appropriateness of each item for inclusion on the survey. Feedback was recorded on the instrument for the researcher to delete or revise items that were not clear.

A third group of five reviewers—three principals, an assistant principal, and a superintendent—suggested three changes on the questionnaire: (1) clarification of questions under the domain "administrative proficiency," (2) the addition of two questions under "demographic information," and (3) the grouping of questions under each domain for easier scoring.

A fourth group of six reviewers—two middle school principals; two elementary principals; a visiting professor from Michigan State University in East Lansing, Michigan; and a professor from Florida A & M University in Tallahassee, Florida—provided additional input on the questionnaire. Both professors have doctorates in applied math with a concentration in computer science. The reviewers were selected because of their expertise and proficiency in using computers. Several questions and responses were edited for better clarification, and the instructions were clarified. Other adjustments included placing questions under each domain on the same page. The questions under "instructional proficiency" and "administrative proficiency" were reviewed for proper placement under each category. Authors were referenced for questions on the survey whenever possible (see Appendix F).

Finally, content validity was established for the items that were developed by the researcher through the use of specific feedback from ten independent reviewers—a superintendent, a facilitator for a Title I program, a reading specialist, a guidance counselor, an assistant principal, and five teachers. The questionnaire was composed of only those items on which the ten reviewers indicated an 80% to 100% agreement. Appendix F contains the content validation data. The final questionnaire is in Appendix D.

Reliability Coefficients
The reliability coefficients for instructional proficiency, administrative proficiency, hardware and software proficiency, and attitude of the responding elementary school principals are in Table 3. All scales have sufficient internal consistency to use the scale score in analyses.

Data Gathering Procedures
The questionnaire was sent in the United States mail to all members of the sample (see Appendix A). The Total Design Method of Dillman (2000) was followed in distributing and gathering the questionnaires. This method achieves good results and improves responses to mail surveys. A stamped, addressed return envelope was enclosed for respondents' convenience in returning the completed questionnaires.

Respondents were given approximately three weeks from the date of initial mailing to return the questionnaires. Approximately one week after mailing the questionnaires, a thank you postcard was sent to all potential respondents (see Appendix B). The postcard served both as a friendly reminder for non-responding individuals to respond and as a thank you to individuals who already responded. A replacement questionnaire was sent to all non-respondents approximately two to four weeks after the initial mailing. This mailing reminded the respondents that their completed questionnaire had not been received and urged them to respond (see Appendix C). A final contact was made using first class mail four weeks after the previous mailing.

All questionnaires were treated confidentially. An identification number was printed directly on each questionnaire. This number was included so follow-up mailings could be sent only to non-respondents. The number was added for convenience and to hold down confusion for respondents who had already responded.

Methods of Analysis
The Statistical Package for the Social Sciences (SPSS) was used to perform the required calculations. Four types of analysis were performed. First, descriptive statistics were calculated for all variables. Means, standard deviations, minimums, and maximums were calculated for continuous variables. Frequencies and percentages were calculated for categorical variables.

Second, the data were disaggregated by demographic variables, and inferential statistics were calculated to assess the relationships between the demographic variables and the computer proficiency variables. Third, the constant comparative method was used to analyze open-ended responses. Fourth, exploratory analyses were conducted to test for a "high tech" profile. The specific analyses are in Table 4.

Table 3

Alpha Reliability Coefficients for Proficiency and Attitude Scales

Scale name	Item numbers	Number of items in scale	Number of subjects	Alpha coefficient
Instructional proficiency	29, 30, 31, 32, 33, 34, 35, 36, 37, 38	10	235	.75
Administrative proficiency	40, 41, 42, 43, 44, 45, 46, 47, 48, 49	10	233	.87
Hardware and software proficiency	19, 20, 21, 22, 23, 24, 25, 26, 27	9	246	.86
Attitude[a]	57, 58, 59, 60, 61, 62	6	246	.85

[a] All items were reverse coded (1=4, 2=3, 3=2, 4=1).

Table 4

Statistical Analyses Applied to the Data

Criterion variable	Classification variable	Statistical analysis
Proficiency in using computers for instructional purposes[a]	*Years of administrative experience (1=1-5, 2=6-10, 3≥11)	One-way ANOVA
	*Gender (1=Male, 2=Female)	Independent t-test
	*Age (2=≤40, 3=41-50, 4=≥51)	One-way ANOVA
Proficiency in using computers for administrative purposes[a]	*Highest degree earned (2=BA/MS, 3=CAS/Ed.S., 4=Ph.D./Ed.D.)	One-way ANOVA
	*Ethnicity (1=Minority, 2=White)	Independent t-test
Proficiency in using hardware and software[a]	*Attitude toward computers	Pearson correlation
	*Proficiency in using the Internet	Pearson correlation
	*Frequency of administrative use (1=Daily, 2=Weekly)	Independent t-test
Proficiency in using the Internet	*Computer training—completed a formal course (1=Yes, 2=No)	Independent t-test
Overall proficiency in using computers[a]	*Computer training—number of courses completed (0=0 courses, 1=1 course, 2=2-4 courses, 3=≥5 courses)	One-way ANOVA
	*Computer ownership at home (1=Yes, 2=No)	Independent t-test
	*Personal digital assistant user (0=No, 1=Yes)	Independent t-test
	*Computers freed me from routine paperwork (0=No, 1=Yes)	Independent t-test
	*Computers improved the quality and accuracy of my work (0=No, 1=Yes)	Independent t-test
	*Computers made very little difference in time and quality (0=No, 1=Yes)	Independent t-test
	*Computers consumed time from other obligations (0=No, 1=Yes)	Independent t-test
	*Computers decreased time on paperwork (0=No, 1=Yes)	Independent t-test
	*Number of hours per week saved for other tasks	Pearson correlation

(table continues)

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Table 4 (continued)

Classification variable	Classification or criterion variable	Statistical analysis
Personal digital assistant use (0=No, 1=Yes)	Frequency of administrative use (1=Daily, 2=Weekly)	Chi square
	Proficiency in using the Internet	Independent t-test
	Computer training—completed a formal course (1=Yes, 2=No)	Chi square
	Computer training—number of courses completed (0=0 courses, 1=1 course, 2=2-4 courses, 3=≥5 courses)	Chi square
	Years of administrative experience (1=1-5, 2=6-10, 3≥11	Chi square
	Gender (1=Male, 2=Female)	Chi square
	Age (2=≤40, 3=41-50, 4=≥50)	Chi square
	Highest degree earned (2=BA/MS, 3=CAS/Ed.S., 4=PhD./Ed.D.)	Chi square
	Ethnicity (1=Minority, 2=White)	Chi square
	Computer ownership at home (1=Yes, 2=No)	Chi square
Frequency of administrative use (1=Daily, 2=Weekly)	Home computer connected to the Internet (1=Yes, 2=No)	Chi square
	School computer connected to the Internet (1=Yes, 2=No)	Chi square
	Use of the Internet (1=Yes, 2=No)	Chi square
	Use of Internet to send email (1=Yes, 2=No)	Chi square
	Use a search engine to conduct an Internet search (1=Yes, 2=No)	Chi square
	Uses a web browser to explore Internet resources (1=Yes, 2=No)	Chi square
	Ability to configure a browser to manage mail, graphics, sounds, attachments (1=Yes, 2=No)	Chi square
	Training—number of courses completed (0=0 courses, 1=1 course, 2=2-4 courses, 3=≥5 courses)	Chi square

(table continues)

Table 4 (continued)

Classification variable	Classification or criterion variable	Statistical analysis
Training—number of courses completed (0=0 courses, 1=1 course, 2=2-4 courses, 3=≥5 courses)	Home computer connected to the Internet (1=Yes, 2=No)	Chi square
	School computer connected to the Internet (1=Yes, 2=No)	Chi square
	Use of the Internet (1=Yes, 2=No)	Chi square
	Use of Internet to send email (1=Yes, 2=No)	Chi square
	Uses a search engine to conduct an Internet search (1=Yes, 2=No)	Chi square
	Uses a web browser to explore Internet resources (1=Yes, 2=No)	Chi square
	Ability to configure a browser to manage mail, graphics, sounds, attachments (1=Yes, 2=No)	Chi square

[a] Analyses were conducted with each criterion variable and each classification variable marked with an asterisk (*).

CHAPTER IV

RESULTS

The purpose of this chapter is to present the analyses and findings of the study of the use of computers by elementary school principals. The criterion variables were proficiency in using computer hardware and software, proficiency in using computers in instructional leadership, proficiency in using computers for administrative purposes, and overall proficiency in using computers. The demographic and predictor variables were years of administrative experience, gender, age, highest degree earned, ethnicity, and general attitude toward computers. The following question guided the analyses:

How does the proficiency of elementary school principals vary in the following areas by years of administrative experience, gender, age, highest degree earned, ethnicity, and attitude toward computers?

a. Proficiency in using computer hardware and software.
b. Proficiency in using computers in instructional leadership.
c. Proficiency in using computers for administrative purposes.
d. Overall proficiency in using computers.

Descriptive Data for Variables Studied

Frequencies and percentages for the participating elementary school principals, disaggregated by demographic categories, are in Table 5. Nearly three fifths of the respondents had 10 or fewer years of administrative experience. There were more females than males. Over four fifths were over 40 years of age. A majority had earned the master's degree, and about two fifths held a Certificate of Advanced Study or doctoral degree. Nearly all respondents owned a home computer. Over four fifths were White, not of Hispanic Origin, and a little over a tenth were African-American, not of Hispanic Origin.

Use of Computers by Elementary School Principals

Frequencies and percentages for the use of computers by responding elementary school principals are in Table 6. All but one principal reported that they used a computer. A desktop computer was used by over 90% of the respondents. Laptops were used by nearly 40% of the principals. Personal digital assistants (PDAs) were used by a quarter of the respondents. Nearly all respondents used a computer on a daily basis for administrative purposes.

Use of the Internet by Elementary School Principals

The results of Internet use by elementary school principals are in Table 7. Nearly all respondents used the Internet. Nearly all had access to the Internet at home and at school, and they used it to send mail, conduct searches, and find professional resources. Fewer than half were able to do such technical chores as configuring a browser for mail, graphics, sounds, and attachments.

Other administrative purposes for which responding elementary school principals used the Internet are in Table 8. These purposes are from the written responses of the principals. Respondents used the Internet to facilitate their administrative work in four domains: research, email, online services, and school information.

Table 5

Distribution of Responding Elementary School Principals Across Demographic Categories, N=252

Demographic categories	N	%
1. Years of experience		
1-5	55	21.8
6-10	94	37.3
11 years or more	101	40.1
Missing	2	0.8
2. Gender		
Male	106	42.1
Female	143	56.7
Missing	3	1.2
3. Age		
30 or less	1	0.4
31-40	46	18.3
41-50	103	40.9
51-60	99	39.3
61 or over	1	0.4
Missing	2	0.8
4. Highest degree earned		
Bachelor's	4	1.6
Master's	144	57.1
Certificate of Advanced Study	82	32.5
Doctorate, EdD or PhD	21	8.3
Missing	1	0.4
5. Home computer ownership		
Yes	236	93.7
No	7	2.8
Missing	9	3.6
6. Ethnicity		
American Indian or Alaskan Native	1	0.4
Asian or Pacific Islander	2	0.8
African-American, not Hispanic origin	29	11.5
Hispanic	8	3.2
White, not of Hispanic origin	209	82.9
Other, please specify		
Mexican	1	0.4
Polish descent	1	0.4
Missing	1	0.4

Table 6

Use of Computers by Responding Elementary School Principals, N=252

Use of computers	N	%
7. Use of computer by principals		
Yes	251	99.6
No	1	0.4
8. Type of computer used		
Laptop		
Yes	97	38.5
No	155	61.5
Desktop		
Yes	234	92.9
No	18	7.1
Personal digital assistant (hand-held computer)		
Yes	63	25.0
No	189	75.0
Centrally located workstation		
Yes	49	19.4
No	203	80.6
9. How often computer is used for administrative purposes		
Daily	234	92.9
Weekly	17	6.7
Monthly	0	0.0
Seldom	0	0.0
Missing	1	0.4

Table 7

Use of the Internet by Responding Elementary School Principals, N=252

Internet use	Frequency	Percent
10. Access to the Internet at home		
Yes	238	94.4
No	9	3.6
Missing	5	2.0
11. Access to the Internet at school		
Yes	251	99.6
No	1	0.4
12. Use of the Internet		
Yes	251	99.6
No	0	0.0
Missing	1	0.4
13. Use of the Internet to send email		
Yes	246	97.6
No	5	2.0
Missing	1	0.4
14. Use of a search engine to conduct an Internet search		
Yes	238	94.4
No	12	4.8
Missing	2	0.8
15. Use of a web browser for educational and professional resources		
Yes	231	91.7
No	19	7.5
Missing	2	0.8
16. Can configure a browser for mail, graphics, sounds, and attachments		
Yes	101	40.1
No	149	59.1
Missing	2	0.8

Table 8

Administrative Purposes for Which Responding Elementary School Principals Used the Internet: Data From Comments

Domains	Comments
Research	"Information for doctoral work: read books, read articles, and work on the dissertation."
	"Educational research by connecting to the state department and [other] websites."
	"Educational videos, materials, and other educational sites."
	"Find grants and grant information."
	"Staff sites for professional development and student sites."
	"Find curriculum information."
Email	"Send daily memos to teachers."
	"Email parents, teachers, and other principals, district personnel."
	"Send notes and messages to parents."
	"File state reports, state forms, submit grants, and expenditure reports."
Online services	"Order supplies and materials."
	"Purchase plane tickets, gifts, clothes, products and make hotel reservations."
	"Pay bills, manage finances, and search for jobs."
	"Take online courses; check news and sport schedules."
	"Register for conferences."
	"Equipment and prices of materials."
School information	"Review school test scores, report cards, and sort data."
	"Access student data, records, web page, and attendance information."
	"Access graphics, create templates for lesson plans, monthly calendars, and newsletters."

In the area of research, the respondents used the Internet to obtain information on doctoral studies, state policies and procedures, instructional materials, professional development, curriculum, and grants.

Email was used to communicate with parents, teachers, other district personnel, and state officials. Messages and announcements, notes, state reports and forms, expenditure reports, and grants were transmitted through email.

Online services performed by the responding principals were ordering supplies and materials, making purchases and reservations, managing finances, paying bills, searching for jobs, taking courses, keeping up with the news and sports schedules, and registering for conferences.

The school system's network and the Internet were used to access graphics, create templates for lesson plans, create monthly calendars and newsletters, and access student data and records, the school's web page, and attendance information.

Proficiency of Elementary School Principals Overall and in Using Computer Hardware and Software

Data on the proficiency of responding elementary principals in using hardware and software are in Table 9. Over four-fifths of the elementary school principals reported an overall intermediate or advanced level of proficiency in using computers. Nearly all reported an intermediate or advanced level of proficiency in using a computer to accomplish a word processing task, using commands necessary to activate a printer to secure a hard copy, using commands to run a program, and using a modem. Fewer were confident of their expertise in accessing information on a CD-ROM, using a digital camera, setting up a computer and peripheral devices, and evaluating software for administrative purposes. A majority of the responding principals were at the beginning level of competency in scanning data, graphics, and photos.

Other domains and comments about hardware and software use are in Table 10. These domains and comments came from the written responses of the principals. Respondents reported that they used software and a projector to make presentations, statistical programs to run data, and software to organize, manage, and display data. The data indicate that principals were beginning to use computers in sophisticated ways to communicate and to manage and manipulate data to help them in administering their schools.

Table 9

Proficiency of Responding Elementary School Principals Overall and in Using Computer Hardware and Software, N=252

Hardware and software proficiency levels	N	%	N	M[a]	SD	Min	Max
18. Overall level of proficiency using computers			242	1.99	0.44	1	3
Beginner	24	9.5					
Intermediate	196	77.8					
Advanced	22	8.7					
Missing	10	4.0					
19. Use a computer to accomplish a word processing task			252	2.69	0.53	1	3
Beginner	8	3.2					
Intermediate	62	24.6					
Advanced	182	72.2					
20. Use commands necessary to activate a printer to secure a hard copy			252	2.78	0.47	1	3
Beginner	6	2.4					
Intermediate	43	17.1					
Advanced	203	80.6					
21. Use commands to run a program			252	2.57	0.59	1	3
Beginner	13	5.2					
Intermediate	82	32.5					
Advanced	157	62.3					
22. Use a modem			249	2.37	0.71	1	3
Beginner	33	13.1					
Intermediate	91	36.1					
Advanced	125	49.6					
Missing	3	1.2					

(table continues)

Table 9 (continued)

Hardware and software proficiency levels	N	%	N	M[a]	SD	Min	Max
23. Access information on a CD-ROM			250	1.84	0.74	1	3
Beginner	91	36.1					
Intermediate	108	42.9					
Advanced	51	20.2					
Missing	2	0.8					
24. Use a digital camera			249	1.80	0.75	1	3
Beginner	99	39.3					
Intermediate	100	39.7					
Advanced	50	19.8					
Missing	3	1.2					
25. Set up a computer and peripheral devices			248	1.92	0.70	1	3
Beginner	71	28.2					
Intermediate	127	50.4					
Advanced	50	19.8					
Missing	4	1.6					
26. Use a scanner to scan data, graphics, and photos			249	1.56	0.66	1	3
Beginner	134	53.2					
Intermediate	91	36.1					
Advanced	24	9.5					
Missing	3	1.2					
27. Evaluate software for administrative purposes			250	1.84	0.61	1	3
Beginner	70	27.8					
Intermediate	151	59.9					
Advanced	29	11.5					
Missing	2	0.8					

[a] The scale was 1=Beginner, 2=Intermediate, 3=Advanced.

Table 10
Other Uses of Hardware and Software by Responding Elementary School Principals: Data From Comments

Domains	Comments
Presentations	"Used software to make presentations."
	"Used computer with the projector to make presentations."
Statistical analysis	"Used statistical programs to run data, example NCSS [Number Cruncher Statistical System]."
Management	"Used software to organize, manage, and display data."

Proficiency of Elementary School Principals in Using Computers in Instructional Leadership

Data on proficiency of elementary school principals in using computers in instructional leadership are in Table 11. Of the ten instructional uses of technology on the questionnaire, two--recording observations in classrooms and recording discipline referrals--were used by less than a majority of the respondents. Thirty-five percent or more of the remaining respondents reported that they were at the intermediate or advanced level of proficiency on these two tasks. Over 65% of the responding principals reported that they were at the intermediate or advanced level of proficiency on five---monitoring student achievement for specific objectives, monitoring students' grades, writing up classroom evaluations, monitoring achievement data, and locating curriculum resources---of the eight remaining tasks. From 42% to 60.3% of the respondents reported that they were at the intermediate or advanced level of proficiency on the remaining three tasks---creating a master schedule, developing or writing curriculum, and creating graphs and charts.

On essential accountability tasks---monitoring achievement data and monitoring student achievement for specific objectives---over 70% of the respondents reported they were at the intermediate or advanced level of proficiency. Those tasks with low percentages at the intermediate and advanced levels---creating a master schedule, developing or writing curriculum, and creating graphs and charts---were tasks that many principals may not do themselves.

It is clear that large percentages of principals have acquired the essential instructional monitoring skills required to be effective in the accountability environment in which they find themselves. This is confirmed by the statement "monitor[ing] student achievement" in the qualitative data (see Table 12). These data confirm that principals use the computer for a range of instructional tasks, from the trivial to the important. They merge letters and type parent newsletters, permission slips, and honor rolls on the one hand, and they prepare presentations and write grants on the other hand.

Table 11

Proficiency of Responding Elementary School Principals in Using Computers in Instructional Leadership, N=252

Instructional leadership tasks and proficiency levels	N	%	N	M^a	SD	Min	Max
29. Record observations in classrooms			101	2.34	0.70	1	3
Beginner	13	5.2					
Intermediate	41	16.3					
Advanced	47	18.7					
Did not use this task	140	55.6					
Missing	11	4.4					
30. Monitor student achievement for specific objectives			204	2.26	0.61	1	3
Beginner	18	7.1					
Intermediate	114	45.2					
Advanced	72	28.6					
Did not use this task	33	13.1					
Missing	15	6.0					
31. Monitor students' grades			186	2.24	0.63	1	3
Beginner	20	7.9					
Intermediate	101	40.1					
Advanced	65	25.8					
Did not use this task	55	21.8					
Missing	11	4.4					
32. Create a master schedule			161	1.94	0.79	1	3
Beginner	54	21.4					
Intermediate	62	24.6					
Advanced	45	17.9					
Did not use this task	79	31.3					
Missing	12	4.8					

Table 11 (continued)

Instructional leadership tasks and proficiency levels	N	%	N	Mᵃ	SD	Min	Max
33. Write up classroom evaluations			203	2.59	0.53	1	3
Beginner	4	1.6					
Intermediate	76	30.2					
Advanced	123	48.8					
Did not use this task	38	15.1					
Missing	11	4.4					
34. Monitor achievement data			212	2.25	0.63	1	3
Beginner	22	8.7					
Intermediate	114	45.2					
Advanced	76	30.2					
Did not use this task	29	11.5					
Missing	11	4.4					
35. Record discipline referrals			109	2.30	0.71	1	3
Beginner	16	6.3					
Intermediate	44	17.5					
Advanced	49	19.4					
Did not use this task	132	52.4					
Missing	11	4.4					
36. Locate curriculum resources			229	2.23	0.62	1	3
Beginner	23	9.1					
Intermediate	131	52.0					
Advanced	75	29.0					
Did not use this task	11	4.4					
Missing	12	4.8					

Table 11 (continued)

Instructional leadership tasks and proficiency levels	N	%	N	M[a]	SD	Min	Max
37. Develop or write curriculum			198	2.02	0.69	1	3
Beginner	46	18.3					
Intermediate	103	40.9					
Advanced	49	19.4					
Did not use this task	42	16.7					
Missing	12	4.8					
38. Create graphs and charts			224	1.83	0.71	1	3
Beginner	77	30.6					
Intermediate	107	42.5					
Advanced	40	15.9					
Did not use this task	17	6.7					
Missing	11	4.4					

[a] The scale was 1=Beginner, 2=Intermediate, 3=Advanced.

Table 12
Other Uses of Computers by Responding Elementary School Principals in Performing Instructional Leadership Tasks: Data From Comments

Domains	Comments
Communications	"Type parent newsletters, permission slips, and honor roll awards." "Mail merge letters." "Writing grants."
Presentations	"Create PowerPoint presentations."
Student information	"Monitor student achievement data."

Proficiency of Elementary School Principals in Using Computers for Administrative Purposes

Data on the proficiency of elementary school principals in using computers for administrative purposes are in Table 13. The highest levels of proficiency were found for using word processing software for professional work, practicing the responsible use of technology, and retrieving information from the student database. All had means over 2.00 and percentages of intermediate or advanced users of 74 or more. Over one-third of the principals reported they were beginners on creating their own database, using a program to develop budgets and cost projections, creating and presenting an electronic slide show using presentation software, creating and enhancing transparencies using a scanner, using and creating spreadsheets, and using a program to disaggregate and analyze information. The most frequently unused tasks were using a program for developing budgets and cost projections, creating and enhancing transparencies using a scanner, and using a program to disaggregate and analyze information. None of these is surprising. Elementary principals have small budgets and little discretionary money. Transparencies are clerical tasks that are likely to be handled by staff. And, these data were collected early in the disaggregation phase of the accountability movement. The No Child Left Behind legislation was only recently enacted.

Domains and tasks found in the comments are in Table 14. Respondents used computers for maintaining inventories, ordering supplies, communicating with staff and others, and for preparing presentations.

Types of Training Received by Elementary School Principals

Over 70% of the responding elementary school principals completed a formal computer course (see Table 15). Over three quarters took at least one professional technology course, and just over a quarter took five or more courses. A little less than half completed these courses through in-service training, and about a fifth completed them as undergraduate or graduate courses. Less than one percent reported they were "self-taught." Clearly, these respondents looked beyond themselves for training in the use of technology.

Those who responded that they had not completed a formal computer course (23%) were asked how they learned to use the computer. They learned in three ways: self-teaching, getting assistance from others, and through workshops and other forms of inservice training (see Table 16). Hands-on learning and trial-and-error methods were most frequently used by these

Table 13

Proficiency of Responding Elementary School Principals in Using Computers for Administrative Purposes, N=252

Administrative tasks and proficiency levels	N	%	N	M[a]	SD	Min	Max
40. Create your own database			220	1.72	0.67	1	3
Beginner	88	34.9					
Intermediate	105	41.7					
Advanced	27	10.7					
Did not use this task	19	7.5					
Missing	13	5.2					
41. Use a program for developing budgets and cost projections			198	1.71	0.71	1	3
Beginner	86	34.1					
Intermediate	83	32.9					
Advanced	29	11.5					
Did not use this task	43	17.1					
Missing	11	4.4					
42. Retrieve information from the student database			223	2.19	0.69	1	3
Beginner	36	14.3					
Intermediate	109	43.3					
Advanced	78	31.0					
Did not use this task	17	6.7					
Missing	12	4.8					
43. Create and present an electronic slide show using presentation software			229	1.81	0.72	1	3
Beginner	86	34.1					
Intermediate	101	40.1					
Advanced	42	16.7					
Did not use this task	12	4.8					
Missing	11	4.4					

(table continues)

Table 13 (continued)

Instructional leadership tasks and proficiency levels	N	%	N	M[a]	SD	Min	Max
44. Practice the responsible use of technology (regarding copyrights and site licenses)			227	2.36	0.63	1	3
Beginner	18	7.1					
Intermediate	109	43.3					
Advanced	100	39.7					
Did not use this task	11	4.4					
Missing	14	5.6					
45. Create and enhance transparencies with the use of a scanner			206	1.56	0.69	1	3
Beginner	115	45.6					
Intermediate	67	26.6					
Advanced	24	9.5					
Did not use this task	35	13.9					
Missing	11	4.4					
46. Use word processing software for professional work			231	2.42	0.63	1	3
Beginner	18	7.1					
Intermediate	99	39.3					
Advanced	114	45.2					
Did not use this task	9	3.6					
Missing	12	4.8					
47. Use and create spreadsheets for a variety of tasks			221	1.78	0.71	1	3
Beginner	86	34.1					
Intermediate	98	38.9					
Advanced	37	14.7					
Did not use this task	19	7.5					
Missing	12	4.8					

(table continues)

Table 13 (continued)

Instructional leadership tasks and proficiency levels	N	%	N	M[a]	SD	Min	Max
48. Use presentation software			224	1.87	0.70	1	3
Beginner	72	28.6					
Intermediate	110	43.7					
Advanced	42	16.7					
Did not use this task	16	6.3					
Missing	12	4.8					
49. Use a program to disaggregate and analyze information			208	1.75	0.71	1	3
Beginner	84	33.3					
Intermediate	91	36.1					
Advanced	33	13.1					
Did not use this task	31	12.3					
Missing	13	5.2					

[a] The scale was 1=Beginner, 2=Intermediate, 3=Advanced.

Table 14

Other Uses of Computers by Responding Elementary School Principals in Performing Administrative Tasks: Data From Comments

Domains	Comments
Inventory	"Inventory textbooks, school supplies, and to order supplies."
Communication	"To write newsletters, staff memoranda, and professional communication[s]."
Presentations	"Make PowerPoint presentations."

Table 15

Distribution of Responding Elementary School Principals by Type of Training in Technology, N=252

Type of training	N	%
51. Completion of a formal computer course		
Yes	182	72.2
No	58	23.0
Missing	12	4.8
52. The number of professional technology courses completed		
1. One	16	6.3
2. Two to four	114	45.2
3. Five or more	65	25.8
4. None	41	16.3
5. Missing	16	6.3
53. Type of formal computer course completed		
1. Undergraduate	11	4.4
2. Graduate	38	15.1
3. In-service training	117	46.4
4. Non-school computer classes	29	11.5
5. Presented by a company representative	6	2.4
6. Other		
Self-taught	2	0.8
Two hour workshop	1	0.4
7. Missing	48	19.1

Table 16

Types of Training of Responding Elementary School Principals Not Taking Formal Courses: Data From Comments

Type of training	N
Self-taught	
Experience, learn as I go, exploration	4
Hands on	5
Self-taught	10
Trial and error	8
Assisted by others	
Secretarial assistance	3
Help from family and friends	9
Asking help from school system	1
Workshops, inservice	
District staff development offerings	3
Workshops	8
Other	
Not expensive	1
Courses	1

respondents, with many getting help from others, books, or on-line or paper documentation as needed. A few reported taking mini-courses and workshops. Sources of help from others included spouses, children, friends, technicians, secretaries, and colleagues.

Effects of Computer Use on the Work of Elementary School Principals

Data on the effects of computers on the work of elementary school principals are in Table 17. Most of the principals indicated that the use of computers improved the quality and accuracy of their work. Over half reported that computers decreased the amount of time spent on paperwork; however, just under two-thirds reported that the use of computers did not free them from routine paperwork so that they could devote time to other tasks. Over 85 percent denied that use of computers for administrative tasks "made little difference in increasing time for other tasks or improving quality of work." When asked how many hours per week they saved on paperwork, their responses ranged from none to 20 hours with an average of 6.97. If principals work a normal 40-hour week, this is a time saving of 17.5%---a considerable amount. Clearly, the use of computers for administrative tasks improves the quality and accuracy of work and saves time for large numbers of elementary principals.

Attitude of Elementary School Principals Toward Computer Use

A "comfort" scale was used to assess respondents' general attitudes toward the use of computers in work and life. The rationale behind this scale is that the more comfortable one is with the ideas expressed in the items, the more positive he or she would be toward the use of computers generally (see Table 18 for the items, the scale, and the data). Across the six items measured, responding elementary school principals were between "comfortable" and "moderately comfortable," on average, that the computer has made administrative work less tedious, learning in classrooms is enhanced, teachers' lives are made easier, school and community communications are improved, curriculum is enriched, and nearly everyone's life is better because of the computer. Only a few of the responding principals are uncomfortable about the effects of the computer on administrative work, the educational process, and life itself. In general, responding principals had a positive attitude toward the effects of computers.

General Comments About the Use of Computers by Respondents

Respondents were given an opportunity at the end of the questionnaire to make "other comments … about the use of computers by elementary school principals." These comments are in categories in Table 19. This part of the questionnaire received more extensive comments than the others. The respondents expressed the need for training, monetary support, and time to learn and practice using computers. They reported new demands requiring greater efficiency, and they expressed such benefits of computers doing data analyses, communicating quickly, doing more work, and having direct access to on-line resources. These benefits, however, are not without drawbacks. They expressed that the workload had increased for them because the computer permitted them to do more work with less help.

Table 17

Effects of Computer Use on the Work of Responding Elementary School Principals, N=252

Effects	N	%
54. Use of computers for administrative tasks has:		
1. Freed me from routine paperwork to devote time to other tasks		
Yes	84	33.3
No	166	65.9
Missing	2	.8
2. Improved quality and accuracy of my work		
Yes	222	88.1
No	29	11.5
Missing	1	.4
3. Made very little difference in increasing time for other tasks or improving quality of work		
Yes	36	14.3
No	215	85.3
Missing	1	.4
4. Consumed time that I would have spent in conferences, in the halls, or in classroom observations		
Yes	28	11.1
No	223	88.5
Missing	1	.4
5. Other		
Does not free me to do other things	2	.8
Improved communication to parents	1	.4
Improved speed of communication	1	.4
Less calls and notices to staff	2	.8
Easy to store and retrieve information	1	.4
55. Computer use has decreased the amount of time spent on paperwork		
Yes	144	57.1
No	104	41.3
Missing	4	1.6

Effect	N	M	SD	Min	Max
56. Approximate time available for other tasks resulting from decreased time on paperwork (in hours per week)	130	6.97	3.97	0	20

Table 18

Attitude of Responding Elementary School Principals Toward Computer Use, N=252

Items and scales	N	%	N	M[a]	SD	Min	Max
57. Administrative work would be tedious without computers			247	2.82	.89	1	4
Extremely Comfortable	70	27.8					
Moderately comfortable	72	28.6					
Comfortable	96	38.1					
Uncomfortable	9	3.6					
Missing	5	2.0					
58. Learning in classrooms has been truly enhanced by computers.			250	2.78	.84	1	4
Extremely Comfortable	58	23.0					
Moderately Comfortable	87	34.5					
Comfortable	96	38.1					
Uncomfortable	9	3.6					
Missing	2	.8					
59. Teachers' lives are made easier by the computer.			250	2.64	.79	1	4
Extremely Comfortable	40	15.9					
Moderately Comfortable	88	34.9					
Comfortable	114	45.2					
Uncomfortable	8	3.2					
Missing	2	.8					
60. School and community communications have been improved because of the computer.			250	2.69	.89	1	4
Extremely Comfortable	60	23.8					
Moderately Comfortable	63	25.0					
Comfortable	116	46.0					
Uncomfortable	11	4.4					
Missing	2	.8					

(table continues)

Table 18 (continued)

Attitude	N	%	N	M[a]	SD	Min	Max
61. Curriculum has been enriched because of the access			250	2.86	.81	1	4
to the Internet							
Extremely Comfortable	61	24.2					
Moderately Comfortable	100	39.7					
Comfortable	83	32.9					
Uncomfortable	6	2.4					
Missing	2	.8					
62. Nearly everyone's life has been improved because			249	2.57	.84	1	4
of the wide use of computers.							
Extremely Comfortable	43	17.1					
Moderately Comfortable	69	27.4					
Comfortable	123	48.8					
Uncomfortable	14	5.6					
Missing	3	1.2					

[a] The recoded scale was 4=Extremely Comfortable, 3=Moderately Comfortable, 2=Comfortable, 1=Uncomfortable.

Table 19

Comments Made About the Use of Computers by Responding Elementary School Principals

Domains	Comments
Training	"Administrators need more training." "Additional classes are needed to keep up with all the new stuff." "More money and training needed for the new technology." "Need more school system training in the summer months." "Principals should be provided with training that is ongoing."
Time	"Having enough time to spend learning programs while running a school is a draw back." "If a principal spends time in classrooms, meetings with teachers, counseling and meeting with parents, there is not enough time left to work on the computer." "Consistent computer skills require practice." "In some cases, the amount of communication, organizing data, reports, and creating databases equals no time savings on paperwork." "The computer has not decreased or increased work. We get more done in the same amount of time."
Benefits of using computers	"We use computers for statistical purposes." "We are data-driven and make adjustments to enhance learning based on student performance." "Computers in schools have enhanced online resources and district items." "Ease of communication is a plus." "Technology has enabled workers to do more in there jobs. Paperwork has increased because we do more with less help." "Our entire workload has increased. The computer makes it possible to make modifications on annual notices." "The immediate access to computers has become overwhelming."
Miscellaneous	"There is a good and bad in every innovation." "The job of the principal is so complex by utilizing the computer, we are expected to be more efficient, but more stuff is also sent from other departments." "I liked this survey because it got me to thinking how important the computer is in the day-to-day work of the principal."

Inferential Statistical Analyses: Looking for Population Differences and Relationships Among the Socio-Demographic Variables and Proficiency in the Use of Computers by Elementary School Principals

A number of inferential statistical tests were conducted to determine if the differences and relationships found in the sample data would reasonably be found in the population. Pearson product moment correlation coefficients were calculated for relationships between and among continuous variables, t-tests were run to study differences between dichotomous independent variables and the proficiency variables, and one-way analyses of variance followed by Scheffé's post-hoc comparisons were run to study differences in proficiency for independent variables with three or more categories. Although some of these tests may provide redundant information, together they provide a full picture of the relationships and differences that may be found in the population studied. The results of these analyses follow.

Relationships Among Attitude Toward Computer Use and the Measures of Proficiency in Computer Use by Elementary School Principals

Pearson product moment correlation coefficients were calculated to assess the relationships among these variables. Data are in Table 20. Except for a very small insignificant negative correlation (-.02) between attitude toward computer use and Internet proficiency, positive, significant coefficients were found among all measures of proficiency and between attitude toward computer use and the remaining four measures of proficiency. The highest coefficients were found among the proficiency measures. This means that as any measure of proficiency increases so does all other measures of proficiency increase. General attitude toward computer use was positively and significantly correlated with four proficiencies (hardware and software, instructional, administrative, and overall); however, the correlations were relatively small (r=.22 to r=.40). This is not surprising because general attitudes are not very good predictors of behaviors. Nor are overall, instructional, administrative, and hardware and software proficiencies strongly correlated with Internet proficiency. All four have coefficients of .36 or less. This may mean that the principals don't have much time to spend on the Internet regardless of their level of proficiency in the use of computers.

Differences in Proficiency of Elementary School Principals in Using Computers Between and Among Categories of Nominal Socio-Demographic Variables

Two types of analysis are presented. First, differences in proficiency of elementary principals between nominal socio-demographic variables with two categories are analyzed with t-tests. Then, differences in proficiency among nominal socio-demographic variables with more than two categories are analyzed with one-way analyses of variance and Scheffé's post-hoc comparisons.

T-tests for Differences Between Two-Category Socio-Demographic Variables and Proficiency of Elementary School Principals in Using Computers

Differences in nominal variable categories for the four types of proficiency—hardware and software, administrative, instructional, and overall—were analyzed for eleven dichotomous variables (see the tables in this section for the variables and categories). Findings follow.

Table 20

Correlation Coefficients, Significance Levels, and Ns for Relationships Among Attitude Toward Computer Use and the Measures of Proficiency in Computer Use by Elementary School Principals

		Internet proficiency	Hardware and software proficiency	Instructional proficiency	Administrative proficiency	Attitude toward computer use
Overall proficiency	Pearson correlation	.28	.58	.47	.55	.23
	Sig. (2-tailed)	.00	.00	.00	.00	.00
	N	242	242	230	230	240
Internet proficiency	Pearson correlation		.36	.19	.33	-.02
	Sig. (2-tailed)		.00	.00	.00	.74
	N		252	240	240	250
Hardware and software proficiency	Pearson correlation			.58	.62	.22
	Sig. (2-tailed)			.00	.00	.00
	N			240	240	250
Instructional proficiency	Pearson correlation				.67	.40
	Sig. (2-tailed)				.00	.00
	N				239	239
Administrative proficiency	Pearson correlation					.28
	Sig. (2-tailed)					.00
	N					239

Two-category socio-demographic variables and proficiency in using hardware and software. Data for the proficiency of elementary school principals in using hardware and software are in Table 21. Principals who completed a formal computer course, who believed that computers made a difference in the quality and accuracy of their work, and who believed that computers made a difference in the amount of time they spent on their work and the quality of that work reported that they were more proficient users than those who had not completed a formal computer course, who believed that computers did not improve the quality and accuracy of their work, and who believed that computers made little difference in the amount of time they spent on their work and the quality of their work. No differences were found in the proficiency of elementary principals in using hardware and software based on differences in the frequency of the use of computers for administrative purposes, gender, home computer ownership, ethnicity, or personal digital assistant use. Further, there were no differences in the proficiency of hardware and software use based on beliefs about freeing up time, the concern that computers would take time from other obligations, or that computers would decrease time spent on paperwork.

Two-category socio-demographic variables and proficiency in using computers for administrative purposes. Data for differences in proficiency in using computers for administrative purposes are in Table 22. Elementary principals who used a personal digital assistant, believed that the computer freed time for other purposes, and believed that the computer decreased the time spent on paper work were more proficient in using computers for administrative purposes than were those who did not use personal digital assistants, or those who did not believe the computer decreased time spent on paperwork. Further, those who reported that the computer made very little difference in time spent on their work and the quality of that work were less proficient in administrative uses than were those who reported that the computer made a difference in the time spent on their work and the quality of their work. Frequency of use, having completed a formal computer course, gender, home computer ownership, ethnicity, reporting whether computers made a difference in the quality and accuracy of their work, and reporting whether computers consumed time from other obligations were not related to the proficiency of elementary principals in using computers for administrative purposes.

Two-category socio-demographic variables and proficiency in using computers for instructional purposes. Data for differences between groups of elementary principals for proficiency in using computers for instructional purposes are in Table 23. Principals who used a personal digital assistant and who reported that the computer freed up time, improved the quality and accuracy of their work, and reported "no" to "computers made very little difference in time and quality" of their work scored higher on instructional proficiency than principals who did not use a personal digital assistant and reported "no" to computers freed up time, reported "no" to computers improved the quality and accuracy of their work, or reported "yes" to computers made very little difference in time and quality of their work. No differences in instructional proficiency were found between those who used computers daily and those who used computers weekly for administrative purposes, those who completed a formal computer course and those who had not, males and females, those who owned a computer at home and those who did not own a computer at home, minorities and whites, those who believed that computers consumed time from other obligations and those who believed that computers did not consume time from other obligations, and those who believed that computers decreased time spent on paperwork and those that did not believe computers decreased time spent on paperwork.

Table 21

Proficiency of Elementary School Principals in Using Computer Hardware and Software by Selected Two-Category Socio-Demographic Variables: t-tests

Variable	N	M	SD	df	t	p
Administrative use				249	1.88	.06
Daily	234	2.16	.44			
Weekly	17	1.95	.51			
Missing	1					
Completed a formal computer course				81.77[a]	3.56	.00
Yes	182	2.20	.40			
No	58	1.95	.50			
Missing	12					
Gender				247	1.62	.11
Male	106	2.21	.46			
Female	143	2.12	.43			
Missing	3					
Home computer ownership				241	-.59	.55
Yes	236	2.15	.43			
No	7	2.25	.59			
Missing	9					
Ethnicity				247	1.50	.14
Minority	40	2.25	.47			
White	209	2.14	.44			
Missing	3					
Personal digital assistant use				250	-1.75	.08
Yes	63	2.24	.46			
No	189	2.12	.44			
Missing	0					
Freed up time				248	-1.91	.06
Yes	84	2.22	.45			
No	166	2.11	.44			
Missing	2					
Improved my work quality and accuracy				32.70[b]	-3.35	.00
Yes	222	2.19	.42			
No	29	1.85	.53			
Missing	1					
Made very little difference in time and quality				249	2.56	.01
Yes	36	1.97	.47			
No	215	2.18	.43			
Missing	1					

Table 21 (continued)

Variable	N	M	SD	df	t	p
Consumed time from other obligations				249	1.61	.11
Yes	28	2.02	.46			
No	223	2.16	.44			
Missing	1					
Decreased time spent on paperwork				246	1.81	.07
Yes	144	2.19	.43			
No	104	2.09	.45			
Missing	4					

[a] Based on unequal variances, Levene's test (F=4.31, p=.04). [b] Based on unequal variances, Levene's test (F=3.89, p=.05).

Table 22

Proficiency of Elementary School Principals in Using Computers for Administrative Purposes by Selected Two-Category Socio-Demographic Variables: t-tests

Variable	N	M	SD	df	t	p
Administrative use				237	1.73	.09
Daily	222	1.94	.50			
Weekly	17	1.72	.47			
Missing	13					
Completed a formal computer course				237	1.52	.13
Yes	182	1.95	.48			
No	57	1.84	.57			
Missing	13					
Gender				236	1.51	.13
Male	100	1.99	.50			
Female	138	1.89	.50			
Missing	14					
Home computer ownership				230	-1.37	.17
Yes	225	1.92	.50			
No	7	2.19	.54			
Missing	20					
Ethnicity				236	-.57	.57
Minority	40	1.89	.53			
White	198	1.94	.50			
Missing	14					
Personal digital assistant use				238	-3.03	.00
Yes	59	2.09	.54			
No	181	1.87	.48			
Missing	12					
Freed up time				237	-2.06	.04
Yes	80	2.02	.52			
No	159	1.88	.49			
Missing	13					
Improved my work quality and accuracy				238	-.69	.49
Yes	214	1.93	.50			
No	26	1.86	.56			
Missing	12					
Made very little difference in time and quality				238	3.08	.00
Yes	35	1.69	.43			
No	205	1.97	.50			
Missing	12					

(table continues)

Table 22 (continued)

Variable	N	M	SD	df	t	p
Consumed time from other obligations				37.26[a]	1./80	.08
Yes	27	1.79	.41			
No	213	1.94	.51			
Missing	12					
Decreased time spent on paperwork				229.57[b]	2.83	.01
Yes	137	2.00	.52			
No	100	1.82	.45			
Missing	15					

[a] Based on unequal variances, Levene's test ($\underline{F}$=4.27, $\underline{p}$=.04). [b] Based on unequal variances, Levene's test ($\underline{F}$=5.56, $\underline{p}$=.02).

Table 23

Proficiency of Elementary School Principals in Using Computers for Instructional Purposes by Selected Two-Category Socio-Demographic Variables: t-tests

Variable	N	M	SD	df	t	p
Administrative use				237	1.47	.14
Daily	222	2.19	.50			
Weekly	17	2.01	.48			
Missing	13					
Completed a formal computer course				237	1.46	.15
Yes	181	2.20	.49			
No	58	2.09	.53			
Missing	13					
Gender				235	.74	.46
Male	99	2.21	.49			
Female	138	2.16	.50			
Missing	15					
Home computer ownership				229	-1.32	.19
Yes	224	2.18	.50			
No	7	2.43	.51			
Missing	21					
Ethnicity				235	-.32	.75
Minority	40	2.16	.54			
White	197	2.19	.49			
Missing	15					
Personal digital assistant use				238	-2.53	.01
Yes	58	2.32	.50			
No	182	2.13	.49			
Missing	12					
Freed up time				237	-2.67	.01
Yes	80	2.30	.47			
No	159	2.12	.51			
Missing	13					
Improved my work quality and accuracy				238	-3.03	.00
Yes	213	2.21	.49			
No	27	1.91	.50			
Missing	12					
Made very little difference in time and quality				238	3.36	.00
Yes	35	1.92	.44			
No	205	2.22	.50			
Missing	12					

Table 23 (continued)

Variable	N	M	SD	df	t	p
Consumed time from other obligations				238	.82	.41
Yes	27	2.10	.51			
No	213	2.19	.50			
Missing	12					
Decreased time spent on paperwork				235	.61	.55
Yes	137	2.19	.51			
No	100	2.15	.49			
Missing	15					

Two-category socio-demographic variables and overall proficiency in using computers.
Data for differences between groups of elementary school principals and overall proficiency in using computers are in Table 24. Elementary principals who reported that computers made a difference in the time they spent on their work and the quality of their work scored higher on overall proficiency than those who reported that computers made very little difference in the time they spent on their work and the quality of their work. No differences in overall proficiency in using computers were found for groups based on frequency of use for administrative purposes, completion of a formal computer course, gender, home computer ownership, ethnicity, personal digital assistant use, and reporting whether computers freed time, improved the quality and accuracy of work, consumed time from other obligations, or decreased time spent on paperwork.

Analyses of Variance and Scheffé's Post-Hoc Comparisons for Differences Among Categories of Multiple-Level Socio-Demographic Variables and Proficiency of Elementary School Principals in Using Computers

Differences in proficiency in using computers—hardware and software, administrative, instructional, and overall—were analyzed for categories of four socio-demographic variables (number of computer courses taken, age, years of administrative experience, and highest degree held). Whenever a significant F was found, Scheffé's post-hoc comparisons were used to locate the differences among the means.

Number of computer courses taken and proficiency of elementary school principals in using computers. Data for the differences between groups based on the number of formal computer courses taken and the four types of proficiency in computer use by elementary school principals are in Table 25. The number of computer courses was categorized as zero, one, two to four, or five or more. Differences were found among the levels of formal computer training (number of courses taken) and proficiency in using hardware and software and overall proficiency. The more formal courses the elementary principals reported they had taken, the higher they rated their proficiency in using hardware and software (see Scheffé's post-hoc comparisons in Table 26). Those who reported taking two to four or five or more courses rated themselves more proficient in using hardware and software than those taking no courses, and those who reported taking five or more courses rated themselves more proficient in using hardware and software than those taking one course. Those who took five or more courses rated themselves as more proficient in using computers overall than those who took no formal courses (see Scheffé's post-hoc comparisons in Table 27). There were no differences among the levels of formal training and proficiency in using computers for administrative or instructional purposes.

Age, years of administrative experience, highest degree held, and proficiency of elementary school principals in using computers. Data for these analyses are in Tables 28, 29, 30, and 31. No differences were found among categories of age (≤ 40, 41-50, ≥ 51), years of experience (1-5, 6-10, 11 or more), or highest degree held (BA and MS, CAGS and EdS, EdD and PhD) for all of the proficiency variables except overall proficiency for age. A significant F was found for differences among the age categories; however, no differences were detected when Scheffé's test for post-hoc comparisons was applied. This is probably due to the conservative nature of the test which holds the overall error rate to the alpha applied. In this case the alpha was .05.

Table 24

Overall Proficiency of Elementary School Principals in Using Computers by Selected Two-Category Socio-Demographic Variables: t-tests

Variable	N	M	SD	df	t	p
Administrative use				239	1.70	.09
Daily (1)	225	2.00	.44			
Weekly (2)	16	1.81	.40			
Missing	11					
Completed a formal computer course				74.78[a]	1.47	.15
Yes (1)	173	2.01	.39			
No (2)	57	1.89	.56			
Missing	22					
Gender				237	1.15	.25
Male (1)	102	2.03	.46			
Female (2)	137	1.96	.43			
Missing	13					
Home computer ownership				6.14[b]	-.56	.59
Yes (1)	226	2.00	.43			
No (2)	7	2.14	.69			
Missing	19					
Ethnicity				237	.13	.90
Minority (1)	40	2.00	.45			
White (2)	199	1.99	.44			
Missing	13					
Personal digital assistant use				240	1.89	.06
Yes (1)	59	2.08	.47			
No (0)	183	1.96	.42			
Missing	10					
Freed up time				238	1.58	.12
Yes (1)	80	2.05	.42			
No (0)	160	1.96	.44			
Missing	12					
Improved my work quality and accuracy				239	1.70	.09
Yes (1)	213	2.00	.43			
No (0)	28	1.86	.45			
Missing	11					
Made very little difference in time and quality				42.76[c]	-2.27	.03
Yes (1)	34	1.82	.46			
No (0)	207	2.01	.42			
Missing	11					

(table continues)

Table 24 (continued)

Variable	N	M	SD	df	t	p
Consumed time from other obligations				239	-1.35	.18
Yes (1)	24	1.88	.45			
No (0)	217	2.00	.43			
Missing	11					
Decreased time spent on paperwork				237	.55	.59
Yes (1)	141	2.00	.41			
No (2)	98	1.97	.44			
Missing	13					

[a] Unequal variances in the two groups, Levene's test (F=14.90, p=.00). [b] Unequal variances in the two groups, Levene's test (F=4.23, p=.04). [c] Levene's test (F=4.75, p=.03).

Table 25

One-way Analysis of Variance for Differences in Proficiency of Elementary School Principals in Using Computers by the Number of Formal Computer Courses Taken

Proficiency variable	Source of variance	Sum of squares	df	Mean square	F	p
Hardware and software proficiency	Between groups	4.87	3	1.62	9.47	.00
	Within groups	39.71	232	.17		
	Total	44.58	235			
Administrative proficiency	Between groups	1.53	3	.51	2.04	.11
	Within groups	57.80	231	.25		
	Total	59.33	234			
Instructional proficiency	Between groups	1.71	3	.57	2.31	.08
	Within groups	56.76	231	.25		
	Total	58.46	234			
Overall proficiency	Between groups	1.88	3	.63	3.48	.02
	Within groups	40.10	222	.18		
	Total	41.98	225			

Note: Groups were 0, 1, 2-4, 5+ computer courses taken.

Table 26

Scheffé's Post-hoc Comparisons for Differences in Proficiency in Using Hardware and Software by Number of Computer Courses Taken

Dependent variable	(I) Number of computer courses taken	(I) Group mean	(J) Number of computer courses taken	(J) Group mean	(I-J) Mean difference	Std. error	p
Hardware and software proficiency	0	1.90	1	1.93	-.03	.12	.99
			2-4	2.19	-.29	.08	.00
			5+	2.30	-.39	.08	.00
	1	1.93	2-4	2.19	-.26	.11	.14
			5+	2.30	-.36	.12	.02
	2-4	2.19	5+	2.30	-.10	.06	.46

Table 27

Scheffé's Post-hoc Comparisons for Differences in Overall Proficiency of Elementary School Principals in Using Computers by Number of Computer Courses Taken

Dependent variable	(I) Number of computer courses taken	(I) Group mean	(J) Number of computer courses taken	(J) Group mean	(I-J) Mean difference	Std. error	p
Overall proficiency	0	1.83	1	1.87	-.04	.13	.99
			2-4	2.02	-.19	.08	.12
			5+	2.08	-.25	.09	.04
	1	1.87	2-4	2.02	-.15	.12	.64
			5+	2.08	-.21	.12	.38
	2-4	2.02	5+	2.08	-.06	.07	.84

Table 28

Age of Elementary School Principals and Proficiency in Using Computers

Proficiency variable	Source of variance	Sum of squares	df	Mean square	F	p
Hardware and software proficiency	Between groups	.39	2	.19	1.00	.37
	Within groups	47.62	247	.19		
	Total	48.00	249			
Instructional proficiency	Between groups	.23	2	.11	.45	.64
	Within groups	58.61	235	.25		
	Total	58.84	237			
Administrative proficiency	Between groups	.32	2	.16	.64	.53
	Within groups	59.49	236	.25		
	Total	59.81	238			
Overall proficiency	Between groups	1.28	2	.64	3.40	.04
	Within groups	44.70	237	.19		
	Total	45.98	239			

Note: Recoded age categories were 1=≤40, 2=41-50, 3=≥51.

Table 29

Scheffé's Post-hoc Comparisons for Differences in Overall Proficiency of Elementary School Principals in Using Computers by Age

Dependent variable	(I) Age	(I) Group mean	(J) Age	(J) Group Mean	(I-J) Mean difference	Std. error	p
Overall proficiency	≤40	1.90	41-50	2.03	.06	.08	.76
			≥51	2.09	.18	.08	.07
	41-50	2.03	≥51	2.09	.13	.06	.13

Table 30

Years of Administrative Experience of Elementary School Principals and Proficiency in Using Computers

Proficiency variable	Source of variance	Sum of squares	df	Mean square	F	p
Hardware and software proficiency	Between groups	.44	2	.22	1.15	.32
	Within groups	47.56	247	.19		
	Total	48.00	249			
Instructional proficiency	Between groups	.48	2	.24	.97	.38
	Within groups	58.36	235	.25		
	Total	58.84	237			
Administrative proficiency	Between groups	.96	2	.48	1.93	.15
	Within groups	58.85	236	.25		
	Total	59.81	238			
Overall proficiency	Between groups	.53	2	.27	1.39	.25
	Within groups	45.45	237	.19		
	Total	45.98	239			

Note: The administrative experience categories were 1-5 years, 6-10 years, and ≥ 11 years.

Table 31

Highest Degree Held by Elementary School Principals and Proficiency in Using Computers

Proficiency variable	Source of variance	Sum of squares	df	Mean square	F	p
Hardware and software proficiency	Between groups	.17	2	.09	.44	.65
	Within groups	48.07	248	.19		
	Total	48.24	250			
Instructional proficiency	Between groups	.19	2	.09	.37	.69
	Within groups	58.66	236	.25		
	Total	58.84	238			
Administrative proficiency	Between groups	.66	2	.33	1.32	.27
	Within groups	59.43	237	.25		
	Total	60.09	239			
Overall proficiency	Between groups	.53	2	.26	1.38	.25
	Within groups	45.46	238	.19		
	Total	45.98	240			

Some Exploratory Analyses

Some exploratory analyses were conducted. The last time a study of this type was completed (Celata, 1998), hand held computing devices (personal digital assistants) were not yet popular; however, in the early 2000s they were used much more frequently. In this study, 63 of the 240 responding principals reported that they used some form of handheld calendar or computer. This piqued my curiosity enough to explore a number of relationships using chi-square analyses and t-tests.

Chi-square tests were used to determine if relationships existed between the use of a personal digital assistant (yes, no) and whether the respondent had completed a formal computer course (yes, no), the number of formal computer courses taken (none, one, two to four, five or more), administrative experience (1-5, 6-10, 11 or more years), gender (male, female), age ($\leq$40, 41-50, $\geq$50), highest degree (BA/MS, CAGS/EdS, EdD/PhD), ownership of a home computer (yes, no), and ethnicity (minority, white). Anyone using a personal digital assistant was considered a "high-tech user," and I wanted to see if I could identify a profile for these users. Results are in Table 32. No profile was found. None of the chi-square coefficients was significant at the .05 level.

Finding no relationships between the demographic variables and the use of personal digital assistants, I turned to checking whether personal digital assistant users were more likely to have more favorable attitudes toward computers and would be more proficient using hardware and software, using computers for administrative purposes, using computers for instructional purposes, using the Internet, and overall. Data for these analyses are in Table 33. Levene's test for homogeneity of variances indicated that the variances were equal for the two groups across all dependent variables; therefore, the t-test for equal variances was applied in all tests. If alpha is set at .10, a reasonable level for exploring data, differences were found for attitude toward computers and all five proficiency variables. Personal digital assistant users used the Internet more, had more favorable attitudes toward computers, were more proficient users of hardware and software, and were more proficient users of computers overall and for administrative and instructional purposes than non-personal digital assistant users.

Summary of Findings

A summary of findings is in Tables 34, 35, and 36. The findings demonstrate the following:
1.   Attitude toward computers and proficiency in using computers are related. Those who are proficient users have favorable attitudes toward computers and those with favorable attitudes toward computers are proficient users. With the exception that attitude is not correlated with internet proficiency, there is nothing surprising here.
2.   Those who completed more formal courses in computer use were more proficient overall users and users of hardware and software than those who completed fewer formal courses. This seems to indicate that formal courses may focus on the use of hardware and software.
3.   Those who use handheld computers and calendars, called personal digital assistants in this study, reported they were more proficient users of computers for administrative and instructional purposes than those who are not personal digital assistant users. These same personal digital assistant users reported greater proficiency in Internet use and hardware and software use, and a more favorable attitude toward computers than non-personal digital assistant users. These personal digital assistant users may well be called the "high

Table 32

Chi-square Tests for Relationships Between Use of a Personal Digital Assistant by Elementary School Principals and Selected Demographic Variables

Relationship	N	df	Chi-square	p
Personal digital assistant use (yes, no) by completing a formal computer course (yes, no)	240	1	.37	.54
Personal digital assistant use (yes, no) by number of computer courses taken (0, 1, 2-4, ≥5)	236	3	3.35	.34
Personal digital assistant use (yes, no) by administrative experience (1-5, 6-10, ≥11)	250	2	.02	.99
Personal digital assistant use (yes, no) by gender (male, female)	249	1	.00	.96
Personal digital assistant use (yes, no) by age (≤40, 41-50, ≥50)	250	2	.60	.74
Personal digital assistant use (yes, no) by highest degree earned (BA/MS, CAGS/EdS, EdD/PhD)	251	2	.83	.66
Personal digital assistant use (yes, no) by ownership of a home computer (yes, no)	243	1	.42	.52
Personal digital assistant use (yes, no) by ethnicity (minority, white)	249	1	.20	.66

Table 33

Differences in Attitude Toward Computers and Proficiency in Using Computers of Elementary School Principals Who Are Personal Digital Assistant Users Compared to Elementary School Principals Who Are Non-Personal Digital Assistant Users: t-tests

Dependent variable	Personal digital assistant User	N	Mean	SD	Mean difference	Std. error difference	t	df	p
Internet proficiency	No	189	6.11	.88					
	Yes	63	6.38	.72	.28	.12	2.24	250	.03
Hardware and software proficiency	No	189	2.12	.44					
	Yes	63	2.24	.46	.12	.06	1.75	250	.08
Instructional proficiency	No	182	2.13	.49					
	Yes	58	2.32	.50	.19	.07	2.53	238	.01
	Missing	12							
Administrative proficiency	No	181	1.87	.48					
	Yes	59	2.09	.54	.22	.07	3.03	238	.00
	Missing	12							
Overall proficiency	No	183	1.96	.42					
	Yes	59	2.08	.47	.12	.07	1.89	240	.06
	Missing	10							
Attitude toward computers	No	187	2.68	.62					
	Yes	63	2.85	.66	.17	.09	1.85	248	.07
	Missing	2							

Table 34

Summary of Findings Related to the Research Question

Independent or demographic variable	Dependent variables			
	Hardware and software proficiency	Instructional proficiency	Administrative proficiency	Overall proficiency
Correlation analyses (alpha = .05)				
Attitude toward computer use	X	X	X	X
Internet proficiency	X	X	X	X
t-tests (alpha = .05)				
Frequency of administrative use	NS	NS	NS	NS
Completed a formal computer course	X (Yes)	NS	NS	NS
Gender	NS	NS	NS	NS
Home computer ownership	NS	NS	NS	NS
Ethnicity	NS	NS	NS	NS
Personal digital assistant use	NS	X (Yes)	X (Yes)	NS
Computer freed time	NS	X (Yes)	X (Yes)	NS
Computer improved work quality and accuracy	X (Yes)	X (Yes)	NS	NS
Computer made little difference in time and quality	X (No)	X (No)	X (No)	X (No)
Computer consumed time from other obligations	NS	NS	NS	NS
Decreased time spent on paperwork	NS	NS	X (Yes)	NS
One-Way ANOVA (alpha = .05)				
Number of formal computer courses taken (0, 1, 2-4, 5+)	X (0 v. 2-4) (0 v. 5+) (1 v. 5+)	NS	NS	X (0 v. 5+)
Age	NS	NS	NS	X[a]
Years of administrative experience	NS	NS	NS	NS
Highest degree held	NS	NS	NS	NS

Note. X = significant finding at alpha = .05. The word or numerals within parentheses indicate the group that scored higher or the post-hoc comparison that was significant. [a] Significant *F* but Scheffé's post-hoc comparisons were not significant.

Table 35

Summary of Findings From the Chi-square Exploratory Analyses of Relationships Between Personal Digital Assistant Use and Selected Profile Variables, Alpha = .10

Selected profile variable	Personal digital assistant use (Yes, No)
Completing a formal computer course	NS
Number of computer courses taken	NS
Administrative experience	NS
Gender	NS
Age	NS
Highest degree held	NS
Ownership of a home computer	NS
Ethnicity	NS

Table 36

Summary of Findings From the t-test Exploratory Analyses of Relationships Between Personal Digital Assistant Use, Attitude Toward Computers, and Proficiency in Using Computers, Alpha = .10

Criterion variable	Personal digital assistant user[a] (Yes, No)
Internet proficiency	X (Yes)
Hardware and software proficiency	X (Yes)
Instructional proficiency	X (Yes)
Administrative proficiency	X (Yes)
Overall proficiency	X (Yes)
Attitude toward computers	X (Yes)

[a] "Yes" means the difference is in favor of the personal digital assistant user.

tech users" among the elementary principals. They seem to be slightly ahead of the technology curve. However, no socio-demographic variables distinguished these high-tech users from others.

4. Those who reported that the computer freed time for other purposes were more proficient users of the computer in administration and instruction than those who reported that computers didn't free time for other purposes.

5. Those who reported that the computer improved both work quality and accuracy were more proficient users of hardware and software and were more instructionally proficient in use of computers than those who reported that the computer didn't improve both work quality and accuracy.

All findings and correlations need to be taken in view of the large number of tests that were conducted. When only a few tests are significant, as in this study, caution must be exercised in placing too much confidence in them. They could be due to statistical error.

CHAPTER V

CONCLUSIONS AND DISCUSSION, LIMITATIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to investigate the use of computers by elementary school principals. Conclusions drawn from the findings, a discussion of the results, implications for practice, and recommendations for further research are included.

The study included 252 elementary school principals with grades kindergarten through eight. One hundred six males and 143 females participated. The percentage of questionnaires returned was 63%. Nearly all of the principals (99.6%) used the computer on the job.

Most of the principals (93.7%) owned a home computer, and 92.9% used a desktop computer at the office. Laptop computers were used by nearly two-fifths of the principals, and personal digital assistants were in the hands of a quarter of them. Laptops and personal digital assistants allow principals' greater flexibility and mobility of settings in the use of computers. Access to computers does not seem to be a problem for elementary principals, and nearly all (92.9%) are daily users.

Conclusions and Discussion

Based on the findings of this study, several conclusions about computer use by elementary school principals can be drawn.

Tasks Performed by Elementary School Principals with Computers

Elementary principals use the computer on a daily basis for administrative tasks. The tasks include creating their own database, retrieving information from the student database, creating and presenting an electronic slide show using presentation software, using and creating spreadsheets for a variety of tasks, using presentation software, and using a program to disaggregate and analyze information.

Computers are used by the elementary school principals for a variety of instructional tasks. They use the computer to create master schedules, develop or write curriculum, and create graphs and charts. Less than half of principals use the computer to monitor student objectives and grades, to write up classroom observations, monitor achievement test data, and to locate curriculum resources. The use of the computer by elementary school principals allows them to perform leadership and management tasks more efficiently.

Variables Related to the Proficiency of Elementary School Principals in Using Computers

Looking across the four measures of proficiency—use of hardware and software, instructional, administrative, and overall—there are differences between those who are more proficient in using computers and those who are less proficient in using computers. The more proficient users have more favorable attitudes toward the use of computers, use the Internet more frequently and for more tasks, and believe that computers make a difference in the time spent on their work and the quality of their work. Formal training seems to make a difference in the proficiency of elementary principals in using hardware and software and in overall proficiency but not in instructional and administrative proficiency. This may be due to the emphasis in formal courses, which may be a preponderance of content on hardware components and program applications.

Some socio-demographic variables don't appear to be associated with proficiency in using computers. These are gender, ownership of a home computer, ethnicity, age, years of administrative experience, and highest degree held. Males and females were equally proficient in this study. Minorities and whites reported equal levels of proficiency. Older and younger principals didn't differ across all types of proficiency, and years of experience did not distinguish more proficient from less proficient users. Education level, as measured by the highest degree held, made no difference in level of proficiency.

The more proficient users of computers seem to make use of these devices in their administrative work, for participants reported that computers decreased the time they spent on paperwork. Regardless of proficiency in using computers, respondents reported that computers did not consume time from other obligations. This reflects a generally positive perspective on the use of computers in administrative work at the elementary school level.

As the analysis proceeded, the researcher became aware of the possibility of a "high tech" elementary school principal, one who was savvy about the use of computers and who used computers across all functions of his or her work. One variable—the use of a personal digital assistant, which was coming into more prevalent use at the time the data were collected—was used as an indicator of these "high tech" principals. About 25% of the principals reported they were personal digital assistant users. However, when relationships with selected socio-demographic variables were explored, no profile of distinguishing characteristics was found. Personal digital assistant users and non-personal digital assistant users did not differ in formal computer training, administrative experience, gender, age, highest degree held, ownership of a home computer, or ethnicity. However, the use of a personal digital assistant was a good indicator of the proficiency of elementary principals in using computers. It was statistically related to Internet use, hardware and software proficiency, instructional proficiency, administrative proficiency, overall proficiency, and attitude toward computers. Thus, the use of the latest technologies by principals may be a good measure of the proficiency of principals in using technology generally.

Limitations

This study was limited to a national sample of 400 elementary school principals in the United States in the year 2002-2003. Proficiency was based on the perceptions of the participating principals. Some of the principals may have overrated their proficiency. Others may have underrated their proficiency. These ratings may not reflect the true proficiency levels of the principals.

Implications for Practice

An important finding in this research is the relationship between formal training and hardware and software proficiency. Principals who took formal courses believed they were better able to use computers and apply software in their work. Without these capabilities principals can do little to improve their efficiency. School districts should make available to principals a continuously evolving set of formal computer courses that feature the latest hardware and software.

To improve computer proficiency among elementary school principals, districts should plan computer programs to train principals. School districts should continue to place emphasis on training for elementary principals to effectively use technology in their work. Funds need to be made available to purchase hardware and software. School districts are expecting principals

to model the use of technology in their schools. For principals to do this, principals must have access to updated hardware and software. School budgets must include funds for training and for hardware and software upgrades.

Most of the elementary principals reported that the computer had improved the quality and accuracy of their work and that the computer freed them from routine paperwork. Computers allow principals the opportunity to be more efficient in their use of time. Computers give principals an opportunity to complete tasks in a timely manner because they have more control over gathering information for decision-making (Hartweg, 2001; Moursand, 1999; Wilkinson, 1999). The time saved—nearly seven hours per week—should be redirected into instructional work to meet accountability standards and enrich the school's program for all children.

The findings clearly indicate that elementary school principals are using computers in their work. Computers are being used for instructional and administrative purposes. Principals must be given support to help them understand and continue to use computers. The work that principals do is complex. They must be given support to help them continue to understand and use computers for the complex tasks of their jobs.

Elementary school principals need continual training if they are to expand their use of computers. The findings indicate that nearly half of the principals learned computer skills through in-service training. Training needs to be ongoing so principals can continue to learn how to use hardware and software applications within the context of their administrative and instructional responsibilities (Brown, 2001). The closer the training is to the work of the principals, the greater the transfer of learning to that work.

Recommendations for Future Research

The purpose of this section is to make recommendations for future research that will add to the general knowledge on elementary school principals' use of computers.

Research should be conducted to explore effective methods of staff development for principals using computers. Effective training methods contribute to increasing the proficiency of principals using computers for administrative purposes. Various methods of staff development may include formal training, informal training, demonstrations by vendors, experiential learning and hands-on practice (Brown 2001; Hartweg (2001), Reed, 1998). Some methods may be more appropriate in specific contexts and for specific content or skills than others. On-line training options should be included.

Research on how principals use the Internet for administrative and instructional purposes should be explored. The Internet can be an avenue for researching information and data. This information and data can aid principals in making informed decisions. Additional research on principals' use of the Internet would indicate how principals use the Internet as a decision-making tool.

Further research should explore how principals use personal digital assistants in their work. The survey results indicated that handheld computers are used by one-fourth of the elementary principals. With the rapid change in technology, periodic surveys of elementary principals will be useful in identifying needs for school district investments in hardware, software, and staff development.

Reflections on How Elementary School Principals Use Computers

I pursued this study because I wanted to see how well elementary school principals were accommodating and using the technology that is available to them. Principals should have the

ability to effectively use computers and other technology. The effective use of the computer in management, communication, and decision-making can help increase their accountability. Computers can increase productivity and save time. This study was important to me because I wanted to know if elementary school principals were proficient users of computers, the types of tasks they performed using the computer, and the variables that contributed to their proficiency in using computers.

Elementary principals are using computers on a daily basis as a part of their work. Most principals are proficient in using computers for administrative and instructional responsibilities. These tasks range from monitoring achievement data and grades to writing or developing curriculum. Principals use computers for routine tasks such as merging letters, typing parent newsletters, permission slips, and preparing presentations.

Computers are used for retrieving student information, word processing, presentations, and other simple tasks. Elementary principals are proficient in using computers to activate a printer to secure a paper copy, run software programs, and connect to the Internet. Most principals are less proficient and confident in using computers for detailed and involved tasks. These tasks are using a digital camera; setting up a computer with its peripheral devices; scanning data, graphs, and photos; and evaluating hardware.

Elementary principals are utilizing the Internet at home and at school. The Internet is used to send email, conduct searches, and find professional resources. Principals were less comfortable with such intricate tasks as configuring a browser for mail, graphics, and sounds.

The desktop computer is the main choice of principals. This could be because of the price of these computers and the purchasing policies and practices of school districts. This type of computer is more affordable than the laptop. Reductions in the cost and discounts can be given to those who work in the field of education. Costs are less for schools if computers are purchased in large numbers.

Most of the principals have a master's degree and are over 40 years of age. This age range represents the era of the baby boomers.

Most of the principals use the computer on a daily basis. They believe that using the computer has decreased the amount of time spent on paperwork. This savings allows principals more time to handle other administrative and instructional responsibilities. It is not clear how they use their saved time. This is an area that deserves additional study.

Most of the principals are being formally trained to use computers. Some are enrolling in professional courses. Over two-fifths learned to use the computer through some type of in-service provided by the school district. This method of training ensures that principals use the software programs provided by the district. These programs can generate data that principals use as leaders in decision making for administrative and instructional tasks.

In an age of technology and information, principals are becoming competent in using computers. The use of computers for menial or involved tasks can help principals save time as they perform their daily responsibilities. Their ability to use computers helps them become more effective managers in using and analyzing the information that is available to them. In an informational and technological society, principals who recognize the potential of technology and computers may understand that technology can unlock a world of computer use that can improve the effectiveness of their schools.

Since this study was completed, sweeping changes have occurred in technology. Speed and capabilities of computers have increased. Larger amounts of information can be stored. Wireless computers such as laptops and personal digital assistants or hand held devices have

become more advanced and cost less. Wireless computers have more sophisticated functions that require sophisticated software. Cell phones are multifunctional with voice tones, ring tones, cameras, videos, pictures, graphics, voice mail, text messaging, and music. The advancements of smart technology and computers can save time and increase productivity.

The sample in this study had a majority of the respondents from the K-3 grade span. This could have happened because of the large numbers of elementary principals with a K-3 configuration within school districts. Minorities were underrepresented. The reasons for this are unknown.

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APPENDICES

APPENDIX A

INITIAL LETTER TO THE SAMPLE

Dear (Name of Potential Participant):

I am Faye Felton, a doctoral student at Virginia Tech. This questionnaire is part of a nationwide study of computer use by elementary school principals. The survey attached will take approximately 15-20 minutes to complete. Since your response reflects your experience as a principal, the information you provide is essential.

I am aware of the demands of your daily work load. However, your input is vital to the success of this study. When the questionnaires are completed and returned, I will be able to determine how elementary principals use computers in their work. I will also be able to identify the variables that affect computer use by elementary administrators. Your responses will remain confidential.

Please complete the questionnaire and return it in the enclosed stamped envelope.

The identification number on the instrument is for record keeping only. I would appreciate receiving it by (date).

I sincerely thank you for contributing to this study and invite you to call me collect if you have any questions at (757) 483-2178(H) or (757) 465-2923(O) or email me at fsfelton@aol.com.

Sincerely,

Faye Felton

David Parks
Research Advisor

APPENDIX B

POSTCARD TO NON-RESPONDENTS

Date

Dear Fellow Principal:

Upon checking the returned surveys, I did not find a survey completed by you. Therefore, I am asking for your help again. Please forward your survey on the use of computers by elementary school principals as soon as possible. If you have returned your survey, thank you for returning it.

Sincerely,

Faye S. Felton

David Parks
Research Advisor

APPENDIX C

LETTER TO NON-RESPONDENTS

Date

Dear Fellow Principal:

Recently, I sent you a questionnaire on how elementary principals use computers. Your survey has not been received. If you have returned it, thank you for participating in the study. I am aware that an occurrence could have hindered your returning the instrument. Your responses to the questionnaire items are needed to provide accurate national data on this topic.

In case the survey has been misplaced, another copy is enclosed. It would be greatly appreciated if you would take a short amount of time to complete it.

Please return it in the stamped envelope.

Thank you for participating in this study.

Sincerely,

Faye Felton

David Parks
Research Advisor

APPENDIX D

QUESTIONNAIRE:

A STUDY OF THE USE OF COMPUTERS BY ELEMENTARY SCHOOL PRINCIPALS

**A Study of the Use of Computers by Elementary
School Principals**

Dear Building Principal:

     I am Faye Felton, a doctoral student at Virginia Tech. This questionnaire is part of a nationwide study involving the use of computers by elementary school principals.

     I know that your time as a practicing principal is limited and very valuable. However, your input is vital to the success of this study. When the questionnaires are completed and returned, I will be able to determine how elementary principals use computers in their work and the variables that affect that use.

     Please complete the questionnaire and return it in the enclosed stamped envelope. It should take approximately 20 minutes. Your responses will be kept confidential. The identification number on the instrument is for record keeping only. Please make every effort to return the questionnaire by March 1, 2003.

     I sincerely thank you for contributing to this study and invite you to call me collect if you have any questions at (757) 483-2178(H) or (757) 465-2923(O) or email me at fsfelton@aol.com.

Faye S. Felton   David Parks
Doctoral Candidate   Research Advisor

**A Study of the Use of Computers by
Elementary School Principals**

A. <u>Demographic Information</u> Please circle the appropriate response.

1. How many years of administrative experience do you have?
   a. 1 – 5 years
   b. 6 – 10 years
   c. 11 years or more

2. What is your gender?
   a. Male
   b. Female

3. What is your age?
   a. 30 years or less
   b. 31 – 40 years
   c. 41 – 50 years
   d. 51 – 60 years
   e. 61 years or over

4. What is the highest degree you have earned?
   a. Bachelor's Degree
   b. Master's Degree
   c. Certificate of Advanced Study, Ed.S.
   d. Doctorate, Ed.D. or Ph.D.

5. Do you own a home computer?
   a. Yes
   b. No

6. What is your ethnicity?
   a. American Indian or Alaskan Native
   b. Asian or Pacific Islander
   c. African-American, not Hispanic Origin
   d. Hispanic
   e. White, not of Hispanic Origin
   f. Other, Please Specify

   _____
   _____

B. Administrative Use of Computers Please check the appropriate response.

7. Do you use a computer? ____1. Yes
    ____2. No
    If no, please stop here and return the questionnaire in the enclosed envelope. Thank you.

8. What computer do you use? ____1. Laptop
    (Check all that apply) ____2. Desktop
    ____3. [Personal digital assistant] (hand held computer)
    ____4. Centrally located workstation

9. How often do you use the ____1. Daily
    computer for administrative ____2. Weekly
    purposes? ____3. Monthly
    ____4. Seldom

C. Internet Use Please check the appropriate response.

10. Is your home computer ____1. Yes
    connected to the Internet? ____2. No

11. Is your computer at school ____1. Yes
    connected to the Internet? ____2. No

12. Do you use the Internet? ____1. Yes
    ____2. No (Skip to question 18)

13. Do you use the Internet to send ____1. Yes
    email? ____2. No

14. Do you use a search engine to ____1. Yes
    conduct an Internet search? ____2. No

15. Do you use a web browser to
    explore educational and ____1. Yes
    professional resources? ____2. No

16. Can you configure a browser to
    manage mail, graphics, sounds, ____1. Yes
    attachments? ____2. No

17. Please list other purposes for _____
    which you have used the _____
    Internet. _____
    _____
    _____
    _____
    _____

D. Hardware and Software Use

18. In your opinion, which best describes 1. Beginner
    your level of proficiency using a 2. Intermediate
    computer? (Circle one) 3. Advanced

For the following items, please circle the number that corresponds to your level of proficiency based on the categories in item 18. Proficiency is defined as the level of expertise one has in operating a computer and in utilizing software.

19. Use a computer to accomplish a word processing task. 1 2 3

20. Use commands necessary to activate a printer to secure a hard copy. 1 2 3

21. Use a computer to run specific programs. 1 2 3

22. Use a modem. 1 2 3

23. Access information and download pictures on a CD-ROM. 1 2 3

24. Use a digital camera to take pictures. 1 2 3

25. Set up a computer and peripheral devices. 1 2 3

26. Use a scanner to scan data, graphics, and photos. 1 2 3

27. Evaluate software for administrative purposes. 1 2 3

28. Other (please list)
    _____ 1 2 3
    _____ 1 2 3
    _____ 1 2 3

E. Instructional Proficiency Please circle the number that corresponds to your proficiency in using the computer for instructional tasks.
1. Beginner 2. Intermediate 3. Advanced 4. Do not use a computer for this
                                                                                                      task

29. Record observations in the classroom.   1 2 3 4

30. Monitor student achievement for specific objectives.   1 2 3 4

31. Monitor students' grades.   1 2 3 4

32. Create a master schedule.   1 2 3 4

33. Write up classroom evaluations.   1 2 3 4

34. Monitor achievement data.   1 2 3 4

35. Record discipline referrals.   1 2 3 4

36. Locate curriculum resources.   1 2 3 4

37. Develop or write curriculum.   1 2 3 4

38. Create graphs and charts.   1 2 3 4

39. Other (please list)

_____   1 2 3 4

_____   1 2 3 4

_____   1 2 3 4

F. Administrative Proficiency Please circle the number that corresponds to your level of proficiency in using a computer for administrative tasks.
1. Beginner 2. Intermediate 3. Advanced 4. Do not use a computer for this
                                                                                                      task.

40. Create your own database.   1 2 3 4

41. Use a program for developing budgets and cost
       projections.   1 2 3 4

42. Retrieve information from a student database.   1 2 3 4

43. Create and present an electronic slide show using
       presentation software.   1 2 3 4

44. Practice the responsible use of technology (regarding
       copyrights and site licenses).   1 2 3 4

45. Create and enhance transparencies with the use of a
       scanner.   1 2 3 4

46. Use word processing software for professional work.   1 2 3 4

47. Use and create spreadsheets for a variety of tasks.   1 2 3 4

48. Use presentation software.   1 2 3 4

49. Use a program to disaggregate and analyze information
       for solving problems.   1 2 3 4

50. Other (please list)

_____   1 2 3 4

_____   1 2 3 4

_____   1 2 3 4

G. Training Please check the appropriate response.

51. Have you completed a formal   ____1. Yes
       computer course?   ____2. No
                                          If no, how did you learn to use the
                                          computer?
                                          _____
                                          _____
                                          _____
                                          _____
                                          _____

52. How many professional courses   ____1. One
       in technology have you   ____2. Two to four
       completed?   ____3. Five or more
                                          ____4. None

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53. If you completed a formal computer class or course, was it

____1. Undergraduate
____2. Graduate
____3. Inservice training
____4. Non-school computer classes
____5. Presented by a company representative
____6. Other (Please specify)

_____
_____
_____

H. Effects of Computer Use Please check the appropriate response.

54. The use of computers has : (Check all that apply)

____1. Freed me from routine paperwork so I have more time to devote to other tasks.
____2. Improved the quality and accuracy of my work.
____3. Made very little difference in terms of either increasing time for other tasks or improving the quality of my work.
____4. Consumed time I previously would have spent in conferences, in the hall, or in classrooms.
____5. Other (Please specify)

_____
_____
_____
_____
_____

55. Has computer use decreased the amount of time you spend on paperwork?

____1. Yes
____2. No

56. If computer use has decreased the amount of time you spend on paperwork, please give the approximate amount of time that is now available per week for other tasks.

____ hours per week

I. Attitude Please circle the number that corresponds to how comfortable you are with each statement.

    1. Extremely Comfortable   3. Comfortable
    2. Moderately Comfortable 4. Uncomfortable

57. Administrative work would be more tedious without computers.
    1 2 3 4

58. Learning in classrooms has been truly enhanced by computers.
    1 2 3 4

59. Teachers' lives are made easier by the computer.
    1 2 3 4

60. School and community communications have been improved because of computers.
    1 2 3 4

61. The curriculum has been enriched because of the access to the Internet.
    1 2 3 4

62. Nearly everyone's life has been improved because of the wide use of computers.
    1 2 3 4

63. Are there other comments you would like to make about the use of computers by elementary school principals? If so, please use the space below for that purpose.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Thank you for participating in this study!

Survey No. _____

Please return to
    Faye S. Felton
    5837 Bernhowe Manor Lane
    Suffolk, VA 23435

APPENDIX E

**CONTENT VALIDITY OF DOMAINS AND ITEMS
AS SUPPORTED IN THE LITERATURE**

Table F1

The Use of Computers by Elementary School Principals: Domains and Items Supported by the Literature

Domains	Items	Citations
Demographic information	How many years of administrative experience do you have?	Riggs (1993), Celata (1998), Mullins (1996)
	Are you male or female?	Mullins (1996), Tiede (1992)
	What is your age?	Tiede (1992), Mikulcik (1993)
	What is your highest degree?	Tiede (1992), Booker
	Do you own a home computer?	Celata (1998), Tiede (1992), Armistead (1989)
Administrative use of computers	Do you use a computer?	Celata (1998), Armistead (1989)
	What computer do you use?	Celata (1998), Booker
	How often do you use a computer for administrative purposes?	Celata (1998), Booker
Internet use [proficiency]	Is your computer at home connected to the Internet?	Shoemaker (1997), Molindo (1997)
	Is your computer at school connected to the Internet?	Shoemaker (1997), Molindo (1997)
	Do you use the Internet?	Shoemaker (1997), Molindo (1997), Technology Standards for Instructional Personnel (1998)
	If you responded yes to question 11, please list the administrative purposes for which you have used the Internet?	Shoemaker (1997), Molindo (1997)

Domains	Items	Citations
Internet use [proficiency] (cont'd)	Do you use the Internet to send email?	Shoemaker (1997), Molindo (1997), Technology Standards for Instructional Personnel (1998)
	Do you use a search engine to conduct an Internet search?	Celata (1998), Technology Standards for Instructional Personnel (1998)
Hardware and software proficiency	Use a computer to accomplish a word processing task.	Celata (1998), Armistead (1989)
	Use commands necessary to activate a printer to secure a hard copy.	Celata (1998), Armistead (1989)
	Create graphs and charts.	Celata (1998), Armistead (1989)
	Use a modem.	Celata (1998), Armistead (1989)
	Access information on a CD-ROM.	Technology Standards for Instructional Personnel (1998)
	Use a digital camera.	Technology Standards for Instructional Personnel (1998)
	Use a computer spreadsheet to manipulate information.	Celata (1998), Armistead (1989)
Instructional proficiency	Record observations in classrooms.	Mikulcik (1993), Mullins (1996)
	Monitor student achievement for specific objectives.	Mikulcik (1993), Mullins (1996)
	Monitor students' grades.	Mikulcik (1993), Mullins (1996)
	Create a master schedule.	Celata (1998), Armistead (1989)

Domains	Items	Citations
Instructional proficiency (cont'd)	Write up classroom evaluations.	Mikulcik (1993), Mullins (1996)
	Monitor achievement data.	Mullins (1996)
	Record discipline referrals.	Blake (2000), Boyd
	Identify effective use of technology in classrooms.	Blake (2000)
	Evaluate teachers' use of technology integration activities into curriculum.	Blake (2000)
Administrative proficiency	Create your database.	Celata (1998), Armistead (1989)
	Use a program for developing budgets and cost projections.	Celata (1998), Armistead (1989)
	Retrieve information from the student database.	Celata (1998), Technology Standards for Instructional Personnel (1998)
	Create and present an electronic slide show using a television monitor or LCD panel.	Celata (1998), Technology Standards for Instructional Personnel (1998)
	Prepare the school's budget.	Celata (1998), Tiede (1992)
	Do you practice the responsible use of technology (regarding copyrights and site licenses.	Celata (1998), Blake (2000), Technology Standards for Instructional Personnel (1998)
Training	Have you completed a formal computer course?	Rockman & Robinson (1993), Tomei (1999)
	If you answered no, how did you learn to use the computer?	Celata (1998), Tiede (1992), Tomei (1999)

Domains	Items	Citations
	How many technology professional courses have you had? a. One b. Two to Four c. Five or More d. None	Preston (1994), Riggs (1993), Tomei (1999), Celata (1998)
Training (cont'd)	If you completed a formal computer class or course, was it-- a. Undergraduate b. Graduate c. In-service training d. Non-school classes e. Presented by company representatives f. Other	Celata (1998), Armistead (1989), Tiede (1992), Blake (2000)
Effects of computer use	The use of computers for administrative purposes has-- a. Freed me from routine paperwork. b. Improved the quality and accuracy of my work. c. Made very little difference. d. Consumed time. e. Other (Please specify)	Celata (1998), Armistead (1989)
	Has computer use decreased the amount of time spent on paperwork?	Celata (1998), Armistead (1989)
	If computer use has decreased the amount of time spent on paperwork, give the amount of time available for other tasks.	Celata (1998), Armistead (1989)
Attitude	I feel confident in my ability to use a computer.	Blake (2000), Riggs (1993), Celata (1998), Armistead (1989)
	I believe that the computer is a practical tool for elementary school principals.	Celata (1998), Riggs (1993), Armistead (1989)
	I feel confident in my ability to evaluate teachers' instructional use of technology.	Celata (1998), Blake (2000), Riggs (1993)

Domains	Items	Citations
No domain	Are there other comments you would like to make about the use of computers by elementary school principals? If so, please use the space below for that purpose.	Celata (1998), Armistead (1989)

VITA

The researcher, Faye S. Felton, is currently employed with the Portsmouth Public School Division, in Portsmouth, Virginia, as a principal. She has held various teaching, specialist, and administrative positions, including elementary classroom and Title I teacher, reading specialist, and assistant principal.

Dr. Felton earned a Bachelor of Science Degree in Elementary Education from Norfolk State University, a Master of Education Degree with a concentration in early childhood education from Old Dominion University, a reading specialist's certificate from Old Dominion University, and an elementary principal's certificate from courses taken at Old Dominion University and Virginia Tech.