A STUDY OF THE TECHNOLOGY LEADERSHIP OF TEXAS HIGH SCHOOL PRINCIPALS

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Effectively integrating technology into school requires the presence of informed and visionary leadership. Past research on change in schools demonstrates the importance of the principal to that process. In that research it is obvious that the principal must possess more than skills and knowledge about the change, he or she must also possess leadership skills to lead the campus through the change. Despite this finding, very little research has been attempted to determine the leadership knowledge and skills of principals for technology integration.

This study attempts to investigate the technology leadership of high school principals in Texas using the National Educational Technology Standards for Administrators (NETS*A). In addition, this study compares technology leadership among principals who have attended the Technology Leadership Academy with those who have not attended this training. The two questions that guided this study are:

1) What are the technology leadership actions of Texas' high school principals in each of the six technology leadership standards identified by the NETS*A standard document?

2) How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?

Because no existing survey measured technology leadership using the NETS*A, a 46-part survey document was created by the researcher. The survey contained multiple questions covering each of the six standards of the NETS*A and was administered online. Descriptive statistics were used to answer the first research question. A MANVOA, using the combined mean scores for questions covering each NETS*A standard as the dependent variable and the principal's participation in the Technology Leadership Academy as the independent variable, was run to provide answers to the second research question.

The principals in this study scored highly in each of the six NETS*A standards. The lowest combined mean score dealt with a principal's leadership and vision for technology. Descriptive statistics showed principals exhibited the highest combined mean score in the area of support, maintenance, and operations. Furthermore, the MANOVA indicated little difference between principals who attended the Technology Leadership Academy and those who did not attend.

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CHAPTER 1

IINTRODUCTION

Increasingly our society is becoming dependent on technology for existence. Cellular phones, e-mail accounts, web searches, personal digital assistants, digital cameras, global positioning satellites, and a multitude of other technological devices are standard in our society. Each of these advances occurred within the last twenty years, most have developed within the last decade.

Technology is redefining the lives of millions of people in a variety of ways. It is transforming the world of work and even creating new jobs. It was only a few short years ago that filling up with gas also included a gas station attendant checking the oil and washing the windows. Today self-serve gas pumps, created with the advent of technology, have practically forced the gas station attendant into extinction. Similarly, the bank teller is being replaced with automated teller machines (A. T. M.). The North Central Regional Educational Laboratory (n.d.) reports that by 2006, nearly one-half of all U. S. workers will be employed in industries that produce or intensively use information technology products and services.

Similarly, technology is transforming our schools. The U. S. Department of Education's *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge*, describe computers as "the new basic" of American education, and the Internet as "the blackboard of the future" (U. S. Department of Education, 1996, p. 3). Certainly, in the last few years schools have made huge strides in providing technology to students. Between 1992 and 1998, schools, often assisted by federal and state programs designed to minimize the costs of technology acquisition, have increased the number of computers by 150% (Anderson and

Ronnkvist, 1999). Education Week's Technology Counts 2002 reports that today's schools have one computer for every 4.2 students. Multimedia computers are available in schools at a rate of one for every 6.9 students. Ninety-two percent of schools and 84% of classrooms have computers that have Internet access: 83% of teachers have school provided e-mail accounts (Technology Counts, 2002).

Public schools are spending record amounts on technology in an effort to help provide students with experiences that will prepare them for their world. The Southern Regional Education Board reports that schools spent $5 billion during the 1997-98 school year (Thomas, 1999). Between 1996 and 1999, 16,000 schools spent over $1 billion through the federal "E-rate" program administered by the Schools and Libraries Division of the Universal Service Administration Company (Anderson and Ronnkvist, 1999). Many schools have spent a large portion of their technology funds to create a technological infrastructure. They bought computers, printers, fax machines, connections to the Internet, and a variety of software products designed to improve and modernize education.

While these efforts are significant, the technological changes that have affected society have left educational systems largely unaltered and the process of teaching relatively unchanged. The Office of Technology Assessment's *Teachers and Technology: Making the Connection* (1995) reinforced this point, "Despite technologies available in schools, a substantial number of teachers report little or no use of computers for instruction" (p. 1). Those teachers using computers in their classrooms are not integrating the technology into the instruction. Becker (1999) reports that although teachers are using technology more frequently, most of that use is instruction related rather than integrated into the instruction. For example, these teachers might download information for a particular class or complete some administrative function using

technology. *Teachers' Tools for the Twenty-first Century* (United States Department of Education, 2000b) reports that 99% of teachers use technology to accomplish a number of prepatory and administrative tasks while only 53% indicate that they use it for instruction during class time. While technology equipment has been provided to schools, its use as an instructional tool integrated seamlessly into the curriculum is less admirable.

To fully realize the potential of technology to improve education, we must prepare teachers to use the technology. "Making the connection between technology and teachers ... is one of the most important steps the nation can take to make the most of past and continuing investments in educational technology" (Office of Technology Assessment, 1995, p. 18). The Department of Education (2000b) reports that teachers' willingness to use computers and the Internet may depend on certain characteristics of schools and classrooms in which they work. Equipment, time, technical assistance, and leadership "may act as either barriers to or facilitators of technology use" (p. 4). Possibly the most important of these four characteristics is leadership, particularly from the campus leader. Certainly, the principal of a school influences each of the four components directly. He or she budgets for the equipment, creates the time for staff development and training, provides for technical assistance, and provides technology leadership.

Purpose of the Study

The importance of the principal to the success of a particular campus is reported extensively in the research (Awalt, 1999; Dufour and Eaker, 1992; Schlechty, 1990; Institute for Educational Leadership, 2000). Only recently, however, has considerable attention been placed on the role of the school principal as a leader in technology integration into the schools. Indeed, the principal was often a victim of the commercial and societal onslaught to get technology into

schools. Much of the time, the technology was simply added to the school with little regard for the technological abilities or attitudes of the principal (Gibson, 2001).

To provide national expectations of technology leadership, the Collaborative for Technology Standards for School Administrators released the Technology Standards for School Administrators (TSSA) in November 2001. The International Society for Technology in Education (ISTE), which had previously released technology standards for students (NETS*S) and teachers (NETS*T), adapted the TSSA in 2002 as the National Educational Technology Standards for Administrators (NETS*A). Six domains are identified by NETS*A:

I. Leadership and Vision

II. Learning and Teaching

III. Productivity and Personal Practice

IV. Support, Management, and Operations

V. Assessment and Evaluation

VI. Social, Legal, and Ethical Issues (International Society for Technology in Education, 2002)

Despite the fact that administrative leadership may be "the single most important factor affecting schools' successful integration of technology" (Byrom and Bingham, 2001, p. 4), surprisingly little attention has been paid to the technology related needs of school administrators.

The only large-scale national initiative for training school administrators in technology leadership is the Bill and Melinda Gates Foundation State Challenge Grants for Leadership Development (McLeod, 2002). The Texas Association of School Administrators and the Texas Business and Education Coalition received $6.3 million from the Gates Foundation to train superintendents and principals throughout the state (Texas Association of School Administrators,

2001). The four-day training for school administrators is designed to produce the following outcomes.

Participants will:

1. Be able to articulate the premises of systems change and the role of leadership in a standards-based, results driven, data-rich educational setting,
2. Be familiar with examples of how technology enhances high student performance, excellent teacher performance, and administrative effectiveness,
3. Understand how to develop an organizational structure that integrates curriculum and assessment with technology,
4. Learn technology tools that can be used for personal productivity and to enhance learning opportunities for students,
5. Participate in networking and on-line experiences to share knowledge and best practices, pose questions, gather data, and obtain support regarding systems change, leadership development, and the use of technology,
6. Learn planning processes that can be replicated during planning sessions in participants home districts,
7. Have access to a variety of resources to guide future planning efforts and funding,
8. Model and define an effective professional development program for helping teachers integrate technology into the curriculum, including results-based training, evaluation of results, adult learning theory and subsequent practices, and continuous learning rather than one-shot sessions,

9. Design a unique action plan for the participant's district or campus, reflecting their leadership in systems change and using technology to enhance student success and system effectiveness. (Texas Association of School Administrators, 2001b)

This training promised to develop in participant's not only additional technological competencies, but also new leadership skills to be used in providing technological leadership. The purpose of this study is to determine how high school principals in Texas embody this role as technology leader using the NETS*A standards and if those principals who participated in the TASA Technology Leadership Academy exhibit different leadership skills than those who haven't completed this training.

Statement of the Problem

Studies indicate that the implementation of technology often hinges on the leadership of the organization (Gates, 1995; Sandholtz, 1997; Thomas, 1999). Most administrators completed their education and certification before the advent of current technologies. Thus, many schools still have not fully integrated technology into the curriculum and instruction. Awalt (1999) states, "Inquiries into the slowness of full scale technology adoption and integration cite the lack of school administrators' knowledge about advanced technologies" (p. 1). Since technology continues to change rapidly, it is important for administrators to develop leadership skills and technology competencies. This study evaluated the technology leadership actions of high school principals in Texas. In addition, it determined if principals who participated in the Technology Leadership Academy differed significantly in their technology leadership role from those who have not participated in the training.

Research Questions

This study describes the technology leadership actions of Texas high school principals in each of six technology leadership standards developed by the NETS*A and compares results between principals who have participated in Technology Leadership Academy with those who have not participated. Two questions guide the study:

1. What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?
2. How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?

The null hypothesis for question 2 of this study is there is no difference between Texas high school principals who have completed the TASA Technology Leadership Academy and those who have not attended the training in their technology leadership practices as identified by the NETS*A. The null hypothesis is stated in statistical terms in Chapter 3.

Definition of Terms

This study considers the leadership practices and technology competencies to be identified as critical elements of any technology professional development activity for school administrators. The study includes the following terms:

NETS*A – National Educational Technology Standards for Administrators. This standard document was published by the International Society for Technology in Education (ISTE) and is identical to the TSSA (Technology Standards for School Administrators) published by the

Collaborative for Technology Standards for School Administrators. This study will refer to the document through the acronym NETS*A.

Technology integration - an instructional program in which student outcomes are the focus and technology use is woven throughout the curriculum (Brooks-Young, 2002, p. 46).

University Interscholastic League (UIL) – Association for interscholastic athletics in the state of Texas. The UIL divides schools into five "classifications" based upon student enrollment. Respondents to the study survey will list their schools UIL classification thus providing additional descriptive data for evaluating the data.

Limitations

This study has several limitations that may affect its generalizability. First, while other states have conducted similar types of training, often also with the financial support of the Bill and Melinda Gates Foundation, this study is limited by the participation of high school principals from only the state of Texas. Second, limitations on validity and reliability occur anytime a study uses self-reports or surveys. Third, this study uses an online survey instrument. This could limit the ability of participants to respond to the survey. They would be limited by either their access to electronic mail, their willingness to open e-mail from an unknown source, or their ability to complete an online survey.

Significance of the Study

Gibson (2001) says the presence of informed and effective leadership is the number one issue in the effective integration of educational technology into the learning environment, not the preparation of teachers for technology usage. Wilmore (2000) recognizes the scarcity of studies regarding the role of the principal and the implementation of instructional technology in schools.

School principals have wide ranging responsibilities and jobs. Principals are tasked with being an instructional leader, personnel manager, discipline agent, vision builder, plant manager, legal guide, assessment expert, and team builder. High school principals, especially, find themselves additionally dealing with grade point averages, interscholastic athletics, cheerleader disputes, availability of advanced courses, financial record keeping, and a host of other duties. The Texas Education Agency identifies the following as components of the school administrators' job:

- Learner-Centered Values and Ethics of Leadership
- Learner-Centered Leadership and Campus Culture
- Learner-Centered Human Resources Leadership and Management
- Learner-Centered Communications and Community Relations
- Learner-Centered Organizational Leadership and Management
- Learner-Centered Curriculum Planning and Development
- Learner-Centered Instructional Leadership and Management

The seven domains of a school administrator's job demonstrate the wide range and extremely high expectation of the position.

> Susan Brooks-Young (2002) identifies the complexity of the principal's job: Becoming, and remaining to be an effective leader in today's educational environment requires sustained effort on the administrators' part. It requires the ability to hold a global perspective of the school or district while, at the same time being able to recognize and address all the pieces that affect programs including technology, curriculum, instructional practice, staff and community members, and managerial tasks (p. 3).

The National Association of Secondary School Principals commissioned the Milken Family Foundation to prepare its report on the high school principalship. The report, entitled *Priorities and Barriers in High School Leadership* (2001), details the opinion of high school principals throughout the nation that "there is simply not enough time to do everything that needs to be done" (p. 8).

Given the complexity and time-consuming nature of the principal's job, the significance of this study is to describe the extent to which high school principals see technology leadership as a part of their campus responsibilities. As principals begin to recognize their important role in the leadership of their campuses to acquire and use technology, they will better provide their campuses the opportunities to improve. In addition, this study gauges the level of success the Technology Leadership Academy has had on educating principals about their technology leadership role. Few, if any, studies have tried to ascertain the success of technology training for school administrators. This study will add to the relatively scarce body of knowledge concerning the importance of technology leadership by school administrators.

Organization of the Study

This study follows a traditional dissertation organization. Chapter Two details the literature currently available on technology in schools and the development of the leadership role of the principal regarding technology. Chapter Three describes the study methodology and instrumentation. Chapter Four describes the results of the study and analyze the data. Chapter Five focuses on evaluating the results of the study and provides recommendations for further study.

CHAPTER 2

REVIEW OF THE LITERATURE

Technology has become a part of a typical public school education in recent years. The Department of Education, in its *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge*, described computers as "the new basic" of American education, and the Internet as "the blackboard of the future" (U. S. Department of Education, 1996, p.3). In *Preparing Schools and School Systems for the 21st Century*, the American Association of School Administrators say, "Just as paper and pencils replaced the slate boards in schools, contemporary information and communication technologies are either replacing or enhancing a number of traditional resources (American Association of School Administrators, 1999, p. 17).

Inculcating technology in schools has become a goal of both federal and state governments. The federal effort is centered around the E-Rate program that allows schools to receive financial discounts on technological equipment. The program has contributed $1.2 billion to the nations school systems (U. S. Department of Education, 2000a). Similarly individual states have subsidized their schools' technology spending. Texas has provided millions of dollars to public schools and libraries through its Telecommunications Infrastructure Fund (Denton, Davis, and Strader, 2001).

Most of the research dealing with technology and schools has focused on the availability of technology in schools and classrooms. Multiple bodies of research have documented the incredible increase in the availability of instructional technology for schools (Anderson, 1999; U. S. Department of Education, 2000a; Becker, 2000; Bossert, 1997; U. S. Department of

Education, 2000b). For example, in 1994, 35% of all schools were connected to the Internet. Five years later, 95% of schools had been connected to the Internet (U. S. Department of Education, 2000a).

This review of the relevant literature was conducted using a variety of resources. The first exposure the researcher had to the problem being studied occurred after participation in the TASA Technology Leadership Academy in the fall of 2001 and spring of 2002. Much of the relevant literature concerning the actual academy, as well as significant contact with the academy faculty came from this experience. Second, Internet searches on all of the major commercial search engines yielded some significant Internet-based literature. Much of this literature came from a variety of Internet sites devoted to the use of technology in education. Internet sites such as the International Society for Technology in Education (ISTE), the Center for Research on Information Technology and Organizations (CRITO) and the Millken Family Foundation contained numerous links to articles and government reports that are being used in this review. A third source of resources came from traditional keyword searches through the library and electronic databases. The library database used most often was the EBSCOHost database. This strategy resulted in the acquisition of many dissertations and articles used in this chapter. For example, Ronald Jetton's (1997) dissertation on the comparison of principals' willingness to incorporate technology in their schools with their perceptions of restructuring included information on Texas principals located in the Houston, Texas service center area (Region 4). In addition to the findings from the many dissertations, the references used by the researchers were reviewed. For example, after reading that Larry Cuban's work had been referenced by many of the dissertations, this researcher accessed and used his works for this review (1986, 1994, 1999, 2001, & 2002). Last, the researcher subscribed to various e-mail listserves that sent alerts when

new research had been published. When a new report or study was published an alert was sent via e-mail to the researcher, often with a link to the actual study or an abstract of the study.

This chapter reviews the literature associated with a principal's technology competencies and leadership expectations and abilities. The information contained in this chapter sets a foundation for the study of principals' role as technology leaders. The chapter first provides a concise history of the use of technology in education, particularly the rise of the personal computer in the last fifteen years. Technologies such as the radio, motion picture, and television have had specific effects on the schooling process throughout history. However, as this review will point out, each subsequent technological development has failed to produce the systemic change often envisioned by educational reformers. Given that many of the past technologies introduced to education have had little affect on education, the chapter then reviews the literature on the promise that technology holds for the future. The literature review focuses on the promise of technology for students, for teachers, and finally, for the schools themselves. However, this promise for technology to change schools cannot take place without the involvement of the school leadership: the principal. Therefore, the chapter will briefly review the literature on the relationship of the principal to school effectiveness. Then the review will continue with an examination of the existing literature on principals' technology competencies and their leadership in relation to technology. Finally, the chapter will detail the technology standards created by the International Society for Technology in Education and the Collaborative for Technology Standards for School Administrators.

History of Technology in Education

Technology has been an integral part of education since the beginning of organized schools. Defining technology, especially educational technology during the modern era, has

often focused on computers. However, educators have been using various forms of technologies within classrooms for decades. Cuban (1986) named textbooks, chalkboards, radio, film, and television as forms of educational technologies. The definition used by this researcher is from Lanford's research on the history of educational technology: Tools that extend human capabilities, the systems within which the tools are used, and an approach to the management of an environment (Lanford, 1999). Given this definition educational technology can encompass a multitude of objects, procedures, and networks.

The use of this definition also points to the conclusion that some form of technology has existed during the entire history of organized education. Each historical era has included its own tools, systems, and management approaches that have affected the way instruction has been delivered. This review, however, focuses on education in the United States during the last century. It is during this time period several electronic technologies have promised to change education. Radio, television, film, the popular press, and mass media have all been described as "pervasive educational forces in modern society" (Lanford, 1999, p. 21).

The first two decades of the twentieth century saw the introduction of several new technologies to the American society. For example, Henry Ford created the assembly line process to mass produce a promising new mode of transportation called the automobile, the Wright brothers built and flew in the first airplane, motion pictures were being produced in large numbers, and radio was beginning to make mass communication available (Lanford, 1999). In schools, the most promising of the new technologies during this time period was the film. Thomas Edison's motion picture projector prompted him to say:

> I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of

> textbooks. I should say that on the average we get about two percent efficiency out of schoolbooks as they are written today. The education of the future, as I see it, will be conducted through the medium of motion picture… where is should be possible to obtain one hundred percent efficiency. (as quoted in Cuban, 1986, p. 9)

As Edison's comment confirms, many reformers saw films as a much better curricular resource than the textbook. Motion pictures were touted as methods to pique student interests and stir emotions. Films allowed students to view places and people they otherwise would never be able to experience. As early as 1910, a catalogue of educational motion pictures included over 1000 films (Cuban, 1986).

As great a promise as motion pictures had for improving education, Cuban's (1986) review of the research on the technology revealed teachers used it sparingly. His analysis indicated that elementary teachers used films more extensively than secondary teachers, but neither made the widespread use of films predicted by Edison. Furthermore, he identified obstacles blocking increased film use in the classrooms:

- Teachers' lack of skills in using equipment and film
- Cost of films, equipment, and upkeep
- Inaccessibility of equipment when it is needed
- Finding and fitting the right film to the class

Solutions identified by the researchers of the era identified solutions to this infrequent use. They promoted solutions that would eliminate these hardware and software problems, advocated increased training in teacher education, increasing the supply of films, increasing the budget allocation for films and similar suggestions (Cuban, 1986).

Between 1920 and 1940, the radio was presented as the next great technological tool for education. It, along with a continued emphasis by reformers on film, dominated the next few decades. In his 1945 book, *Teaching Through Radio*, William Levenson proclaimed, "The time may come when a portable radio receiver will be as common in the classroom as is the blackboard. Radio instruction will be integrated into school life as an accepted educational medium" (p. 457, as quoted by Cuban, 1986, p. 19). Indeed, hundreds of schools throughout the country established radio stations for transmitting instructional programming (Lanford, 1999). Even state departments of education became involved in this reform effort. In 1932, nine state education departments reported regularly broadcasting of educational programs (Cuban, 1986). Again, this technology was used sparingly at best and certainly did not change classroom instruction to the extent prophesized by many of its most fervent proponents. Among the reasons expressed by either schools or teachers were no equipment, scheduling difficulties, programs not related to the curriculum, and teachers not interested in using the radio as an instructional aid. Critics quickly pointed to more pervasive explanations. Cuban (1986) reported Woelfel and Tyler saying, "Radio grew from childhood through adolescence into maturity too rapidly for organized education, with its fixed courses of study and rules of conduct, to keep pace" (p.26).

After World War II, however, technology did begin to influence public school classrooms. The experience of the military in training the millions of soldiers, sailors, and airmen who fought the war was translated to public school classrooms. After the war, public school classrooms were exposed to the same technologies used to train our fighting force: motion pictures, overhead projectors, and to a small extent, magnetic videotapes (Lanford, 1999). Although these technologies did not fundamentally change the classroom, as the supporters for

film and radio had earlier predicted, they did begin to be used as supplemental aids in classrooms across the country.

The next wave of technology intended by some reformers to transform classroom practice was the television. While radio and film had received limited support from public and private agencies, television received widespread extended support from both the business and political sectors of the American society (Cuban, 1986). So pervasive was the inherent belief television could transform education that by 1952 the Federal Communications Commission had allocated over 200 channels for the exclusive use of education (Lanford, 1999). The educational reforms following Sputnik in 1957 merely accelerated the effort of government and business to reform education. Cuban (1986) reported that by 1970, over $100 million had been spent to place televisions into schools.

Instructional television's promise was to transform schools. It was first introduced during a time of predicted teacher shortages and increased curriculum demands from a nation embroiled in a "cold war." The intention of school reformers was to implement the television as (1) a total instructional program presented by television, (2) supplemental television instruction where a teacher facilitates a television lesson, or (3) television as a teaching aid where the classroom teacher controls and implements the lesson (Cuban, 1986). Even after policy makers made efforts to calm teacher's fears of television replacing teachers, many of the most fervent reformers promoted the idea television could do all of the things a teacher could do and more. However, the technology failed once again to accomplish a redesign of classroom practice. Cuban found teacher's use of television was sporadic at best. For example, in a 1981 Maryland study researchers found 13% of elementary, 43% of junior-high, and 60% of high school teachers never turned to televised lessons (1986).

It was at the end of the 1970's that a new technology began to be used – the computer. Although computers had existed for decades, the real promise of this technology did not impact individuals and schools until the 1980's. In *Teachers and Machines: Classroom Use of Technology Since 1920*, Larry Cuban began his chapter on computers with this 1984 quote from Seymour Papert:

> There won't be schools in the future…. I think the computer will blow up the school. That is, the school defined as something where there are classes, teachers running exams, people structured in groups by age, following a curriculum – all of that. The whole system is based on a set of structural concepts that are incompatible with the presence of the computer…. But this will happen only on communities of children who have access to computers on a sufficient scale. (p. 72)

The personal computer's introduction to schools led many similar types of expressions, expressions not unlike those heard at the advent of film, radio, and television to school curriculums.

Throughout the 1970s and '80s, computers brought increasingly diverse and more powerful technological tools into schools. These technologies were typically text-based, locally networked or stand-alone computer-assisted instruction applications (Honey, Culp, and Carrigg, 1999). Students used computers primarily for drill and practice (U. S. Department of Education, 2000b). However, recently schools have been acquiring multimedia capable computers connected to local area networks and the Internet. In 1994, only 35% of public schools and 3% of public school classrooms were connected to the Internet. That number rose to 95% of the schools and 63% of the classrooms by 1999 (U. S. Department of Education, 2000a).

The Promise of Technology for Students

Microsoft founder Bill Gates seems to echo some of the earlier technology proponents as he describes the newest technology's effect on public education: "I expect education of all kinds to improve significantly within the next decade. I believe that information technology will empower people of all ages, both inside and outside the classroom, to learn more easily, enjoyably, and successfully than ever before" (Gates, 1995). Many educators and policy makers are making similar claims about the power of the information technology to transform education (Becker, 2000; Jerald & Orlofsky, 1999; Lemke & Coughlin, 1998; Sandholtz, Ringstaff, & Dwyer, 1997; Schacter, 1999).

The first promise technology holds for education deals with the student. Most students find using digital technologies no more intimidating than using a VCR or a toaster. Don Tapscott (1998) called these children the "Net Generation." He suggested media-literate kids watch much less television than their parents did at the same age. Since TV is not interactive and does not allow viewers to have dialogue with one another, Tapscott wrote, the current generation finds it somewhat old-fashioned. Today's kids want to be active participants, not just viewers or listeners. Tapscott (1998) cited a 1997 survey by Teenage Research Unlimited in which more than 80 percent of teenagers polled said it is "in" to be online, a rating that puts being online on a par with dating and partying.

These characteristics have not gone unnoticed by educators trying to improve schools. While some educators might be intimidated by their students' technological prowess, others recognize technological needs of the students. Chris Dede wrote, "As educators, our task is to prepare our children to function in a future civilization created by the biggest leap in technology since the Industrial Revolution two centuries ago" (Association of Supervision and Curriculum

Development, 1998, iv). In a 1996 report for the American Association of School Administrators, Uchida also recognizes the importance of using the technology for the good of the students. She said, "Students will need to be skilled not only in accessing the vast array of information available through advanced technology, but in processing it as well. Because of the key role of technology in our society, students must know how to use computers and be familiar with various types of technology" (p.3).

Dede (1996) stated there are four types of student improvements when using technology. First, there is increased learner motivation. Second, there are opportunities for mastering advanced topics. Third, students act as experts do. They rise to the level of acting or modeling behavior similar to those they interact with from the various settings. Last, the research shows students perform better on standardized tests. Hopson (1998) indicated use of a technology rich classroom improves students' higher order thinking skills. His study of the effect of technology on student's cognitive processes showed significant increases in the "Evaluation" domain on Bloom's taxonomy. Morgan's (1998) study of technologies affect on student standardized test scores showed a positive relationship between technology integration variables and students scores on the Texas Assessment of Academic Skills.

The Promise of Technology for Teachers

Since technology will integrate itself throughout society in ever increasing ways, teachers have a need to develop technological skills. The second promise of technology then deals with teachers' use of technology. As Will Rogers, the cowboy philosopher, once remarked, "You can't teach what you don't know any more than you can come back from where you ain't been" (cited in Clark, 2000, p. 178). Ropp's research bears out the wisdom of Will Rogers, "If teachers

are to integrate technology into their teaching, they must feel efficacious about using it" (1999, p. 402).

Recently, research has begun to concentrate on the technological competency of the teacher. The U. S. Department of Education's National Center for Educational Statistics report *Teachers tools for the 21st Century* details records on teachers' technological competencies (U. S. Department of Education, 2000b). Becker used results from the Teaching, Learning, and Computing Survey of 1998 to demonstrate the increase in teacher competency over previous years (Becker, 2000).

Several factors have been identified that affect teachers technology competencies. Janet Chu (2000) recognized these factors in her dissertation *Assessment of the Integration of Technology into the Curriculum by Middle School and High School Teachers*. Her research identified the age and gender of the teacher was not statistically significant, while subject area assignment, grade level assignment, technology training received, and access to computers did have an affect on a teacher's technology competencies.

Research also appears to point out while teachers are using technology personally more often; they have yet to actually truly integrate it into their classroom instructional strategies. Jerald and Orlofsky (1999) reported teachers feel less prepared to integrate technology into their teaching than to handle many other professional demands, such as incorporating new academic standards or assessment techniques. Teachers' use of computers is more for instruction-related tasks rather than to augment the instruction itself (Becker, 1999). For example, teachers were more likely to use the Internet to access research on best practices or to download information to present to class than to allow their students to use technology in the classroom. In addition,

Becker reported teachers use technology to complete administrative tasks and to communicate with colleagues.

The Promise of Technology for Schools

Finally, technology promises to transform educational practice and customs. Bill Gates writes about this promise in *The Road Ahead* (1995). He states technology will force schools to change, albeit slowly.

> Over time, in stages, the proportions will change and the daily habits of students and teachers will change to take advantage of the opportunities the interactive network offers. The small changes will add up, as they did in the business office over the last two decades, to significant changes in the formal processes of education (p. 214).

Gates envisions a school system connected to families via electronic mail, the use of videoconferencing technologies to allow students to interact from miles away, the use of technology to acquire information and then report it back to the teacher, collaborative student work groups using laptop computers, and teachers serving as resources to students seeking information rather than dispensers of information.

Educators are also espousing a vision of the technologically literate school and classroom. In the most significant longitudinal study, the Apple Classrooms of Tomorrow project made some remarkable findings concerning the role of technology and school (Sandholtz, Ringstaff, and Dwyer, 1997). Their study looked at the impact of technology integration over a period of ten years. The researchers found as teachers used the technology provided by the study they moved through a continuum of instructional practices. The five stages of "Instructional Evolution" were used to track the changes both in the teacher and in the classroom. In the Entry

stage teachers were primarily concerned with the technical aspects of the technology. Their primary concern was with their own ability to manage the classroom and make the technology work. The classroom environment remained one of teacher directed activity and passive learning. However, by the time the teacher had moved to the final stage, Invention, the teacher's concern became less personal and more student centered. The researchers commented, "When teachers reached this stage the whole tenor of the sites began to change. Interdisciplinary project-based instruction, team teaching, and individually paced instruction became common" (p. 44).

The SouthEast Initiatives Regional Technology in Education Consortium (2001) support this finding. The consortium found that after integrating technology into their instruction, many teachers "embrace strategies for student-focused learning" (p. 14). After five years of supporting twelve schools with integrating technology into the curriculum and instruction, the consortium observed that technology works in concert with "pedagogically sound teaching practices" (p. 14) to lead to improvements in student performance. Therefore, merely the introduction of technology into the instructional process will not change teaching methodology. However, teachers with sound pedagogical training who introduced technology into their classrooms began to individualize instruction, use technology to develop student's problem-solving and critical thinking skills, and provided students with more opportunities for project-based team learning.

The literature describes three major uses of instructional computing in schools today. As schools progress through the three uses they move from traditional classroom environments to constructivist learning environments. Learning from technology is the first use. Maddux, Johnson, and Willis (1997) describe this as a Type I application, which is "designed to make it easier, quicker, or otherwise more efficient to continue teaching the same things in the same ways we have always taught them" (p. 18). Technologies that are considered Type I include

computer assisted instruction, integrated learning systems, computer-based tutoring systems, administrative software, such as electronic grade books and attendance record-keeping software. The second way technology is used in schools is when technology is the object of instruction. In this type of instruction, the technology becomes the focus of instruction. A good example of this type of use is the teaching of programming that became prevalent during the 1980's (Jonassen, 1996). The last use of technology in schools is described as learning with technology. Maddux et al (1997) label these types of uses as Type II technologies. This includes the use of normal technology software such as spreadsheets, databases, graphics, presentation software, simulations, electronic mail, and the Internet. In the use of these Type II technologies, the learner controls almost everything that happens, including the interaction between the user and the machine (Maddux et al, 1996). Jonassen (1997) says that when technology is used in this way technology actually becomes a "mindtool." Mindtools are defined as "computer-based tools and learning environments that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning" (p. 9).

Technology, by itself, is not sufficient to produce the type of constructivist learning environments envisioned by those above. In fact, Larry Cuban (2001) stated that unless the expectations in the individual classroom change significantly, increasing the number of computers in schools would not affect education. He predicted the same demise of computer technology as he reported for film, radio, and television technologies (1986). His hope for computer technology to change the school is centered on providing the time, money, and resources to teachers to change their ingrained classroom practices.

OTA (1998) reported that merely adding technology to schools is not sufficient. "Technology, in and of itself, does not directly change teaching or learning. Rather, the critical element is how technology is incorporated into instruction" (p. 57). When technology is integrated into the curriculum and the teacher feels comfortable with it, "myriad changes occur that may ultimately redefine the role of teachers" (p. 69). The teacher becomes much more a "guide on the side." The report stated teachers who have experienced this transformation become learners alongside the students. The teacher feels comfortable not having to have all the answers. In fact, one side benefit the study found was the students helping the teacher learn the technology.

Principal's Relationship to School Effectiveness

The previous paragraphs specify the promise of technology to students, teachers and schools. However, technology cannot impact education in any of these areas without the leadership and support of the campus leadership. In their report, *Leadership for Student Learning: Reinventing the Principalship*, The Institute for Educational Leadership (2001) stated, "As studies show the crucial role that principals can play in improving teaching and learning, it is clear that principals today must serve as *leaders for student learning* (emphasis original)" (p. 2). This imperative from the Institute demonstrates the importance of principals in guiding schools. Indeed, the report quotes a study by the Educational Research Service, "Researchers, policymakers, and educational practitioners agree: good school principals are the keystone of good schools" (p. 6). The importance of the principal to the success of the school has been well documented.

Hallinger and Heck (1998) published a review of the various studies detailing the effect school principals have on schools. In the review, they summarized the research done on

principals during the previous two decades. Their review includes over forty journal articles, dissertations, and papers presented at peer-reviewed conferences. It also included information from international studies of school principals. They divided the research into three general categories: direct effects model, mediated effects model, and reciprocal effects model.

The direct effect model studies proposed that the leader's practices have a direct effect on school outcomes. Much of the early research concerning principals and school effectiveness used this model of inquiry. Hallinger and Heck (1998) identified twenty-two different direct effect studies from 1982 to 1994. While the results of these studies were determined to be inconclusive regarding the principals' effect on schools, the researchers also stated the direct effect model failed to account for the possibility of intervening variables effecting school outcomes. "Direct effect models have limited utility for investigating the effects of principal leadership. They have not demonstrated conclusive results with respect to principals' effects" (p. 166).

Hallinger and Heck's (1998) second model, the mediated effects model, suggest leaders achieve their effect on schools through indirect paths. Researchers using this methodology say that leadership practices do contribute to the outcomes of school but are mediated by other people, events, and organizational factors. Typically, researchers using this method would rely upon multiple regression analysis statistical procedures. These studies seem to indicate a relationship between principal leadership practices and school effectiveness. According to Hallinger and Heck, the more sophisticated the statistical measures being used the stronger the correlation between the leaders practices and the school outcomes.

The most recent research, according to Hallinger and Heck (1998), seems to be using the supposition that the relationship between the school and its leadership is interactive and dynamic. This characterizes the third type of study, or the reciprocal effect model. The similarity between

this proposition and systems theory is inescapable. According to Hallinger and Heck, "Principals enact leadership in the school through a stream of interactions over a period of time. In doing so, they address salient features of the school" (p. 168). An example mentioned by the researchers is of a principal entering a poor performing school that has major disciplinary problems. The principal's highly directive effort to solve the disciplinary issues also affects the schools performance. The data from these types of research reinforce the idea that principal behavior is important to school effectiveness.

Throughout their review of the literature of the principal's effect on school outcomes, Hallinger and Heck (1998) identified four areas in which the principal influences the organizational system: "(1) purposes and goals, (2) structure and social networks, (3) people, and (4) organizational culture" (p. 171). Each of these aspects is reviewed more thoroughly below.

Principals use purposes and goals to influence school outcomes. "The most consistent findings among the studies support the view that principals' involvement in framing, conveying, and sustaining schools purposes and goals represent an important domain of indirect influence on school outcomes" (Hallinger and Heck, p. 171). Many studies reported by Hallinger and Heck (1998) supported this claim. For example, their review pointed to Beaver's 1993 study that found higher academic gains in schools where the principals held high academic goals and expected more from the teachers (as reported by Hallinger and Heck, 1998). Another example of the studies supporting this conception pertained to leadership as a transformational experience. Leithwood's 1993 study of principals provided evidence that "principal vision, group goals, high expectations, and individual support have effects on several in-school processes, such as goal formulation, school culture, teachers, policy and organization" (Hallinger and Heck, 1998, p. 173).

The second domain of leadership influence is the interplay between organizational structure and social networks. Hallinger and Heck (1998) conceptualized this as "how leadership is exercised (e.g., centralized or decentralized) and what are its basic aims with respect to other people in the organization" (p. 174). Again, the researchers used their review of the literature, specifically the mediated-effects studies, to draw a positive conclusion about the role of the principal. For example, Leithwood reported, "leadership indirectly affects the organizational outcomes of restructuring initiatives and teacher-perceived student outcomes, but had little effect on student participation in school activities and student grades" (as reported by Hallinger and Heck, 1998, p. 174). Other studies quoted focused on parental involvement, decentralized decision making, and collaborative structures.

The third domain of leadership influence reviewed by Hallinger and Heck (1998) was that of the leader's effect on the people of an organization. They found several studies that recognized the impact of the principal on the people of the schools (Bossert, et al, 1982; Leithwood, 1994, and Ogawa and Bossert, 1995 as quoted by Hallinger and Heck, 1998). "The evidence from the last fifteen years of research on educational leadership provides considerable support concerning the importance of this domain of principal influence" (Hallinger and Heck, 1998, p. 175). One of the common conclusions of the studies they reviewed said principals affect the progress of the school they lead primarily through promoting change in individuals within the organization.

The last of the domains identified by Hallinger and Heck's (1998) review of the literature is the organizational culture. While there is less support for the positive effects of the specific role of the principal in this domain, the person of the principal is important to transformation of school culture. It appears the principal does effect changes within the organizational culture,

which in turn tends to be positively correlated to school effectiveness. “Principals were found to impact school culture which, in turn, impacted a range of restructuring outcomes including program, policy, teacher behavior, and students” (p. 177).

Principal’s Technology Competencies and Leadership

Obviously, the principal is critical to the success of schools. Many of the previously reviewed studies point to the principal as a change agent affecting the organization and individual aspects of the school. Additional research has indicated the principal’s role is changing. For example, the Institute for Educational Leadership (2000) reports, “Schools are changing dramatically. Principals in the coming decades will lead schools that are far different than those of today…. In other words, principals will be expected to lead in an atmosphere of constant, volatile change” (p. 4). Without question, technology is one of the major forces affecting schools today.

Although research on the role of principals and technology integration is relatively small, it consistently demonstrates the importance of school leadership on implementation of technology. Gibson (2001) said, “The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology usage, but the presence of informed and effective leadership” (p. 1). Slowinski (2000) stated it this way; “Administrators who implement technology effectively in their schools and communities will contribute greatly to both education and economy in the twenty-first century” (p. 1). The Educational Technology Advisory Committee of the Texas Education Agency (2001) also recognized the importance of the school administrator.

> The process of integrating technology in schools is, in itself, systemic school reform. It is complex schoolwide innovation, and, as such, vision-building,

administrator commitment, and skilled leadership play pivotal roles is success.

> Texas faces a significant challenge in providing visionary school leadership with the necessary background and requisite skills to lead and nurture the changes technology brings (p. 5).

The SouthEast Initiatives Regional Technology in Education Consortium (SEIR*TEC) concurs with the importance of principals in supporting technology in schools. SEIR*TEC provided technical support and professional development for five years to twelve schools. This support consisted of several days each month working with teachers and administrators as they tried to incorporate technology into the schools. After five years of intensive support the organization published its findings in an online booklet entitled *Factors that Affect the Effective use of Technology for Teaching and Learning: Lessons Learned from the SEIT*TEC Intensive Sites* (2001). The report's first lesson specifically dealt with leadership. Their experience led them to claim, "leadership is probably the single most important factor affecting the successful integration of technology into schools. This is true at all levels – state, district, and school" (p. 4).

Given the mandate that principals also be technology leaders one must examine the level of their technological competence. In a study of high school principals in Florida, Robert Blake (2000) found low technological competency levels for many applications. Blake studied a range of technological competencies for school administrators: word-processing, e-mail, Internet, database, information search, spreadsheet, graphics, and presentation software. His study found that while the principals used some applications frequently (e.g., 84% used e-mail daily) many weren't competent in other areas (e.g., 90% said they had either never used a spreadsheet or used it rarely). The study identified low use for spreadsheet, graphics, presentation, and database software.

R. Blair Peterson's (2000) dissertation study of principals of technology-rich schools showed similar reports on competencies. Peterson (2000) used information from the CEO Forum's 1999 School Technology and Readiness (STaR) Report to identify these principals. He then surveyed over 600 of these principals on various factors: (a) the level of importance of technological skills, (b) the level of importance of technological knowledge, (c) their frequency of use – by tool, (d) their frequency of use – by task, (e) their preferred format for principal-preparation programs, and (f) a general professional profile. His results indicate few principals identified themselves as computer use experts (4.2%). They identified the use of word processing (93.3%), e-mail (89.1%), navigation of the World Wide Web (86.7%), and searching on the World Wide Web (82.3%) as the most important skills for principals. Most of the principals identified these same four areas as those they practiced frequently. 84.2% said they used e-mail daily, 80.3% said they used the word processor daily, 83.9% said they navigated the World Wide Web at least weekly, and 80.5% said they searched using the World Wide Web weekly. However, the study also indicated principals of high-technology schools use some applications infrequently. Desktop video (91.8%), statistical software (84.7%), desktop publishing (74.1%), database (49.6%), and spreadsheets (43.1%) were used infrequently (monthly or less).

Jetton (1997) found one reason for administrators low level of technological competence has to do with the scarcity of technology training provided in current administrators training. In his research on principals in the Region IV Educational Service Center Region (Houston), Jetton found 77% of the secondary school principals had no computer-related training as part of their professional degree program. Of those remaining, 95% had only one three-hour class or less in computer or technology area.

Technology Standards for School Administrators

Maybe more important than a principal's individual competency level with technology is the principal's technological leadership practices. This is perhaps no more evident than in the technology standards developed recently by the Collaborative for Technology Standards for School Administrators and adapted by the International Society for Technology in Education (ISTE). Although released separately and with different names, the standards released by these two organizations are identical. The Collaborative for Technology Standards for School Administrators released the Technology Standards for School Administrators (TSSA) in November 2001. ISTE, which had previously released technology standards for students (NETS*S) and teachers (NETS*T), released the administrators' standards in 2002 as the National Educational Technology Standards for Administrators (NETS*A). In fact, the director of the Collaborative for Technology Standards for School Administrators was Dr. Don Knezek who also serves as CEO of the International Society for Technology in Education. For simplicity of understanding, this study will refer to the standards as the NETS*A.

According to literature from the Collaborative for Technology Standards for School Administrators (November 2001), the standards, "focus on the role of leadership in enhancing learning and school operations through the use of technology… They define neither minimum nor maximum level of knowledge and skills required of a leader, and are neither a comprehensive list nor a guaranteed recipe for effective technology leadership."

Rather, these standards are a national consensus among educational leadership for comprehensive and appropriate use of technology in schools (p. 3).

The six standards identified in the NETS*A document are

I. Leadership and Vision – Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

II. Learning and Teaching – Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

III. Productivity and Professional Practice – Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.

IV. Support, Management, and Operations – Educational leaders ensure the integration of technology to support productive systems for learning and administration.

V. Assessment and Evaluation – Educational leaders use technology to plan and implement comprehensive evaluation systems of effective assessment and evaluation.

VI. Social, Legal, and Ethical Issues – Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision making related to these issues. (Collaborative for Technology Standards for School Administrators, November 2001, pp. 8-13).

The NETS*A standards are then further broken down into specific indicators and into one of three different job roles: (1) superintendent and executive cabinet, (2) district-level leaders (technology coordinators), and (3) campus-level leaders, including principals and assistant principals. For example, there are five separate indicator statements for the first standard,

Leadership and Vision. These indicator statements break down the standard into performance indicators related to technology leadership and vision. However, the leadership and vision performance indicators for Superintendents are different from that of Technology Coordinators and Campus Principals. The expectations of campus principals in relation to technology leadership is much different than that of a district level technology coordinator or a district leader. Therefore, each of the standards can be explained through specific indicators that pertain to that standard and further to the specific job role responsibilities of the various job roles. The remainder of this review of the literature will describe the specific indicators under each standard and the implication each has on the job role of high school principal.

The first NETS*A standard deals with "Leadership and Vision." The six performance indicators for this standard promote the establishment of a vision for technology and the leadership practices that encourage staff members and students to use that technology. The indicators are:

A - Educational leaders facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision,

B - Educational leaders maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long range, and systemic technology plan to achieve the vision,

C - Educational leaders foster and nurture a culture of responsible risk taking and advocate policies promoting continuous innovation with technology,

D - Educational leaders use data in making leadership decisions,

E - Educational leaders advocate for research-based effective practices in the use of technology,

F – Educational leaders advocate, on the state and national levels, for policies, programs, and funding opportunities that support implementation of the district technology plan. (Collaborative for Technology Standards for School Administrators, November 2001, p. 8).

These indicators for principals relate the need for campus leadership to be involved in the establishment of a district wide technology vision and plan, and to advocate the innovative and efficient use of technology by the staff. Brooks-Young (2002) describes the vision for technology as being, "more than articulating how technology can support instructional programs. It is to describe an instructional program in which technology is present and regularly used as a teaching and learning tool" (p. 15). In order to achieve the vision, a principal must develop a comprehensive plan that supports the district's long-range goals for technology and learning. Brooks-Young (2002) advises that instead of creating a separate campus technology plan, a principal might combine the various campus based plans into one comprehensive document. In order to put into action the plan, the principal must create an environment of risk taking and innovation among the staff. The principal should advocate the use of technology to meet the student achievement goals identified by the comprehensive school improvement plan. The Collaborative for Technology Standards for School Administrators (2001) identifies three tasks performed by campus leadership in achieving the Leadership and Vision standard:

1. Participate in an inclusive district process through which stakeholders formulate a shared vision that clearly defines expectations for technology use,
2. Develop a collaborative, technology-rich school improvement plan, grounded in research and aligned with the district strategic plan,

3. Promote highly effective practices in technology integration among faculty and other staff (p. 8).

The second NETS*A standard refers to "Teaching and Learning." The five performance indicators under this standard help "administrators better understand how to examine and evaluate current instructional technology use and then provide support to teachers as they strive to improve their instructional practice" (Brooks-Young, 2002, p. 45). The performance indicators for this standard are,

A – Identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement,

B – Facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning,

C – Provide for learner-centered environments that use technology to meet the individual and diverse needs of learners,

D – Facilitate the use of technologies to support and enhance instructional methods that develop higher-order thinking, decision-making, and problem-solving skills,

E – Provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology (Collaborative for Technology Standards for School Administrators, November 2001, p. 9).

The first four performance indicators relate to the integration of technology into the curriculum. Technology integration refers to "an instructional program in which student outcomes are the focus and technology use is woven throughout the curriculum" (Brooks-Young, 2002, p. 46). A principal needs to

understand the change process that many teachers will have to endure in order to integrate technology into their instruction. One of the most critical components facing school administrators as they provide the technology leadership role for their teaching staff is the realization that fully integrating technology is a long-term goal. Brooks-Young (2002) cautions that technology integration will require several years for full implementation. The last indicator emphasizes the importance of professional development for teachers. Teachers will have to be provided time to change, training to make the change, and support to encourage change. The Collaborative for Technology Standards for School Administrators (2001) identifies two technology leadership tasks for principals concerning the Learning and Teaching standard.

1. Assist teachers in using technology to access, analyze, and interpret student performance data, and in using the results to appropriately design, access, and modify student instruction, and
2. Collaboratively design, implement, support, and participate in professional development for all instructional staff that institutionalizes effective integration of technology for improved student learning (p. 9).

Performance indicators for this standard refer to the support role of the principal as he or she provides encouragement and understanding as teachers begin to incorporate technology into their instructional practices and as they learn to use technology as a part of their classrooms.

The third standard named by the NETS*A is, "Productivity and Professional Practice." One of the best ways to support change is to model it personally. This standard identifies the importance of the principal modeling the use of technology in personal and professional roles. The six performance indicators are:

A – Model the routine, intentional, and effective use of technology,

B – Employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community,

C – Create and participate in learning communities that stimulate, nurture and support faculty and staff in using technology for improved productivity,

D – Engage in sustained, job related professional learning using technology resources,

E – Maintain awareness of emerging technologies and their potential uses in education,

F – Use technology to advance organizational improvement (Collaborative for Technology Standards for School Administrators, November 2001, p. 10).

The performance indicators of this standard relate directly to the principals ability and inclination to use technology. Principals need to use technology effectively to make positive changes in productivity for themselves and those they lead. Once again the Collaborative for Technology Standards for School Administrators (2001) identifies two technology leadership tasks for principals in this standard. Their suggestions for the standard of productivity and personal practice are:

1. Use current technology-based management systems to access and maintain personnel and student records,
2. Use a variety of media and formats, including telecommunications and the school website, to communicate, interact, and collaborate with peers, experts, and other education stakeholders (p. 10).

Brooks-Young (2002) identifies several promising technologies for school leaders. For example, she advocates the use of a personal digital assistant (PDA) to improve productivity, the

use of electronic list-serv to improve awareness of new technologies and other educational issues, and the utilization of school wide information management systems to centralize student and campus record keeping. However, she cautions "against creating an environment where faculty, staff, and leaders feel pressured to intensify or extend their workday simply because access to a computer, cell phone, or other device makes them more accessible than before" (p. 83). Principals need to model the use of technology to increase the efficiency of their schools and improve communication and collaboration within the educational community.

"Support, Management, and Operations" is identified by the NETS*A as the fourth standard. The performance indicators for this standard examine areas vital to the ongoing success of technology for the school – the acquisition, maintenance, and replacement of technological infrastructure. The six performance indicators listed by the Collaborative for Technology Standards for School Administrators (2001) are:

> A – Develop, implement, and monitor policies and guidelines to ensure the compatibility of technologies,
>
> B – Implement and use integrated technology-based management and operations systems,
>
> C – Allocate financial and human resources to ensure complete and sustained implementation of the technology plan,
>
> D – Integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources,
>
> E – Implement procedures to drive continuous improvements of technology systems and to support technology replacement cycles (p. 11).

The acquisition, maintenance, and replacement of the technology infrastructure may be easily considered to be the purview of the Superintendent, school board and technology specialists. However, the Collaborative for Technology Standards for School Administrators (2001) recognizes three specific technology leadership tasks for principals:

1. Provide campus-wide staff development for sharing work and resources across commonly used formats and platforms,
2. Allocate campus discretionary funds and other resources to advance implementation of the technology plan,
3. Advocate for adequate, timely, and high-quality technology support services (p. 11).

Brooks-Young (2002) also indicates campus principals have a very important role regarding this standard. Several initiatives have actively promoted the acquisition of technology by schools. The E-Rate program supported by the federal government and the Telecommunication Infrastructure Board in Texas are two such initiatives that have poured millions of dollars into Texas schools for the purpose of increasing the technology infrastructure. Now, schools throughout the country find themselves with ongoing, large-scale implementation issues associated with maintaining and replacing those original technology purchases. All school leaders must become acquainted with the term "total cost of ownership" or TCO. Brooks-Young (2002) describes TCO as the combined costs associated with technology. It refers to software upgrades, staff training, network maintenance personnel, and updates for infrastructure, connectivity, and equipment replacement. She says that a school should budget 40 – 50% of the original cost of the technology. This type of budgetary expenditure certainly needs to be the concern of every campus principal.

Brooks-Young (2002) identifies a second way principals' demonstrate their technology leadership within this standard. The principal often serves as a mediator when issues arise between the wants of teachers to add software programs with the desires of technicians to maintain a functional and compatible computer network. Therefore, principals must be participants in the development of system-wide standards for hardware and software acquisition and support.

A third way principals exhibit their technology leadership role is through supporting adequate and efficient technology support services. The Consortium for School Networking (2001) says the cost to large districts in terms of lost instructional time as a result of either malfunctioning equipment or teachers providing professional development instead of instructing students is estimated to exceed $16.5 million per year. Small schools are said to incur costs that are equivalent to one full time teaching position. Brooks-Young (2002) recommends that principals look for innovative ways to provide the technology support needed by teachers. While many of the issues identified by the indicators under this standard seem to indicate a minimal involvement by a campus principal, there are actually several ways the principal can exemplify his or her technology leadership role.

The fifth NETS*A standard deals with using technology for "Assessment and Evaluation." Brooks-Young (2002) recognizes the importance of this standard:

> Evaluation is the tool that enables educators to determine the effectiveness of program or reform innovations…. Evaluation of technology integration within instructional programs helps us learn how to do a better job with students. Using technology to facilitate the process makes it more likely we will maintain a high standard in our evaluation design (p. 143).

As important as evaluation is, it is often the weakest component in technology based programs (SouthEast Initiatives Regional Technology in Education Consortium, 2001).

The four performance indicators identified by the Collaborative for Technology Standards for School Administrators (2001) are:

> A – Use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity,
>
> B – Use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning,
>
> C – Assess staff knowledge, skills, and performance in using technology and use results to facilitate quality professional development and to inform personnel decisions,
>
> D – Use technology to assess, evaluate, and manage administrative and operational systems (p. 12).

Particularly the campus principal's specific technology leadership tasks identified by the Collaborative for Technology Standards for School Administrators (2001) are:

1. Promote and model the use of technology to access, analyze, and interpret campus data to focus efforts for improving student learning and productivity,
2. Implement evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning,
3. Include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff.

As campus leaders of technology principals need to set into place evaluation procedures that ultimately improve student performance. Brooks-Young (2002) says, "Carefully designed, sustained evaluation is based upon defined outcomes and supported through data we collect, analyze, and report" (p. 126). It is only through this type of consistent process that educators can effectively evaluate the school's programs. In addition to the programs of the school, the progress of the students must be monitored and used to make improvements. Principals are charged with leading this effort to analyze student performance data and make it useful. Last, principals should include a technology component in their evaluation of teachers. Brooks-Young (2002) argues that because teachers will be at various stages of technology competency individual technology improvement plans need to be developed. These individual plans then would drive the teachers choice of technology professional development.

The last NETS*A standard deal with "Social, Legal, and Ethical Issues." Brooks-Young (2002) says that administrators should pay careful attention to the performance indicators for this standard. Since many administrators are inexperienced when working with the new technology and are unaware of many of these issues, "administrators often find they are on the bleeding age when it comes to the social, legal, and ethical issues of technology use" (p. 147). In fact, Brooks-Young says that because of the long-range risks associated with not paying attention to these areas, this is the "most important standard for leaders to understand and address as individuals" (p. 147). The following six performance indicators for this standard are replete with potential hazards:

> A – Ensure equity of access to technology resources that enable and empower all learners and educators.

B – Identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.

C – Promote and enforce privacy, security, and online safety related to the use of technology.

D – Promote and enforce environmentally safe and healthy practices in the use of technology.

E – Participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources (Collaborative for Technology Standards for School Administrators, November 2001, p. 13).

Principals cannot underestimate the importance of these issues. "Along with the power and positive potential for technology use in schools comes to possibility for misuse, both intentional and inadvertent" (Brooks-Young, 2001, p. 147). These indicators cover equality of access; social, legal, and ethical issues; safety and security of online use; and potentially harmful environmental issues. The specific tasks facing principals are

- Secure and allocate technology resources to enable teachers to better meet the needs of all learners on campus,
- Adhere to and enforce among staff and students the district's acceptable use policy and other policies and procedures related to security, copyright, and technology use,
- Participate in the development of facility plans that support and focus on health and environmentally safe practices related to the use of technology (Collaborative for Technology Standards for School Administrators, November 2001, p. 13).

Equity of access to computers has become a very important issue for schools throughout the country. However, that doesn't merely refer to the computer to student ratio that has fallen remarkably in the last several years. Brooks-Young (2002) identifies several issues principals must consider when dealing with this indicator: "age, condition and location of equipment; Internet access; race and gender issues; economic status; student academic standing; geographic location; special needs students; and language barriers" (p. 148). Principals must ensure that technology is up to date and available to all students, regardless of race, sex, or academic standing.

Ensuring that schools adhere to social, legal, and ethical practices that promote responsible use of technology brings up some of the "most complex and challenging factors that school administrators are expected to oversee" (Brooks-Young, 2001, p. 154). Principals should be familiar with their district's policies and procedures for the use of technology, including the acceptable use policy. Because technology creates unique legal quandaries that have yet to be finally resolved, education leaders should seek assistance from legal experts when creating their policies and procedures. Schools are under some regulation concerning Internet use from the federal government. The Children's Internet Protection Act (CIPA) was enacted in 2001. One component of the legislation was a requirement that schools provide filtered access to the Internet. All schools that receive E-rate funds must adhere to the regulations set forth in this act (Brooks-Young, 2001).

Another responsibility of principals is to provide environmentally and healthy environments for students and staff to use technology. Brooks-Young (2001) understands that poor ergonomics can be harmful to students and staff members. She recommends that schools provide computer workstations that are comfortable and not harmful physically. The issues

surrounding this standard will continue to expand and change as technology changes. School administrators need to be proactive in researching and monitoring the areas of social, legal, and ethical issues in technology use.

Summary

Technology has inundated schools with the same promises of efficiency and effectiveness it promises for the rest of society. This review of relevant literature has reviewed the progress of technology in education, illustrated the promise technology holds for education of the future, discussed the importance of the principal in incorporating innovations in schools, and has examined the research on principals technology competencies and technological leadership abilities. The literature points to the supposition that in order for schools to realize the potential of technology to effect student learning, the principal must be technologically competent and provide technology leadership.

The literature points to the fact that one of the most important aspects to the successful implementation of technology to schools is the support and leadership of the campus principal. While the leadership of the principal has been reported widely in the research, this review exposes the importance of the principal specifically to technology leadership. Using the six technology standards of the NETS*A, a measure of the actual technology leadership of the principals involved in this study allows the researcher to demonstrate - in at least one population – the level of actual leadership practices of existing principals. In addition, the second research question of this study evaluates the effectiveness of one substantial technology-training program on principals' abilities as a technology leader.

CHAPTER 3

METHODS AND INSTRUMENTATION

Technology is becoming a critical component of schools throughout the nation. In fact, technology is becoming as integral to school as the blackboard (U. S. Department of Education, 1996). The American Association of School Administrators recognized that technology is replacing many traditional educational resources (1999). Both federal and state governments have been actively involved in providing schools discounts and other resources to get technology infrastructure into the school buildings. However, many researchers question the positive impact of technology on the schools mission to educate students (Cuban, 1999; Jerald & Orlofsky, 1999; OTA, 1995;).

Studies showed that the implementation of technology often hinges on the leadership of the organization (Gates, 1995; Sandholtz, 1997; Thomas, 1999). Despite the fact that administrative leadership may be "the single most important factor affecting schools' successful integration of technology (Byrom & Bingham, 2001, p. 4), surprisingly little attention has been paid to the technology related needs of school administrators. This study evaluates high school principals in Texas regarding their role as technology leaders on their respective campuses. In addition, it indicates if principals who participated in the Technology Leadership Academy sponsored by the Texas Association of School Administrators (TASA) and the Texas Business and Education Coalition (TBEC), significantly differed in their technology leadership roles from those who have not participated in the training.

This chapter describes the methods and procedures used in this study. It begins with a description of the purpose of the research and the specific research questions followed by an explanation of the research methodology. Following the methodology is a portrayal of the participants of the study. Then, the study describes the data-gathering instrument complete with its reported validity and reliability. Finally, the chapter ends with an explanation of the procedures and statistical measures used.

Purpose and Questions

This study describes the technology leadership of Texas' high school principals and compares the results between those principals who have participated in the Technology Leadership Academy with those who have not participated. Two questions guide the study:

1. What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?
2. How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?

Research Design and Methodology

This research project utilized quantitative methodology and is designed as descriptive and causal-comparative research. The researcher developed and distributed a survey to two samples of high school principals: those who have completed the Technology Leadership Academy and those who have not.

Gall, Borg, and Gall (1996) described descriptive research as the "most basic of the quantitative research methods" (p. 373). Furthermore, they describe this type of research as being

useful primarily to determine the present condition of an educational issue or phenomenon. The first research question is, "What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?" This question asks Texas' high school principals to evaluate their role as a leader of technology on their campus. Therefore, descriptive research will provide the best answer to this question.

The second research question uses a causal-comparative research methodology. Leedy (1997) depicted this methodology as a means "by which a researcher can examine how specific independent variables affect the dependent variable of interest" (p. 226). Gall, Borg, and Gall (1996) described this research methodology as the "simplest quantitative approach to exploring cause and effect relationships between phenomenon" (p. 380). The second research question attempts to draw that causal relationship between Texas' high school principals participation in the Technology Leadership Academy (the independent variable) with their role as technology leader on their campus (the dependent variable).

Sample

There are two separate populations for this study. The population for the descriptive portion of this study consists of all high school principals in the state of Texas. However, the population for the causal-comparative portion of the study was much smaller since all Texas' high school principals have not participated in the Technology Leadership Academy. Dr. Ellen Bell, Director of Professional Development for the Texas Association of School Administrators, stated 289 high school principals completed the Academy during 2001 and 2002. The Academy did not separate participants by grade level during the first year of operation (2000-2001 school year), where 482 educators participated (Bell, personal communication, November 26, 2002).

This study utilized a sample of 150 high school principals who attended the training and a similar randomly generated sample of Texas' high school principals who had not completed the training.

The Texas Association of School Administrators provided a list of all participants of the Technology Leadership Academy. The entire list was imported into a spreadsheet software program and 150 names were randomly generated using the statistical tools of the program. The comparison sample of Texas' high school principals who had not completed the Technology Leadership Academy was selected using AskTED, an online school and administrator directory published by the Texas Education Agency (n.d.). After downloading a list of all high school principals in Texas, a spreadsheet software program was used to generate a randomly sampled list of 150 participants. The two sample lists were then compared to find common participants. Names found on both sample lists were eliminated from the TEA list and an alternative was randomly generated through the spreadsheet software program. The total sample size for this study was 300 principals.

Instrument

The NETS*A (National Educational Technology Standards for Administrators) were created by the Collaborative for Technology Standards for School Administrators in November 2001. To date no assessment instrument has been created to measure administrators' progress toward meeting these standards. Consequently, an assessment instrument was constructed to ascertain principals' perceptions of their own technology leadership using these standards.

The survey instrument used in this study is a four-part questionnaire developed by the researcher and designed to collect data on factors associated with the role of Texas' high school principals as leaders of technology on their respective campuses. Part One and Two of the instrument is designed to measure the six standards identified by the Technology Standards for

School Administrators (Collaborative for Technology Standards for School Administrators, November, 2001). Part One asks 17 Yes/No questions and Part Two asks 29 questions using the following Likert scale:

1 – Never

2 – Seldom

3 – Occasionally

4 – Routinely

The following chart details the number of Yes/No and Likert scale questions dealing with each of the six technology standards and accompanying performance indicators described by the NETS*A:

*Table 1 - Number of Survey Questions per NETS*A Standard*

NETS*A Standard. Performance Indicator	Yes/No Questions	Likert Questions
I.A – Shared Vision	1	1
I.B – Technology Plan Process	2	1
I.C – Innovation	0	3
I.D – Use of Data to Make Decisions	1	1
I.E – Research-based Technology Practices	0	2
I.F – Advocate for state and national policies	0	1
STANDARD I TOTALS	4	9
II.A – Use Technology for Instruction	2	4
II.B – Support Innovative Uses of Technology	1	2
II.C – Provide Learner Centered Tech Environment	1	2
II.D – Support Tech for Higher-Order Thinking	0	3
II.E – Provide for Professional Development	2	2
STANDARD II TOTALS	6	13
III.A – Model Technology Use	1	5
III.B – Use Technology for Communication	0	1

III.C – Create/Participate in Tech Learning Communities	0		3	
III.D – Engage in Professional Development	1		3	
III.E – Aware of New Technologies	0		2	
III.F – Use Tech for Organizational Improvement	0		3	
STANDARD III TOTALS		2		17
IV.A – Guidelines for Tech Compatibility	2		2	
IV.B – Use of Technology Management Programs	0		3	
IV.C – Allocate Resources for Technology	2		0	
IV.D – Integration of Tech Plan with Other Plans	1		0	
IV.E – Implementation of Continuous Improvement	1		0	
STANDARD IV TOTALS		6		5
V.A – Assessment of Tech Resources	3		0	
V.B – Use of Tech to Analyze Data	0		2	
V.C – Assessment of Staff Competency	1		2	
V.D – Assessment of Administrative Systems	0		2	
STANDARD V TOTALS		4		6
VI.A – Equity of Access	0		2	
VI.B – Social, Legal, and Ethical Practices	1		3	
VI.C – Privacy, Security, and Safety Practices	2		2	
VI.D – Environmentally Safe and Healthy Practices	1		0	
VI.E – Policies that Enforce Copyright	1		1	
STANDARD VI TOTALS		5		8

Part Three of the survey instrument was designed to provide demographic data on the respondents. In addition to asking if the respondent participated in the Technology Leadership Academy, Part Three asked questions designed to identify the geographic region of Texas (Education Service Center region), the size of school (by University Interscholastic League classification), gender, ethnicity, educational level, and the age and number of years of administrative experience of the principal.

Part Four of the instrument contained four open-ended questions designed to elicit responses from only those principals who have participated in the Technology Leadership Academy. The first questions asked respondents to describe how they have implemented the skills and concepts learned during their participation in the Technology Leadership Academy. It was followed by a question asking which concepts and skills learned during the Academy have proven to be the most beneficial. In the third question, respondents had to identify specific supports used to implement the concepts and skills learned during the training. Lastly, the final question asked about the challenges of implementing the training.

Reliability and Validity of Instrument

The reliability of the survey and its data were conducted for the entire survey as well as the particular questions from the survey that were used to investigate each of the six NETS*A Standards. Cronbach's alpha for the entire survey was .8897. As the following chart shows, each of the subscales scored below that of the entire test, some of which were substantially below acceptable range.

Table 2 - Reliability Analysis (N=87)

Scale/Subscale	No. of Items [a]	Cronbach's Alpha
Technology Leadership Survey - Complete	46	.8897
Standard I: Leadership and Vision	12	.7327
Standard II: Learning and Teaching	13	.8346
Standard III: Productivity and Professional Practice	9	.6990
Standard IV: Support, Management, and Operations	9	.3575
Standard V: Assessment and Evaluation	7	.5521
Standard VI: Social, Legal, and Ethical Issues	11	.5965

[a] *- Some items were used for more than one Standard.*

The testing instrument was reviewed for content validity by a panel of experts in educational technology. Following is a brief description of the panel of experts who reviewed the content validity of the instrument:

- Dr. Ellen Bell, Director of Professional Development for the Texas Association of School Administrators, developed and conducted the Technology Leadership Academy since its inception in 2000.
- Dr. Keith Restine, Director of the Technology Applications Center for Educator Development, Texas Center for Educational Technology, University of North Texas.
- Dr. Scott McLeod, Assistant Professor, Department of Educational Policy and Administration, University of Minnesota; Director, School Technology Leadership Initiative, University of Minnesota.
- Rob Leopold, Barwise Middle School, served as Technology Coordinator of Iowa Park Consolidated Independent School District from 2000 to 2002.

This panel was asked to examine the instrument's format, instructions, and questions to make sure the wording was clear and easily understood. Each member of the panel was then asked to make comments or suggestions that the researcher incorporated into a final instrument.

Procedures for Data Collection

On September 23, 2003, each of the 300 members of the sample was sent an e-mail requesting completion of an on-line version of the survey instrument located at http://alan.ipcisd.net. Of the 150 names and e-mails provided by the Texas Association of School Administrators, 57 received System Administrator notices stating the e-mail could not be delivered and 6 recipients indicated they were no longer serving as high school principal. AskTED (Texas Education Agency, n.d.) provided fax numbers for 30 of the participants who were unavailable using the e-mail and an additional 33 participants were selected to participate to create a sample of 150 high school principals who had participated in the Technology Leadership Academy. Of the comparison sample of Texas' high school principals, 18 messages were unable to be delivered. 12 of those received faxes requesting their participation and 6 additional participants were selected from the population.

On September 29, 2003, 46 surveys were completed. A reminder e-mail sent that day resulted in an additional 15 surveys being returned by October 2, 2003. A third e-mail requesting participation was sent, resulting in 16 surveys being returned. Finally, a fourth attempt to contact non-participants was made via e-mail and fax on October 6, 2003. The 11 surveys returned after the last reminder made a total of 87 surveys returned, or a 29% return rate.

Analysis of Data

The data were analyzed using conventional descriptive and inferential statistics. The independent variable was the principals' participation in the Technology Leadership Academy

while the dependent variable was their role as leader of technology as indicated by their responses to the survey instrument.

The NETS*A included six broad standards of technology leadership within which are several indicator statements (Collaborative for Technology Standards for School Administrators, 2001). For example, the first standard is "Leadership and Vision" (p. 8). Six indicator statements follow it. The first of the indicator statements for Leadership and Vision was, "Educational leaders facilitate the shared development by all stakeholders for a vision for technology use and widely communicate that vision" (p. 8). The survey instrument included questions aimed at measuring responses to each of the indicator statements. Therefore, descriptive measures are able to determine responses to each indicator. Participants responded to the survey instrument using the indicators specified in the NETS*A document using Yes/No responses and a four-part Likert scale. Yes/No responses were assigned a numerical score corresponding to the scale used to evaluate responses to the Likert scale questions. Responses of "yes" were assigned a score of 4 and responses of "no" were assigned a score of 1. The range of possible mean scores on the Likert scale responses on this instrument were 1.00 to 4.00. High range mean scores (2.50 – 4.00) indicate a high measure; whereas low range mean scores (1.00 – 2.50) indicate a low measure. In addition, combined responses of indicators under each broad standard were calculated. For example, a combined mean score was established for Standard I from the responses to the four Yes/No and nine Likert scale questions. This mean score was used for descriptive and comparison purposes.

The first research question was, "What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?" Descriptive statistics were used to answer this question. Each of

the six technology standards was evaluated with multiple responses from the participant. Principals' responses to questions within each sub group were combined into a common mean score for each of the six standards. Descriptive statistics were used to show the level of importance assigned by the entire study group on each of the six standards from the NETS*A document.

The second research question required the use of inferential statistical measures designed to analyze the variation in responses from two groups of individuals. Borg, Gall, and Gall (1993) advise readers of educational research to carefully evaluate studies comparing two groups to determine "whether the two groups are similar except for the independent variable on which they are being compared" (p. 248). Therefore, Part Three of the survey instrument asked the participants to give personal information that allow the researcher to describe the two groups. Once again, measures of a descriptive nature were used to provide information on the two groups. Part Three of the instrument asked principals to identify their age, ethnicity, educational level, experience, school location according to education service center region, and size of school using the University Interscholastic Leagues classification system.

Once the descriptive statistics were used to compare the two groups, inferential measures analyzed the responses to the survey instrument. The use of inferential measures necessitates the development of a null hypothesis (Hinkle, Wiersma, & Jurs, 1998). The null hypothesis for this study was there is no difference between Texas high school principals who have completed the TASA Technology Leadership Academy and those who have not attended the training in their technology leadership practices as identified by the NETS*A.. Expressed in statistical terms it is:

H_o: $\mu_{1(TLA)} = \mu_{1(no\ TLA)}$

$\mu_{2(TLA)} = \mu_{2(no\ TLA)}$

$\mu_{3(TLA)} = \mu_{3(no\ TLA)}$

$\mu_{4(TLA)} = \mu_{4(no\ TLA)}$

$\mu_{5(TLA)} = \mu_{5(no\ TLA)}$

$\mu_{6(TLA)} = \mu_{6(no\ TLA)}$

where

$\mu_{n(TLA)}$ = Texas high school principals who have completed the TASA Technology Leadership Academy.

$\mu_{n(no\ TLA)}$ = Texas high school principals who have not attended the TASA Technology Leadership Academy.

and

μ_1 = NETS*A Standard I – Leadership and Vision

μ_2 = NETS*A Standard II – Learning and Teaching

μ_3 = NETS*A Standard III – Productivity and Professional Practice

μ_4 = NETS*A Standard IV – Support, Management, and Operations

μ_5 = NETS*A Standard V – Assessment and Evaluation

μ_6 = NETS *A Standard VI – Social, Legal, and Ethical Issues

This hypothesis was tested using a multivariate analysis of variance (MANOVA). The mean score for each standard was considered the dependent variables while the principal's participation in the Technology Leadership Academy was considered the independent variable. If the MANOVA indicated significant differences in the means individual *t tests* were conducted on each dependent variable.

Gall, Borg, and Gall (1996) said this difference is significant for educational research "if the *t* value reaches a significance level of $p < .05$" (p. 183). Furthermore, Hinkle, Wiersma, and

Jurs, (1998) stated this level needs to be set *a priori*, or before the data has been collected. Therefore, the level of significance for the inferential statistics used for this study is $p<.05$. The MANOVA will indicate if there is any statistically significant difference between combined means of the two groups being studied. The analysis of the differences in the means between the two groups were reported for each of the six standards on the NETS*A.

In addition to the forced choice questions on the survey, were four open-ended questions designed to solicit responses from the participants who attended the Technology Leadership Academy. In those questions, participants were asked to report which knowledge and skills taught at the Technology Leadership Academy were most important and evaluate those difficulties they faced as they attempted to integrate technology using that knowledge and those skills. Merriam (2001) categorizes qualitative data as that data consisting of "direct quotations from people about their experiences, opinions, feelings and knowledge" (p. 69). The responses to the four open-ended questions on the survey fit this description and were, therefore, evaluated using qualitative research methodology.

The following steps outline the procedures used to evaluate the answers from the open-ended questions. These steps were used independently for each of the four questions. First, the answers from all participants were transcribed into a word-processor. Second, as the answers were being transcribed, the researcher looked for common themes in the answers, a process called "open-coding" (Hoepfl, 1997). After deciding on the themes for the answers to the questions, a code indicating the theme was assigned to each answer. Last, the data were evaluated using frequency tables.

The first open-ended questions asks, "How are you implementing the concepts and skills you learned during the Technology Leadership Academy?" The answers to this question fell into

two basic themes: answers emphasizing personal skills learned and answers emphasizing skills principals could implement throughout the organization. Therefore, all answers to this question were coded either "P" dealing with personal skills answers, "O" symbolizing answers that emphasized skills that would benefit the organization, or "B" for answers that contained elements of both a personal and organizational nature.

The second open-ended question was, "Of the concepts and skills that you learned or improved upon during the Technology leadership Academy, which ones have been most beneficial?" As these answers were being transcribed, they, too, seemed to fall within the same framework as the previous question. Therefore, these answers were coded using the same codes as those above.

The third open-ended questions was, "What supports have you taken advantage of that have helped you implement the training you received in the Technology Leadership Academy?" As these answers were transcribed, no specific themes emerged from the data. Since only 25 people responded to this question, these answers were not coded but were dealt with collectively.

The last open-ended question was, "What challenges have you had as you have attempted to provide technology leadership on your campus?" Once again, as the answers were being transcribed, it became obvious that they could fit rather well into one of four categories: lack of time (T), lack of money (M), lack of technical support (S), and personnel issues (P). Each answer was coded so that it reflected the categories above, with some answers listing multiple challenges that required them being categorized into more than one area.

The four open-ended questions provided intriguing information from Technology Leadership Academy participants on the impact of the training and on the difficulties they faced

as they attempted to provide technology leadership on their campus. The purpose of this data were to provide deeper insight into the principals who participated in this training.

Summary

This chapter described the methodology for conducting this study and the instrument to be used in the collection of data. The purpose of the study was to compare the scores of two groups of Texas high school principals on an instrument designed to evaluate their roles as leaders of technology on their campus. It used both descriptive and causal-comparative research methodology. The study evaluated 150 high school principals who completed the TASA Technology Leadership Academy during 2000 and 2001 along with a random sampling of 150 of the remaining Texas high school principals yet to complete the training. The total number of possible participants in the study was 300. The study used a researcher created survey instrument. Experts tested the instrument for reliability and validity. Finally, conventional statistical methods for both descriptive and inferential statistics were used to analyze the data and the constant comparative method was used to analyze the qualitative data.

CHAPTER 4

ANALYSIS AND RESULTS

Technology has been shown to have a significant impact on public schools today. As the previous chapters have illustrated, the social and economic changes initiated by technology on our society are also promising to change schools. Both state and federal governments have programs to assist schools in implementing technology with the hopes that technology might instigate real change in schools. In the absence of governmental assistance, many companies and corporations are infusing schools with money and materials. Similarly, much literature has been produced through government think tanks, commercial enterprises, and professional organizations to help guide schools through the technology integration process.

The previous chapters of this study reviewed the role of the principal to the implementation of technology at a given campus. Research on the role of principals and technology integration consistently demonstrates the importance of school leadership on implementation of technology. Gibson (2001) said, "The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology usage, but the presence of informed and effective leadership" (p. 1). This study is designed to explore the level of technology leadership evidenced in high school principals in the state of Texas and compare a sample of group of administrators who have received specific technology training – the Technology Leadership Academy.

This chapter reports the results of the study and provides some level of analysis. First is a description of the participants of the study. Second is an analysis of research question #1: "What

are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?" Third is an analysis of the second research question: "How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?" Fourth is an analysis of four open-ended questions designed to give some feedback from participants of the TASA Technology Leadership Academy. The chapter concludes with a summary of the results and analysis of the study.

Participants

Three hundred Texas high school principals were asked to participate in this study, 150 that had completed the Technology Leadership Academy (TLA) and 150 who had not completed the training. Of that number, 87 (29%) responded – 45 who participated in the Technology Leadership Academy and 42 who had not participated in the training. Part Three of the survey instrument asked participants to provide demographic data on their schools and themselves: geographic region of school in Texas (by Education Service Center region), the size of school (by University Interscholastic League classification), gender, ethnicity, educational level, and the age and number of years of administrative experience of the principal.

The participants came from all over the state. Table 3 displays the breakdown of participants by geographic region. Between 14 and 20 participants represent each of the five geographic regions. Interestingly, the six Educator Service Center regions (4, 10, 11, 13, 19, and 20) that educate 64% of the state's students (Texas Education Agency, 2003) provided only 40% of the participants for this study. Only four responses were received from the Region 4 Education

Service Center, home to Houston ISD, the largest school district in the state. Table 3 displays the breakdown of participants by education service center region.

Table 3 - Geographic Distribution of Participants' Schools

Region	Education Service Centers	TASA Tech Academy		Total
		Yes	No	
South Texas	1, 2, 3, 4	10	5	15
East Texas	5, 6, 7, 8	6	8	14
North Texas	9, 10, 11	11	8	19
Central Texas	12, 13, 20	7	12	19
West Texas	14, 15, 16, 17, 18, 19	11	9	20
	TOTALS	45	42	87

The schools the respondent principals served also showed great diversity of size. The University Interscholastic League (UIL) sponsors interscholastic athletic, music, and academic competitions among public schools in Texas. The UIL divides schools into five classifications based upon high school enrollment. The smallest schools, or Class A schools, are those with high school enrollments less than 179 and the largest schools, or Class AAAAA schools, are those who enroll more than 1910 in their high school (University Interscholastic League, 2003). The following chart portrays the participants by the UIL enrollment level.

Table 4 - *School Size of Participants*

UIL Classification	Enrollment Range	TASA Tech Academy		Total
		Yes	No	
A	179 and under	11	10	21
AA	180 - 344	6	8	14
AAA	345 – 899	8	7	15
AAAA	900 - 1909	11	9	20
AAAAA	1910 and over	9	8	17
	TOTAL	45	42	87

The participants in the study tended to be white (76%) and male (76%). Well more than half (62%) were 46 years old or older, with 15 (17%) being older than 56. However, their age did not correlate to a large amount of experience. Three-fourths of them had less than ten years experience. Most of the participants (80%) had completed either the minimum education for a Principal's certificate (n=49) or had some education beyond their Master's degree (n=21). The following Tables display the personal characteristics of the participants divided by those that participated in the TASA Technology Leadership Academy and those that did not.

Table 5 – *Ethnicity of Participants*

		TASA Tech Academy		Total
		Yes	No	
Ethnicity	Indian	1	1	2
	African-American	1	1	2
	Hispanic	6	7	13
	White	34	32	66
	Other	3	1	4
Total		45	42	87

Table 6 – Gender of Participants

		TASA Tech Academy		Total
		Yes	No	
Gender	Male	35	31	66
	Female	10	11	21
Total		45	42	87

Table 7 – Age of Participants

		TASA Tech Academy		Total
		Yes	No	
Age	35 or younger	5	5	10
	36-40	7	1	8
	41-45	7	8	15
	46-50	10	8	18
	51-55	11	10	21
	over 56	5	10	15
Total		45	42	87

Table 8 – Experience of Participants

		TASA Tech	Academy	Total
		Yes	No	
Experience	1-5 years	22	19	41
	6-10 years	12	12	24
	11-15 years	5	6	11
	16-20 years	4	5	9
	21 or more	2		2
Total		45	42	87

Table 9 – Educational Level of Participants

		TASA Tech Yes	Academy No	Total
Education	Masters Ed Admin	24	25	49
	Masters	5	3	8
	Additional Coursework	13	8	21
	Doctorate	3	6	9
Total		45	42	87

Technology Leadership Practices of Texas' High School Principals

Research question 1 is, "What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?" The survey document contained forty-six questions, each tied to one or more of the six standards of the NETS*A. Table 5 lists the six standards of the NETS*A and the survey questions that are used to measure that standard.

*Table 10 - Survey Questions by NETS*A Standard*

	Survey Questions measuring	Total # of items
Standard I: Leadership and Vision	1, 2, 3, 4, 18, 19, 20, 21, 22, 23, 24, 32	12
Standard II: Learning and Teaching	5, 6, 7, 17, 21, 22, 26, 27, 28, 29, 30, 31, 32	13
Standard III: Productivity and Professional Practice	8, 22, 25, 29, 33, 34, 35, 36, 37	9
Standard IV: Support, Management,	1, 9, 10, 11, 17, 35, 36, 37, 40, 41	10

and Operations		
Standard V: Assessment and Evaluation	3, 12, 13, 21, 30, 35, 37, 38, 39	9
Standard VI: Social, Legal, and Ethical Issues	9, , 14, 15, 16, 40, 42, 43, 44, 45, 46	10

Each of the Standards from the NETS*A was measured using the responses to only those questions identified to measure that particular standard. Since the survey contains both dichotomous questions and responses using a Likert scale, the dichotomous responses were given a numerical value intended to allow comparisons to be made. Responses of "yes" were assigned a score of 4 and responses of "no" were assigned a score of 1. The range of possible mean scores on the Likert scale responses on this instrument is 1.00 to 4.00. High range mean scores (2.50 – 4.00) indicate a high measure; whereas low range mean scores (1.00 – 2.50) indicate a low measure. Table 11 presents the results of the survey instrument by NETS*A Standard.

*Table 11 - Descriptive Statistics for NETS*A Standards*

	NETS*A					
	Standard I	Standard II	Standard III	Standard IV	Standard V	Standard VI
N	87	87	87	87	87	87
Mean	3.1542	3.3289	3.4777	3.5134	3.3941	3.3783
Std. Deviation	.50073	.52758	.40351	.33644	.44592	.42570
Variance	.25073	.27834	.16282	.11319	.19884	.18122

Participant's mean scores were in the high range for each of the six standard areas. Their highest mean score (3.5134) was for Standard IV – Support, Management, and Operations. The lowest mean score, although still high at 3.1542, was for Standard I – Leadership and Vision. The largest amount for variance occurred in the mean scores for Standard II – Learning and Teaching.

Mean scores were also tabulated for each performance indicator under the NETS*A standards. Table 12 displays a short description of the performance indicator, the questions measuring that indicator, the combined mean scores for all study participants, and combined mean scores for participants who attended the TASA Technology Leadership Academy and those that did not.

Ten of the performance indicator mean scores were higher than 3.5. Performance indicator IV.D, which asked participants if they integrated technology into their regular campus plans, received the highest combined mean score (3.931). Five of those ten highest combined mean scores dealt with personal use (III.B – Use technology for communication, III.A – Model technology use, IV.B – Use of technology management programs, III.F – Use technology for organizational improvement, V.B – Use technology to analyze data). Three of the combined mean scores above 3.5 came from performance indicators in Standard 6 dealing with social, legal, and ethical issues (VI.B – Social, legal, and ethical practices, VI.C – Privacy, security, and safety practices, VI.A – Equity of access). The lowest score, and the only combined mean score less than 3.0, was performance indicator I.A dealing with a shared vision for technology.

Table 12 - Mean Scores by Performance Indicator

NETS*A Standard. Performance Indicator	Questions	Combined Mean
STANDARD I		
I.A – Shared Vision	4, 18	2.766
I.B – Technology Plan Process	1, 2, 19	3.234
I.C – Innovation	20, 24, 32	3.352
I.D – Use of Data to Make Decisions	3, 21	3.253
I.E – Research-based Technology Practices	22, 23	3.029
SANDARD II		
II.A – Use Technology for Instruction	5, 17, 22, 26, 27, 32	3.364
II.B – Support Innovative Uses of Technology	17, 26, 27	3.383
II.C – Provide Learner Centered Tech Environment	7, 28, 29	3.203
II.D – Support Tech for Higher-Order Thinking	28, 30, 31	3.178
II.E – Provide for Professional Development	6, 7, 21, 22	3.310
STANDARD III		
III.A – Model Technology Use	8, 33, 34, 35, 36, 37	3.701
III.B – Use Technology for Communication	34	3.862
III.C – Create/Participate in Tech Learning Communities	25, 29, 36	3.245
III.D – Engage in Professional Development	8, 22, 25, 36	3.356
III.E – Aware of New Technologies	22, 36	3.414
III.F – Use Tech for Organizational Improvement	35, 36, 37	3.567

STANDARD IV		
IV.A – Guidelines for Tech Compatibility	9, 11, 40, 41	3.368
IV.B – Use of Technology Management Programs	35, 36, 37	3.567
IV.C – Allocate Resources for Technology	10, 17	3.724
IV.D – Integration of Tech Plan with Other Plans	1	3.931
IV.E – Implementation of Continuous Improvement	11	3.379
STANDARD V		
V.A – Assessment of Tech Resources	3, 12, 13	3.081
V.B – Use of Tech to Analyze Data	38, 39	3.552
V.C – Assessment of Staff Competency	12, 21, 30	3.230
V.D – Assessment of Administrative Systems	35, 37	3.483
STANDARD VI		
VI.A – Equity of Access	40, 42, 43	3.638
VI.B – Social, Legal, and Ethical Practices	9, 40, 44, 46	3.727
VI.C – Privacy, Security, and Safety Practices	9, 15, 45, 46	3.638
VI.D – Environmentally Safe and Healthy Practices	16	3.000
VI.E – Policies that Enforce Copyright	14, 44	3.040

Comparison of Principals with Technology Leadership Academy Training

The second research question asks, "How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?" Answering this question requires the use of inferential statistical measures. The null hypothesis for this question

is there is no difference between Texas high school principals who have completed the TASA Technology Leadership Academy and those who have not attended the training in their technology leadership practices as identified by the Technology Leadership Survey instrument. A multivariate analysis of variance (MANOVA) was conducted using the combined mean scores on questions on each of the six NETS*A standards as dependent variables and participation in the Technology Leadership Academy as the independent variable.

First, the descriptive statistics over the entire sample in Table 11 demonstrated the similarity of the mean scores in each of the six standard sub scales. When broken down by participation in the TASA Technology Leadership Academy, there was little difference between the combined mean scores. In fact, those not participating in the Technology Academy's combined mean score for questions covering Standard II (Teaching and Learning) were higher than the combined mean score for those that did participate. Both groups lowest mean score was for the standard dealing with leadership and vision, Standard I. The following table provides information on the combined mean scores by NETS*A standard:

*Table 13 – Comparison of Mean Scores by NETS*A Standard*

	TASA Tech Academy Participation	Mean	Std. Deviation	N
Standard I	Yes	3.1944	.5075	45
	No	3.1111	.4958	42
	Total	3.1542	.5007	87
Standard II	Yes	3.3077	.5508	45
	No	3.3516	.5072	42
	Total	3.3289	.5276	87
Standard III	Yes	3.5086	.4390	45
	No	3.4444	.3640	42
	Total	3.4777	.4035	87
Standard IV	Yes	3.5284	.3547	45
	No	3.4974	.3192	42
	Total	3.5134	.3364	87
Standard V	Yes	3.4222	.4786	45
	No	3.3639	.4116	42
	Total	3.3941	.4459	87
Standard VI	Yes	3.4162	.4349	45
	No	3.3377	.4170	42
	Total	3.3783	.4257	87

The data were also broken down by performance indicator and a comparison between the two groups was made. Both groups scored highest on performance indicator IV.D (Integration of tech plan with other plans). Their second highest scoring indicator was also the same (III.B – Use of technology for communication). Interestingly, both groups also had a common lowest scoring performance indicator, I.A for a shared vision of technology. Indeed the similarity of responses between the two groups was worthy of note. The two groups mean scores were within 0.01 of each other on 16 of the 30 performance indicators.

While there were many similarities, there were some fascinating differences between the two groups. The performance indicator mean scores from those who had attended the TASA Technology Leadership Academy were 0.386 higher for performance indicator V.A (Assessment of technology resources), 0.294 higher for performance indicator III.E (Awareness of new technologies), and 0.215 higher for performance indicator VI.E (Policies that enforce copyright laws). In fact, those participants who had attended the TASA Technology Leadership Academy scored at least 0.15 points higher than those who had not attended the training on seven performance indicators. The non-Technology Leadership Academy participants scored at least 0.15 higher on two performance indicators. Their largest difference came on performance indicator VI.D (Environmentally safe and healthy practices) at 0.276.

Table 14 - Comparison of Mean Scores by Performance Indicator

	TASA Tech Academy	
NETS*A Standard. Performance Indicator	Yes	No
I.A – Shared Vision	2.856	2.667
I.B – Technology Plan Process	3.215	3.254
I.C – Innovation	3.422	3.278

NETS*A Standard. Performance Indicator	TASA Tech Academy	
	Yes	No
I.D – Use of Data to Make Decisions	3.267	3.238
I.E – Research-based Technology Practices	3.089	2.964
II.A – Use Technology for Instruction	3.378	3.349
II.B – Support Innovative Uses of Technology	3.348	3.421
II.C – Provide Learner Centered Tech Environment	3.126	3.286
II.D – Support Tech for Higher-Order Thinking	3.178	3.179
II.E – Provide for Professional Development	3.378	3.238
III.A – Model Technology Use	3.733	3.667
III.B – Use Technology for Communication	3.822	3.905
III.C – Create/Participate in Tech Learning Communities	3.237	3.254
III.D – Engage in Professional Development	3.417	3.292
III.E – Aware of New Technologies	3.556	3.262
III.F – Use Tech for Organizational Improvement	3.652	3.476
IV.A – Guidelines for Tech Compatibility	3.367	3.369
IV.B – Use of Technology Management Programs	3.652	3.476
IV.C – Allocate Resources for Technology	3.667	3.786
IV.D – Integration of Tech Plan with Other Plans	3.933	3.930
IV.E – Implementation of Continuous Improvement	3.333	3.429
V.A – Assessment of Tech Resources	3.267	2.881
V.B – Use of Tech to Analyze Data	3.556	3.548
V.C – Assessment of Staff Competency	3.237	3.222
V.D – Assessment of Administrative Systems	3.567	3.393
VI.A – Equity of Access	3.611	3.667

NETS*A Standard. Performance Indicator	TASA Tech Academy	
	Yes	No
VI.B – Social, Legal, and Ethical Practices	3.744	3.708
VI.C – Privacy, Security, and Safety Practices	3.656	3.619
VI.D – Environmentally Safe and Healthy Practices	2.867	3.143
VI.E – Policies that Enforce Copyright	3.144	2.929

Second, although the descriptive statistics on the two groups indicated that there was little, if any, difference between the two groups, a MANOVA was still conducted. A Box's M was conducted to test for the equality of covariance matrices. The results of this test (Box's M = 20.667, sig. = .579) indicated that the variance in the combined mean scores was sufficient to not reject the null hypothesis. The results of the MANOVA, however, were not enough to reject the null hypothesis. Wilks' Lambda (.932, F = .976, p = .447, and η^2 = .364) indicated that the group main effects were not significantly different, meaning that the null hypothesis for each of the six standards had to be accepted.

Table 15 – MANOVA Results

Effect	Value	F	Error df	Sig.	Eta Squared	Observed Power
Intercept						
Wilks' Lambda	.007	1779.904	80.000	.000	.993	1.000
Participation in TASA Tech Academy						
Wilks' Lambda	.932	.976	80.000	.447	.068	.364

The six null hypothesis that made up the second research question were:

(1) The combined mean scores for questions from the Technology Leadership Survey for Standard I of the NETS*A will be no different for Texas' high school principals who have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

(2) The combined mean scores for questions from the Technology Leadership Survey for Standard II of the NETS*A will be no different for Texas' high school principals who have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

(3) The combined mean scores for questions from the Technology Leadership Survey for Standard III of the NETS*A will be no different for Texas' high school principals who have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

(4) The combined mean scores for questions from the Technology Leadership Survey for Standard IV of the NETS*A will be no different for Texas' high school principals who have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

(5) The combined mean scores for questions from the Technology Leadership Survey for Standard V of the NETS*A will be no different for Texas' high school principals who have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

(6) The combined mean scores for questions from the Technology Leadership Survey for Standard VI of the NETS*A will be no different for Texas' high school principals who

have attended the TASA Technology Leadership Academy than for those Texas' high school principals who have not attended the Technology Leadership Academy.

Analysis of Open Ended Survey Questions

The Technology Leadership Survey included four open-ended questions to be answered by those that attended the Technology Leadership Academy. Those four questions were designed to elicit information on the results of the training on the individual personal use of technology and on training toward technology leadership. The responses to these questions were analyzed using widely accepted methods of inductive analysis and coding. The responses were transcribed from the Technology Leadership Survey by question. Once all the answers from participants to a particular question were transcribed, the researcher read and re-read the responses to identify categories of responses. At that point, responses were coded according to those categories and interpreted. The process was repeated for each open-ended question.

The Technology Leadership Academy was designed to improve participants' technology leadership. Following are the objectives of the training:

Participants will:

1. Be able to articulate the premises of systems change and the role of leadership in a standards-based, results driven, data-rich educational setting,
2. Be familiar with examples of how technology enhances high student performance, excellent teacher performance, and administrative effectiveness,
3. Understand how to develop an organizational structure that integrates curriculum and assessment with technology,
4. Learn technology tools that can be used for personal productivity and to enhance learning opportunities for students,

5. Participate in networking and on-line experiences to share knowledge and best practices, pose questions, gather data, and obtain support regarding systems change, leadership development, and the use of technology,
6. Learn planning processes that can be replicated during planning sessions in participants home districts,
7. Have access to a variety of resources to guide future planning efforts and funding,
8. Model and define an effective professional development program for helping teachers integrate technology into the curriculum, including results-based training, evaluation of results, adult learning theory and subsequent practices, and continuous learning rather than one-shot sessions,
9. Design a unique action plan for the participant's district or campus, reflecting their leadership in systems change and using technology to enhance student success and system effectiveness. (Texas Association of School Administrators, 2001b)

The first question asked of the Technology Leadership Academy participants was, "How are you implementing the concepts and skills you learned during the Technology Leadership Academy?" The answers to this question generally fell into one of three areas: Personal, Organizational, and Combined.

Those answers that were personal often detailed a new skill the participant learned at the Academy. For example, one participant wrote, "Using skills to produce power point (sic) presentations, web page development, etc… (sic)). In fact, many (7) of the personal responses included references to Microsoft's presentation software, PowerPoint. While increased individual skill may eventually be transferred to the organization in some fashion, only one of

the nine objectives of the TASA Technology Leadership Academy addressed personal productivity (Objective #4).

Contrastingly, the organizational answers often pointed to how the participant was going to use the skills and concepts to improve the organization. For example, one participant answered the question, "I try to send as many teachers as I can to anything that has to do with technology. We have allocated time and money for this staff development." Most of the objectives of the TASA Technology Leadership Academy and the standards of the NETS*A are designed around leadership and organizational issues. Less than half of the participants in the study identified a learned skill or concept from the TLA that had organizational significance.

Finally, some responses included elements of both a personal and organizational nature. "I now provide more PowerPoint presentations for parents and teachers. I have asked more of teacher [sic] regarding technology integration into daily lessons." These responses indicated principals used personal productivity skills to improve organizational leadership for the school.

Table 16 – Implementation of Concepts and Skills Learned at the TASA Technology Leadership Academy

Categories of Responses	N (35)	%
Personal Productivity	17	48.6
Organizational Improvement	12	34.3
Combined Responses	6	17.1

The second question dealt with the most beneficial concept or skill learned during the TLA. "Of the concepts and skills that you learned or improved upon during the Technology Leadership Academy, which ones have been most beneficial?" Once again, the responses

indicated that personal productivity was enhanced more than technology leadership skills. 27 of the 37 responses (73%) indicated some type of personal productivity skill. Moreover, Microsoft's PowerPoint presentation software garnered the most specific mention (12). Six responses indicated the most beneficial concept or skill was a leadership skill. They were, "the process of teaching teachers", "use of web based information as an instructional tool", "using the internet to drive decisions", "the concept that everyone can use technology", "curriculum development", and "curricular integration". The final four responses could not be categorized into either area.

Only 25 people responded to the third open-ended question, "What supports have you taken advantage of that have helped you implement the training you received in the Technology Leadership Academy?" Almost half of those responding to this question (11) said they were using no supports. Others mentioned a variety of support resources: online forum, personal, regional service center, district technology support staff, and superintendent's support.

The fourth question asked, "What challenges have you had as you have attempted to provide technology leadership on your campus?" Interestingly, the 36 responses could be categorized into four areas: Time, Money, Support, and Personnel. Time, money, and support are challenges because of their scarcity. Personnel challenges listed by the participants indicated unwillingness of staff to buy into the importance of integrating technology into instructional practice and the curriculum.

Table 17 – Challenges to Implementation of Concepts and Skills Learned at the TASA Technology Leadership Academy

Categories of Responses	N (36)[a]	%
Lack of Time	6	17.0
Lack of Money	15	41.7
Lack of Technical Support	7	19.4
Personnel	10	27.8

[a] – 3 of the responses could be placed into more than one category and one person stated they had no challenges.

Summary

This chapter analyzed the statistical results of the study in terms of a description of the participants and answered the two research questions. The participants in this study represented all areas of the state and a variety of school sizes. Generally the participants were white, male, over age 46, with less than 10 years experience as principal, and few had additional education beyond the principals certification. Their responses to the survey questions indicated a relatively high level of technology leadership in each of the six Technology Leadership standards. In addition, the comparison between responses from those principals who attended the TASA Technology Leadership Academy and those that had not attended indicated little difference between the combined mean scores on each of the standards. The MANOVA verified this conclusion showing no significant difference between mean scores for principals who attended the TASA Technology Leadership Academy and those that did not. The results of the MANOVA meant that none of the null hypothesis for the six standards could be rejected. Although the statistical measures showed no significant difference between the two groups, the responses by

TASA Technology Leadership Academy graduates did provide some information about the skills and concepts principals gained from the Academy and challenges they perceived to continued technology leadership on their campuses.

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

Studies indicate that the implementation of technology often hinges on the leadership of the organization (Gates, 1995; Sandholtz, 1997; Thomas, 1999). Awalt (1999) states, "Inquiries into the slowness of full scale technology adoption and integration cite the lack of school administrators' knowledge about advanced technologies." Since technology continues to change rapidly, it is important for administrators to develop leadership skills and technology competencies. This study evaluated the technology leadership actions of high school principals in Texas.

The purpose of this study was to determine how high school principals in Texas embody their role as technology leader and if those principals who participated in the TASA Technology Leadership Academy exhibit different leadership skills than those who haven't completed this training. The study used the six standards of the National Education Technology Standards for Administrators (NETS*A) as the framework for this exploration.

This chapter presents a discussion of the data explored in Chapter 4 as well as recommendations based on the results of this study. It will begin with a summary of the first four chapters. Following this synopsis is a discussion of the results and potential limitations of the study. Implications for educators and recommendations for future study will make up the last few paragraphs of the chapter.

Summary of Previous Chapters

Chapter 1 provided a background for the study, provided an outline of the study, and described the significance and limitations of the study. Additionally, research questions and hypothesis were proposed, terms used in the study were defined, and the assumptions of the study were described.

Chapter 2 reviewed the relevant research literature that applies to the study. First, it reviewed the history of technology in schools, pointing to various technologies in the past that, although promised to drastically alter education, actually had little if any effect. Then the chapter details the promise of computer technology for schools. The review pointed out that proponents of computer technology have lofty expectations for positive change for students, teachers, and schools. The chapter then highlighted the vast amounts of literature detailing the importance of the principal to school effectiveness. Most of the research studied indicated effective principals are necessary for effective schools. After that, the chapter concentrated on research dealing with principals' technological competencies. Most of the research connecting principals with technology centered on the principals' individual competencies rather than his or her leadership skills. Last, the chapter reviewed the six standards of the NETS*A document with accompanying commentary from the few studies that did actually look into technology leadership.

Chapter 3 explained the methodology of the study and described the survey instrument. It began by restating the purpose of the study and the research questions. Then the chapter detailed the research design and methodology. This study was both a descriptive and causal-comparative study. It described the technology leadership characteristics of all of the study participants. After describing those characteristics the study then compared the results of participants who had participated in the TASA Technology Leadership Academy with those who had not. The chapter

then described the rationale and purpose in choosing a 300 member sample to represent Texas' high school principals and the process by which those people were contacted and asked to participate in the study. Following the description of the sample, the chapter described the survey instrument. The instrument was created by the researcher due to the lack of an instrument that attempted to measure the technology leadership skills as detailed by the NETS*A document. The reliability of the instrument was measured statistically during data collection and a panel of experts reviewed the validity of the instrument. The procedures for collecting data were then explained by Chapter 3. The researcher chose to collect most of the data through an online survey. Last, the chapter detailed the steps taken to analyze the data.

Chapter 4 presented an analysis of the data collected for this study. It began with a description of the demographic characteristics of the participants and their schools. Descriptive statistics were used to show that the participants scored high in each of the six NETS*A standards subtest scores. A comparison of combined mean scores indicated participants scored higher than 3.1 in each of the standards. Then a MANOVA was performed to indicate if there were any statistically significant difference between the mean scores for principals who had attended the TASA Technology Leadership Academy and those who had not. The MANOVA indicated no significant difference between the groups on each of the NETS*A subtests. The null hypothesis for research question #2 was accepted. The chapter ended with a description of participants' responses to four open-ended questions.

Discussion of Results

This study was undertaken because existing studies of principals and technology seemed to focus on individual competence with technology (Maher, 1994; Peterson, 2000; Awalt & Jolly, 1999; Blake, 2000; Jetton, 1997; Slowinski, 2000), rather than the leadership for

technology referred to in the NETS*A. Therefore, this study described the technology leadership actions of Texas' high school principals in each of six technology leadership standards developed by the NETS*A and compared results between principals who have participated in Technology Leadership Academy with those who have not participated. Two questions guided the study:

1. What are the technology leadership levels reported by Texas high school principals in each of the six technology leadership standards identified by the NETS*A standard document?
2. How are the technology leadership practices of high school principals who participated in the Technology Leadership Academy sponsored by TASA and TBEC different from those who have not participated in the training?

Before delving deeply into a discussion of the results of this study, two procedural issues affected the study and must be mentioned: the reliability of the survey instrument and the limited return rate on the survey.

Because no instrument had been created to measure the NETS*A standards, this researcher created a survey document using information from the standards documents and from an analysis of the standards completed by Susan Brooks-Young (2002). The Technology Leadership Survey consisted of 17 dichotomous Yes/No questions, 29 four-part Likert scale questions, and 4 open ended questions. Each of the Yes/No questions and Likert scale questions was designed to measure one or more of the six standards of the NES*A. As indicated in Chapter 3, the overall reliability of the survey was .8897, while the reliability scores of the sub scales measuring the six standards varied from .3575 to .8346. While the overall reliability statistics were acceptable, those of three of the subscales were less than desirable. One factor that may

have lessened the reliability of those particular subscales for Standard 4, 5, and 6, could have been the small sample size (n=87).

This study was conducted using a data collection procedure intentionally designed to minimize the imposition on the participants and maximize the return rate for the study. In order to complete the survey, participants were asked to go to an Internet website. As the participants submitted their completed surveys, the results were automatically inserted into a spreadsheet. The sample was initially contacted through e-mail addresses obtained either from the TASA's Technology Leadership Academy participant list or from a database at the Texas Education Agency. The 29% return rate after four attempts to invite participation through e-mail and one attempt to fax participants an invitation was extremely disappointing. Peterson (2000) also was disappointed in his study of principals of technology rich schools by the low return rate of principals using his online survey (15%).

While the participation rate and reliability of the sub scales were disappointing, there are important findings from this study. Generally, previously reviewed literature indicated that principals' lack of technology leadership limited the ability of technology to appropriately affect education. Gibson (2001) said, "The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology usage, but the presence of informed and effective leadership" (p. 1). Slowinski (2000) stated it this way; "Administrators who implement technology effectively in their schools and communities will contribute greatly to both education and economy in the twenty-first century" (p. 1). Both of these statements indicate the presence of informed, competent technology leadership from the principal would allow technology to positively influence education of students. The overall

results of this study indicate that Texas' high school principals engage in the appropriate technology leadership actions to affect such change.

The findings of this study indicate participants' overall technology leadership to be very high as measured by the Technology Leadership Survey. However, this finding must be tempered by the implications of the low return rate on the survey. Since this survey was administered online, the low return rate may indicate that only those principals who feel comfortable with technology responded to the survey. In order to participate in this study principals had to open and read the e-mail requesting their participation, click on a link to the online survey, and complete the online survey. If those who participated were adept at technology, it would stand to reason that those participating in this study, regardless of their participation in the Technology Leadership Academy, reported themselves highly on the survey instrument. This possibility must be considered when describing the findings. The following paragraphs discuss the major findings from the study in each of the six NETS*A standard areas.

The first standard of the NETS*A document deals with "Leadership and Vision." Brooks-Young (2002) states, "Many school administrators now have the latest, greatest whatever in the office or on the campus and it has not made a bit of difference in students' academic achievement. What does make a difference is a school administrator at any level who is a thoughtful instructional leader." (p. 13) This study attempted to place a quantitative score on the abstract concept of leadership. To do so, the Technology Leadership Survey asked questions about planning for technology, using technology to make decisions, and advocating for teachers in the use of technology. Previous research indicated that principals were lacking in this area. For example, Gibson (2001) said, "The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology usage,

but the presence of informed and effective leadership" (p. 1). The SouthEast Initiatives Regional Technology in Education Consortium. (2001) included leaders' planning for technology, using technology, and supporting teachers as precursory to any successful technology implementation.

The combined mean score for Standard I was 3.154. While this number is high, it was also the lowest of all the standard mean scores. This indicates that of the six standards, principals do less well in the area of Leadership and Vision. In fact, the combined mean score for performance indicator I.A (creating a vision for technology) was the lowest of all the performance indicator scores (2.766). The performance indicator scores for questions asking about technology planning were much higher, indicating that principals incorporated technology into their own campus improvement plans and developed technology plans. This may be explained with the recent requirements from the federal and state governments for campus technology plans to be in place before being able to access certain federal and state funds. The performance indicator scores also indicate that principals support their teachers in the innovative use of technology. However, even this score (3.352) was lower than all but one of the combined scores for the standards. These scores point out a continued weakness on the part of principals to provide the necessary vision and leadership for technology.

Standard II of the NETS*A is entitled "Learning and Teaching". Brooks-Young (2002) states, "Standard II helps administrators better understand how to examine and evaluate current instructional technology use and then provide support to teachers as they strive to improve their instructional practice." (p.45) The standard and the questions on the Technology Leadership Survey designed to measure this standard focused on principal support for teacher's use of technology, principal's willingness to provide technology based professional development for teachers, and the principal's evaluation of teacher's technology use. Previous research indicated

principals did not provide the support necessary for teachers to use technology. The U. S. Department of Education's National Center for Education Statistics (2000b, p. 92) stated teachers cited inadequate training opportunities (68%) and lack of support from administrators (43%) as one of their barriers to implementation of technology.

The combined mean scores for Standard II are high (3.329). The results in this standard indicate that principals felt they supported the use of technology for teaching and learning. Indeed, 93% of the participants indicated they provided technology staff development for their teachers during the previous year, 91% allocated additional budget money for technology, and 82% said they reviewed lesson plans and/or classroom observations to review the implementation of technology by teachers. This study indicates principals support technology in the teaching learning process.

Standard III of the NETS*A concerns Productivity and Professional Practice. Brooks-Young (2002) says this standard "addresses how educational administrators use technology to make positive changes in productivity for themselves and others" (p. 75). Awalt and Jolly (1999) recognized that for principals to be leaders in the use of technology, they first had to be knowledgeable about technology and model its use. Gibson (2001) emphasized the importance of the principal modeling technology use.

The mean score for Standard III was 3.478. The performance indicator combined mean score for indicator III.A (Modeling technology use) was 3.667. These scores indicate that the principals are technologically competent and frequent users of technology. Many studies have found an increase in the technological competence of various education professionals. For example, Becker (2000) details the rise in the competency level of teachers from 1995 to 1998. The trend also seems to be true with principals. In 1994, Maher found that 29% of the principals

he studied did not use a computerized word processor and 53% had not used a CD-ROM. Jetton's 1997 study showed that 70% of the principals in the Region 4 Education Service Center Region in Texas used the computer very often. By 2000, Blake's study of Florida principals discovered they were proficient in several technologies. This study confirmed that principals are becoming much more technologically literate and using technology more often.

Communication technologies seem to be especially important to participants of this study. Principals in this study indicated through high mean scores for performance indicator III.B (Use technology for communication) that communication through technology is done often. In fact, 93% of the participants said they routinely communicated with technology. Once again, previous research indicates the use of technology for communication has become commonplace more recently. In Maher's 1994 study on principals' technology competence, only 29% said they consistently used e-mail. However, Peterson (2000) found that 68% of principals in that study communicated *daily* with technology. Maddux, Johnson, and Willis (1997) describe this type of technology use as the highest form, Type II use. The computer is being used as a "mindtool" to help the principal be more efficient and effective in his or her job.

The fourth standard of the NETS*A is "Support, Management, and Operations." Much of this standard dealt with infrastructure issues not directly under the control of the campus principal. The principal's role for issues in this standard often become that of planning for technology improvements and use of technology based management systems. Brooks-Young (2002) states this standard is concerned with compatibility issues, technology based management systems, support issues, and continuous system improvement plans.

The increase in the availability of technology in schools is well documented (U. S. Department of Education, 1996; Anderson and Ronnkvist, 1999; United States Department of

Education, 2000b; Technology Counts, 2002). Educators first recognized the value of technology in automating management type of processes such as student database, gradebooks, attendance recording, and scheduling. Schools continue to use technology to manage schools. *Teachers' Tools for the Twenty-first Century* (United States Department of Education, 2000b) reports that 99% of teachers use technology to accomplish a number of prepatory and administrative tasks. It should be no surprise then, that principals combined mean score for this standard was the highest of all the standards at 3.5134. Not only do principals use these management technologies on their campus, they also insure support of technology. Ninety-one percent of the participants provide at least one technology support person on their campus and 79% participate in some type of technology improvement plan. The survey data also indicated 93% of the principals regularly used a student management software program. This data shows that principals are very adept in this area of the NETS*A.

Standard V of the NETS*A refers to Assessment and Evaluation. Brooks-Young (2002) states, "this performance indicator specifically targets evaluation of technology use in learning, communication, and productivity (p. 125)." She also states that evaluation is often the weakest component in technology-based programs. The SouthEast Initiatives Regional Technology in Education Consortium (2001) say school technology plans often lack strategies or tools for determining if technology integration efforts have had any impact.

The combined mean score on the Technology Leadership Survey for this standard was 3.3941. The participants in this study indicated they used technology for assessment and evaluation. Their combined mean score in the performance indicators V.B (Use of technology to analyze data) and V.D (Assessment of Administrative Systems) was 3.552 and 3.483 respectively. The other two performance indicators in this standard dealt with assessment of the

technology infrastructure (V.A) and assessment of staff technology needs (V.C). Assessment of the technology infrastructure had a combined mean score of 3.081 while the combined mean score for assessment of staff technology needs was 3.230. These scores indicate the principals in the study used existing technologies such as student management programs, computerized grade programs, and attendance programs to evaluate and report results. They scored much lower when they had to create an evaluation tool. For example, only 55% of all the participants stated their teachers had taken a formal assessment of technology competencies. Less than 50% of principals who had not attended the Technology Leadership Academy had completed this task.

The last standard of the NETS*A contains indicators dealing with social, legal, and ethical issues. Brooks-Young (2002) said this standard is "the most important standard for leaders to understand and address as individuals" (p.147). This standard deals with equal access; social, legal, and ethical practices; safe and secure online use; and potential health and environmental issues. Equal access pertains to the ability of all students being able to access the technology of a school regardless of their economic status, race, sex, educational program, or any other limiting factor. According to a report from the U. S. Department of Commerce (1999), minorities, low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that lack access to information resources. This report calls this lack of access a "digital divide." Because of continued advocacy for technology on behalf of both the state and federal government, most students in the state of Texas have equitable access to technology while at school. Very few schools, despite their demographic status or geographic location, have limited technological infrastructure. The Texas Education Agency (2002) reports that all the schools in the state have Internet access and students use technology regularly. The social, legal, and ethical practices

referred to in Standard VI pertains primarily to the presence and enforcement of a school's Acceptable Use Policy. Safe and secure online use refers to a school's ability to filter student's Internet access. With the passage of laws at both the state and federal level (Internet Safety Policy, 2003; Children's Internet Protection Act, 2000), all schools expecting to receive technology funding from the state or E-Rate reimbursements from the federal government are required to have Internet filtering. Last, the standard emphasizes health and environmental issues of concern to technology leaders.

The participants of this study scored very high in this particular area with a combined mean score of 3.378. One explanation for the high scores is the legislative requirements all to which all principals must adhere. For example, 100% of the participants reported their school provided Internet filtering, 97% said they had an Acceptable Use Policy for technology use in place, and 95% said they provide their staff with information concerning equal access for students. However, only 41% of the participants reported having checked campus software inventories in search of licensing violations and 73% reported having reviewed the copyright and intellectual property laws with their staff. This data suggests that while principals perform very well when required by fear of funding cuts or legislation, they continue to misunderstand the magnitude of the copyright infringement issues.

Finally, the open-ended answers from those participants who had attended the Technology Leadership Academy illuminated pertinent issues dealing with the skills learned and the difficulties endured while trying to utilize the skills and knowledge learned in the Academy. First, most of the Technology Leadership Academy participants felt the most beneficial skill or knowledge was personal (48.6%) rather than organizational (34.3%). Given that only one of the nine learning objectives for the training mentioned personal productivity and five specifically

mentioned organizational leadership and/or planning for the organization, this finding indicated that most of the participants used the training to improve personal skills. Participants in the training obviously still have difficulty adopting the role of technology leader on their campus. The second interesting finding from the evaluation of the open-ended questions dealt with the challenges reported by participants. The fact that lack of money was mentioned most by participants was not particularly surprising. However, the next most often mentioned answer, personnel, did provide some interesting information. Personnel, in these responses, pertained to a lack of willingness from staff to integrate technology. Apparently, these principals were having difficulty convincing teachers of the importance of integrating technology into the curriculum. This was a similar finding to that of the Office of Technology Assessment (1995).

Concerns of the Study

Concerns are inherent in any research of this type and need to be considered by anyone who intends to use the information presented in this work. The first concern to be considered is due to the self-reporting nature of survey research. Data analyses assumed honesty and accuracy in the participant's information; however, the possibility of inaccuracy and exaggeration must be considered. This is especially true in reporting abstract concepts like many of those this study attempted to measure.

The survey methodology must also be considered a concern of the study. All participants were contacted through electronic mail and asked to complete an online survey instrument. This methodology was specifically chosen to facilitate ease of participation and encourage a strong return rate. By accepting responses through an online survey instrument, this study limited the ability of those who either lacked the ability or the inclination to complete the instrument. The

possibility that those participating in the study were already at a high level of technological competence must be considered.

A third concern that must be considered was related to the population. The subjects of this study were high school principals in the state of Texas. High school principals were selected as the subject of this study based on an assumption that there were similar administrative experiences and opportunities for high school principals. Using only principals from Texas was a convenience factor for this study. The researcher had ready access to information from the state education agency in Texas. Furthermore, the researcher was experienced in the technology leadership training offered to Texas principals through the Texas Association of School Administrators. Although using Texas high school principals was a convenience for this study, it also used the same assumptions about similarity of experiences and opportunities. Generalizing the findings of this study to principals of other grade levels, or even high school principals from other states, would require assurance that other principals had similar experiences and opportunities.

The final concern involves the inability to relate results of this study to previous research. As has been already documented, no research has been conducted on technology leadership as it is defined by the NETS*A. While portions of the research can be validated through previous research (such as Standard III dealing with the personal technological competence of principals), much of the study was unable to be validated through previous research.

Implications of the Study

This study attempted to gauge the self-reported level of technology leadership in Texas high school principals and compare principals who had participated in a focused technology leadership training with those that had not. Being cognizant of the concerns mentioned

previously, the results of the study still have certain implications for practitioners and for principal preparation programs. First, a principal's ability to be a technology leader is not contingent upon any specific training. Second, principals need continued training on providing leadership and vision for technology. Third, principals need additional education on certain legal responsibilities dealing with technology. Last, the emphasis placed on technology by various sources has continued to positively affect principals' ability to be technology leaders.

There was no statistically significant difference between responses from principals who had attended the TASA Technology Leadership Academy and those who had not attended the training. Dawson (2001) stated that principals who received 13 or more hours of technology training lead schools that are more technologically advanced than those who received less than 13 hours of training. The contention of her study was that principals with the additional training made a significant difference in the technology level of the campus. This study did not try to prove or disprove that hypothesis. However, it was the contention of the researcher that the specific leadership skills taught in the TASA Technology Leadership Academy would be reflected in the survey results. Since the results did not reflect that contention, one might be quick to argue that the Technology Leadership Academy was a failure. On the contrary, this finding can not be supported. The study did not inquire into the level of technology training from the participants. It is very likely that those who had not attended this specific training had attended other, equally effective training. Technology training has been a priority for Texas for the last several years. This study indicated that Texas' principals are receiving either training or practical experience that allows them to report that they fulfill the role of technology leader well.

The second implication from this study is the continued need for training in leadership and vision. Standard I of the NETS*A (Leadership and Vision) contain indicators intended to

guide principals to planning for technology integration, promoting innovation in technology, using research based practices, and providing a vision for the use of technology on the campus. The combined mean score for this standard was the lowest of the six standards. The five performance indicators for this standard were all ranked in the lower half of all performance indicators and the lowest scoring performance indicator was I.A (Shared Vision for Technology). Continued emphasis must be placed on leadership and vision within our technology trainings.

Central office administrators, trainers and principal preparation program faculty need to continue to stress the importance of legality and ethical practices with technology. We live in a nation where the children who attend our schools and use school provided technology readily share copyrighted material with one another without purchasing it. It is also common for cash strapped schools to have acquired software illegally, albeit unintentionally. This study reflects a lack of understanding on the part of principals in reference to copyright laws. Only 36% of the participants in this study reviewed copyright and intellectual property rights laws regularly and only 41% reviewed software licenses. Principals must be more diligent in insuring that software is legally acquired and staff members are properly informed of the copyright and intellectual property laws.

The high mean scores overall and on each standard reflect the increasing competence of principals to be leaders of technology on their campus. This finding has the greatest implications for practice. Principals should feel comfortable providing leadership in this area even if they do not fully understand all the intricacies of technological tools. This statement does not imply that principals do not need technology training. On the contrary, this statement implies that principals are receiving quality technology training during their professional development activities and principal preparation programs. Universities, regional education service centers, and training

consultants should continue to provide quality training aimed at not only improving technological skills, but also leadership for technology.

Recommendations for Future Research

Research into the technology leadership skills for campus leaders needs to continue. One of the major chores facing schools of tomorrow will be how to effectively integrate technology into a changing school. Already thousands of students throughout the nation are receiving "distance learning" classes using technology. As schools continue to adapt to these changes they will need leaders who not only understand the technology but also have a vision for its implementation and future use.

Since this is the first study of its type, the first recommendation for future research would be a replication study. Comparing the results of this study with a replication using a different population would provide validation of the findings of this study and provide a research and methodological base for the replication study. The population could be chosen from different grade levels or from a different geographic location. Since the results of this study would provide comparison data, the need for a comparison group within the study parameters would not be necessary.

In addition, because research into technology leadership is so new, research utilizing different methodologies would be insightful. For example, an in depth qualitative study on several individual principals would provide more understanding into the actual technology leadership practices of principals. Research could be conducted using observation, interviews with the principal and his or her staff, document review of the campus technology plan and other relevant documentation, and results from surveys such as the Technology Leadership Survey.

Specific observations of behaviors and skills within the six standards compared to the results on the survey document would provide interesting data.

Additional research also needs to be done comparing the technology leadership of the principal with a schools ability to use technology. The survey used for this study could provide the information for the principal while the campus technology progress could be measured using one of several formal campus technology evaluation instruments (StaR Chart, Technology Integration Progress Guide, of PCC Assessment Tool are some possibilities). The correlation between a principal's ability to lead a campus and that campuses technological status would provide very useful information.

Summary

Technology is truly redefining our entire society. Just as it has transformed our entire society, technology will undoubtedly also transform education as we know it. But, just as previous technologies that have promised to radically transform the educational process, computerized technology and communication will not completely alter our profession. However, it does offer enormous opportunities to educators who learn how to utilize technology and harness its power to provide a quality education for students.

I began this particular study after a very positive experience in the TASA Technology Leadership Academy. Unlike many other technology trainings, the Technology Leadership Academy focused not on technological skills but leadership skills. The skills I learned during this training were skills that were beneficial in a variety of venues. I believe that efficient and effective use of technology requires the presence of leaders with more than technological skills. Unfortunately, I have seen too many talented professionals with enormous skill fail because of a lack of vision.

This study also was conducted using high school principals because I have a particular prejudice towards the complexities of the high school principal's job. After serving ten years as a high school principal, I have come to believe the high school principal's job is the most difficult in a school district. If a high school principal can find the time to be a technology leader, I have no doubt principals at other campuses can find time.

APPENDIX A: TECHNOLOGY LEADERSHIP SURVEY

HIGH SCHOOL PRINCIPALS PRACTICE
OF
TECHNOLOGY LEADERSHIP

PART I - Answer the following "yes or no" questions regarding your role as technology leader on your campus.

Yes No 1. Our campus improvement plan includes provisions for integrating technology into instructional practice.
Yes No 2. Our campus has a technology committee that meets regularly.
Yes No 3. I review inventories of our campus's technology at least once per school year.
Yes No 4. I have led my campus in creating a written vision for the integration of technology into classroom instruction.
Yes No 5. I require all teachers on my campus to use technology in their classroom instruction.
Yes No 6. I have provided my staff with professional development in integrating technology into instruction this school year.
Yes No 7. My campus has in place at least one of the following:
- Teachers write individual professional growth plans that include at least one target and are tied to improving the use of technology in instruction.
- Teacher study groups that meet regularly to discuss various aspects of classroom instruction, including the use of technology in classroom instruction.
- Curriculum teams that develop standards-based lesson plans and/or curriculum documents that encourage or require the use of technology in the classroom.

Yes No 8. I have participated in technology professional development during the last year.
Yes No 9. My campus has an Acceptable Use Policy for technology use which each staff member is aware.
Yes No 10. My campus has at least one person on campus identified as the technology support staff member.
Yes No 11. My school participates in a campus or district based technology replacement plan.
Yes No 12. My school has evaluated our campus technology use and/or resources through an accepted formal evaluation process. (i.e., STaR Chart, Technology Integration Progress Guide from SEIRTEC, or PCC Assessment Tool from the Milken Family Foundation)
Yes No 13. My teachers have taken a formal assessment of their technology competencies (i.e., TAGLIT, PCC Assessment Tool from the Milken Family Foundation).
Yes No 14. I have reviewed an inventory of campus software licenses at least once during the last school year.
Yes No 15. My campus provides filtering for Internet access.
Yes No 16. I purchase ergonomically appropriate furniture for technology labs and technology stations within individual classrooms.
Yes No 17. I allocate additional campus budget money for technology in addition to the state technology fund and any district-wide technology budget.

PART II – Answer the following statements using the following Likert scale:

1 – Never
2 – Seldom
3 – Occasionally
4 – Routinely

As principal of my high school, I…

1 2 3 4 18. provide time in campus meetings to communicate and/or develop a campus wide vision for the use of technology in my school.
1 2 3 4 19. review and modify my campus technology improvement plan.
1 2 3 4 20. reward teachers who are innovative in their use of technology with additional release time, increased budgetary support, and/or increased public recognition to teachers.
1 2 3 4 21. survey staff members for their technology staff development needs.
1 2 3 4 22. review periodicals, websites, professional publications, and other resources that provide information on research-based technology integration practices.
1 2 3 4 23. provide times in campus or department meetings for teachers to share their experiences with integrating technology with the rest of the staff.
1 2 3 4 24. encourage staff to be innovative in the use of technology as an instructional tool.
1 2 3 4 25. communicate with other campus leaders in or out of my district regarding the integration of technology into the curriculum and instructional practice.
1 2 3 4 26. review lesson plans and/or observe instructional practice specifically to determine the types of technology use and level of technology use for students.
1 2 3 4 27. advocate for teachers to use technology-enhanced, project-based collaborative lessons.
1 2 3 4 28. inform teachers that technology can promote higher order thinking and individualized learning for students.
1 2 3 4 29. review lesson plans and/or use classroom observations to review the implementation of student-centered, individualized learning projects being required by teachers.
1 2 3 4 30. evaluate how campus use of technology encourages higher-order thinking, problem solving, and decision-making skills.
1 2 3 4 31. arrange for training to teachers on higher-order thinking, problem-solving, and decision making skills.
1 2 3 4 32. arrange for technology staff development to teachers.
1 2 3 4 33. use a word processor software program to type correspondence.
1 2 3 4 34. use communication technologies (e-mail and school website) with colleagues, staff, parents, students, and others.
1 2 3 4 35. use a computerized student management program (i.e., WinSchool, RSCCC, etc…)
1 2 3 4 36. access the Internet for information from list serves, professional web-sites, or other sites that provide me information on my profession.
1 2 3 4 37. Use a multimedia projector and presentation software for teacher's meetings, staff development, student presentations, and/or parent presentations.
1 2 3 4 38. use the computerized student management, integrated campus wide electronic student gradebook, and/or attendance programs to analyze data.

1 2 3 4 39. report findings from data analysis using campus based technology to the staff.
1 2 3 4 40. inform staff and students of the components of the campus Acceptable Use Policy.
1 2 3 4 41. inform campus staff of hardware and software compatibility issues.
1 2 3 4 42. ensure that all students have equal access to the various technologies of the campus.
1 2 3 4 43. provide staff with information regarding equal access for students regardless of sex, race, economic status, or academic capability.
1 2 3 4 44. enforce the district's acceptable use policy and other policies related to the security, copyright, and technology use.
1 2 3 4 45. review copyright and intellectual property laws with staff.
1 2 3 4 46. provide information regarding the school's Acceptable Use Policy to teachers.

PART III - Complete the following section to provide demographic data on yourself and your current school.

47. In which Education Service Center does your present school reside?

_____ Region 1 (Edinburg)
_____ Region 2 (Corpus Christi)
_____ Region 3 (Victoria)
_____ Region 4 (Houston)
_____ Region 5 (Beaumont)
_____ Region 6 (Huntsville)
_____ Region 7 (Kilgore)
_____ Region 8 (Mt. Pleasant)
_____ Region 9 (Wichita Falls)
_____ Region 10 (Richardson)
_____ Region 11 (Fort Worth)
_____ Region 12 (Waco)
_____ Region 13 (Austin)
_____ Region 14 (Abilene)
_____ Region 15 (San Angelo)
_____ Region 16 (Amarillo)
_____ Region 17 (Lubbock)
_____ Region 18 (Midland)
_____ Region 19 (El Paso)
_____ Region 20 (San Antonio)

48. What University Interscholastic League classification does your present school fall into?

_____ AAAAA _____AAAA _____AAA _____AA _____A

49. Which of the following best represents your experience as a building principal (do not include experience as an assistant principal, director, or central office administrator)?

_____ 1 – 5 years _____6 – 10 years _____11 – 15 years

_____ 16 – 20 years _____ 21 or more years

50. Which of the following best represents your current age?

_____ 35 or younger _____36 – 40 _____41 – 45

_____ 46 – 50 _____51 – 55 _____ 56 or older

51. Which of the following best describes your educational level?

_____ Masters in Educational Administration
_____ Masters in subject area other than Educational Administration
_____ College coursework in addition to that required for Mid-Management Administration certificate
_____ Doctorate

52. What is your gender?

_____ Male _____ Female

53. What is your ethnicity?

_____ American Indian or Alaskan Native
_____ Asian or Pacific Islander
_____ African-American
_____ Hispanic
_____ White
_____ Other

54. Have you participated in the Technology Leadership Academy sponsored by the Texas Association of School Administrators, Texas Tech University and the Texas Business and Education Coalition?

_____ Yes _____ No

PART IV – If you attended the Technology Leadership Academy please answer the following questions in the space provided.

55. How are you implementing the concepts and skills you learned during the Technology Leadership Academy?

56. Of the concepts and skills that you learned or improved upon during the Technology Leadership Academy, which ones have been most beneficial?

57. What supports have you taken advantage of that have helped you implement the training you received in the Technology Leadership Academy?

58. What challenges have you had as you have attempted to provide technology leadership on your campus?

APPENDIX B: RESPONSES TO OPEN ENDED QUESTIONS

55. How are you implementing the concepts and skills you learned during the Technology Leadership Academy?

- By using the knowledge I gained to make appropriate decisions on the purchase of new technology
- We began the year with staff development (3 days) and gave release during the year by applying for a waiver.
- more use of vtechnology in communication
- Working on comprehensive technology integration plan into our H. S.
- Incorporating the use of technology in the daily functions of our staff and students. I am still learning at a snails pace about technology.
- Each teacher has a website. Each teacher can be e-mailed. PowerPoint presentations are now common place on campus. We use internet access to WebCCAT, Region service center, etc.
- By modeling the use of technology for my teachers and insisting that it be used in the classroom on a regular basis.
- providing direct prof. development to teachers using skills I learned in the academy
- We are doing more projects that include technology in the classroom.
- Leading by example
- My school is currently developing a technology plan for the next five years. I also am suing the information learned for presentations and meetings. I utilize the websites that were shared to improve data-driven decisions.
- Demonstrating and training my staff
- I don't think that the Technology Leadership Academy was very good. It did expose me to some additional websites, but I thought that overall the training was wasteful of my time and energy. There were several colleagues that went to the academy and I don't know one person that thought it was useful.
- Campus and district improvement plan

Integration of technology into instructional program

- Modeling use of technology. Providing access to technology.
- I use technology in my presentations to teachers and other staff members in our school. I also use technology when I use presentations to the school the school. I encourage all teachers to move toward the integration of technology in their classroom.
- Each teacher completed the TAGLIT last year. I now provide more PowerPoint presentations for parents and teachers. I have asked more of the teachers regarding technology integration into daily lessons.
- Using skills to produce power point presentations, web page development, etc.
- I try to send as many teachers as I can to anything that has to do with technology. We have allocated time and money for this staff development.
- By using power point presentation
- The simple fact that I have a growth plan is a reminder that I need to keep improving. Many of the skills taught were already in place.
- More concentration on the integration of technology in all classrooms and subject areas as a supplement to instruction.

- I integrate technology into almost every faculty meeting and expect teachers to integrate at every opportunity.
- Leading by example....increasing amount of funds allocated for technology…actively involved in district plan
- Implemented two wireless labs into our campuses. Received an Intel Teach to the Future grant and trained all teaching staff in the same type skills and concepts learned in the Technology Leadership Academy.
- PowerPoint presentations to various groups.
- Main use is with "Power Point" presentations.
- I was not able to finish the Academy but I have used what I learned to assist my teachers in integrating technology into their instructional practices.
- Power point in presentations, searches for data
- I use power point regularly in staff meetings and in staff developments that I provide. I use email consistently and communicate with out paper with the staff.
- All of my faculty presentations are done with PowerPoint. I use my lab-top to take minutes at all meetings and use a PALM data organizer to keep all my appointments.
- some skills
- Memos to all staff via e-mail, power point, spreadsheet with graphs, charts, etc to share TAKS, ACT, SAT, AP student data during staff inservice and faculty meetings. clip art and pictures to enhance memos and e-mails to staff, print certificates for student and staff commendations.
- I currently use numerous spreadsheet applications.
- The range of computer use was enhanced to where I am able to be more computer competent.

56. Of the concepts and skills that you learned or improved upon during the Technology Leadership Academy, which ones have been most beneficial?

- Use and benefits of software.
- The most significant to me was the process of teaching teachers.
- power point
- Utilization of wireless technology.
- We had a session on excel that helped me a great deal along with the website information.
- Preparing a Power Point presentation
- Presentation software.
- The use of web based information as an instructional tool. example: web quests
- Overall the sessions were just review.
- Using Inspiration
- Using the internet to derive data for decisions.
- Curriculum development
- See above.
- Curricular integration
- Better understanding of technology.
- I use power point presentations most often in my presentations to the board and staff. My communication with district personnel has improved through my continuous use of e-mail.

- The personal skills I gained with using the laptop computer and the monitoring of technology usage with all students at the school.
- Web page development
- The concept that everyone can use technology.
- using internet access for educational purposes
- Probably the file management techniques.
- Better command of the technology that I use daily.
- Power Pt. Presentations.
- Power Point - the TAGLIT survey results are used to plan tech training
- PowerPoint
- Wireless lab concept.
- I was already familiar with most of this...it was primarily a review and some updating.
- "Power Point"
- Learning to share information electronically within and outside the district and to tap resources better.
- Power point
- Power Point
- Us of the projection machines and use of power point
- PowerPoint and the use of graphs and charts.
- Overall knowledge
- spreadsheet and PowerPoint with music
- Spreadsheet Applications
- E-mail and computer presentations

57. What supports have you taken advantage of that have helped you implement the training you received in the Technology Leadership Academy?

- The Online forum
- personal
- None
- N/A
- TAGLIT and STAR chart information was/is used to encourage progressive thinking in staff/faculty
- laptop computer
- Mainly the web addresses that were provided and the computer and software (which I am using to reply to this).
- Region Center
- See above.
- LiTo training
- I have relied on our technologist on campus to guide me in the using technology for school use.
- Not sure I understand this question.
- Staff development dates
- NA
- None that I can think of at this time.

- Continued staff development in the use of Technology.
- Web based information and list-serves
- none
- ?
- None
- None, as of yet.
- District support from superintendent and technology director
- none
- None, because I do not recall them. Sorry!
- I use our district technician to support my training.

58. What challenges have you had as you have attempted to provide technology leadership on your campus?

- Reluctant teachers.
- Time
- unwilling to change
- financial restraints and differing visions for the future direction of our district technology.
- Equipment malfunction. Lack on technology experience.
- Convincing staff that they can be computer literate!
- Funding and availability of technology to use.
- "teaching old dogs, new tricks" i.e. reluctance from veteran teachers
- Attempting to bring the more experienced teachers on board on the issue of using technology in the classroom.
- district level control
- Finding funding for new technology in the school. State and federal funds are diminishing, as are grant opportunities for small districts.
- Technology support
- Budget
- Providing for proper support via qualified staff. Difficult to manage technophobes and cutting edge users simultaneously.
- The biggest challenge has been support. With all of the various technology needs, it stresses any technology department. Also, technical support from providers is usually lacking.
- Available funds for technology
- Getting past security measures to make the technology usable.
- I suppose that finding the time to dedicate to improving my implementation of technology in my daily routine has been most difficult.
- Funding necessary for more computers.
- Time constraints
- The old dog did not want to learn a new trick.
- Getting enough money for updated technology such as computers, programs and the like.
- Lack of most current hardware/software.
- $$$$
- Lack of technology support.

- Budget
- equipment - of course - as well as keeping the old equipment maintained and running
- time factor....anything of quality requires time to research, implement and revise....especially difficult to find time to analyze all the software available, specifically those associated with TAKS remediation.
- I still have teachers not using computers or other technologies to the degree I would like them to.
- Financial constraints
- Time constraints for staff development
- Lack of a district-wide vision or plan for technology implementation
- Budget restraints. Need to upgrade computers and purchase software
- Getting teachers to use technology without fearing it or fearing that they can harm the hardware by making mistakes. They are inherently reluctant to use technology although I have noticed that younger generation teachers are much more comfortable with it.
- funding for computers
- Keeping up with the upgrades in software and hardware. Not enough money.
- Teachers who do not believe that computers are the way of the future.
- My biggest challenge is that our district does not have a technology plan! We appear to run by the "seat of our pants." In my campus alone, I have 65 class rooms with NO computers at all! Budgets are very tight and it doesn't appear that we will be getting any more computers soon. All the administrators and central office personnel have current or up-dated computers and we have three computer labs in our building for students to use, but we do not have computers in teacher's classrooms for grade entry, internet use, attendance, etc....
- funding
- budget
- Keeping up with the new methods.
- None--Everyone is eager to forge ahead in improving their skills.

APPENDIX C: ONLINE SURVEY HOME PAGE

Welcome!

Thank you for agreeing to participate in
A Study of the Technology Leadership of Texas' High School Principals

I am completing my requirements for a doctorate in Educational Administration through the University of North Texas. The final project towards this milestone is the completion of a dissertation. My dissertation is entitled, "A Study of the Technology Leadership of Texas' High School Principals". To complete this study I am distributing this survey to group of 300 randomly assigned high school principals throughout Texas.

The survey uses the National Educational Technology Standards for Administrators (NETS*A) as a framework for the questions. I am measuring the extent to which Texas high school principals practice those activities advocated by the NETS*A standards. In addition, the study will evaluate if there are any significant differences between responses of principals who have competed the TASA's Technology Leadership Academy with responses from principals who have not been able to participate in this training.

By completing this survey instrument, you are voluntarily consenting to participate in this study. Survey responses are confidential - your individual response will not be publicized in any manner. Your identification information will be used only to track the return of survey instruments. After receipt of all survey documents, the campus identification numbers used to track the surveys will be destroyed. Your participation is voluntary and there are no detrimental consequences for choosing not to participate. Furthermore, you may choose to discontinue your participation in this study at any time.

The results of this study will be especially valuable to practicing principals and schools of education. The results from the study will become available January 2004. If you have any questions or comments, or would like to request a summary of results you may either e-mail me at ajseay@ipcisd.net or by phone at (940) 592-4503. Dr. Jane Huffman is the chairperson of my dissertation committee and can be contacted at jhuffman@unt.edu or at (940) 565-2832.

This project has been reviewed and approved by the University of North Texas Institutional Review Board for the Protection of Human Subjects (940-565-3940).

Go to Survey

APPENDIX D: ONLINE SURVEY

Technology Leadership of Texas' High School Principals

ID Information: Please provide the following identification information. Your identification information will be used only to track the return of survey instruments. After receipt of all survey documents, all identification information used to track the surveys will be destroyed.

Name:

School District:

Campus:

Yes/No Questions

Yes☐ No☐ 1. Our campus improvement plan includes provisions for integrating technology into instructional practice.

Yes☐ No☐ 2. Our campus has a technology committee that meets regularly.

Yes☐ No☐ 3. I have reviewed inventories of our campus's technology at least once this school year.

Yes☐ No☐ 4. I have led my campus in creating a written vision for the integration of technology into classroom instruction.

Yes☐ No☐ 5. I require all teachers on my campus to use technology in their classroom instruction.

Yes☐ No☐ 6. I have provided my staff with professional development in integrating technology into instruction this school year.

Yes☐ No☐ 7. My campus has in place at least one of the following:

- Teachers write individual professional growth plans that include at least one target are tied to improving the use of technology in instruction.

- Teacher study groups that meet regularly to discuss various aspects of classroom instruction, including the use of technology in classroom instruction.

- Curriculum teams that develop standards-based lesson plans and/or curriculum documents that encourage or require the use of technology in the classroom.

Yes☐ No☐ 8. I have participated in technology professional development during the last year.

Yes☐ No☐ 9. My campus has an Acceptable Use Policy for technology use of which each staff member is aware.

Yes☉ No○ 10. My campus has at least one person on campus identified as the technology support staff member.

Yes☉ No○ 11. My school participates in a campus or district based technology replacement plan.

Yes☉ No○ 12. My school has evaluated our campus technology use and/or resources through an accepted formal evaluation process. (i.e., StAR Chart,Technology Integration Progress Guide from SEIRTEC, or PCC Assessment Tool from the Milken Family Foundation)

Yes☉ No○ 13. Most of the teachers in my building have taken a formal assessment of their technology competencies (i.e., TAGLIT, PCC Assessment Tool from the Milken Foundation).

Yes☉ No○ 14. I have reviewed an inventory of campus software licenses at least once during the last school year.

Yes☉ No○ 15. My campus provides filtering for Internet access.

Yes☉ No○ 16. I purchase ergonomically appropriate furniture for technology labs and technology stations within individual classrooms.

Yes☉ No○ 17. I allocate additional campus budget money for technology in addition to the state technology fund and any district-wide technology budget.

Likert Scale Questions - Please select one answer from the drop down menu.

18. As principal of my high school, I provide time in campus meetings to communicate and/or develop a campus wide vision for the use of technology in my school. Never

19. As principal of my high school, I review and modify my campus technology improvement plan. Never

20. As principal of my high school, I reward teachers who are innovative in their use of technology with additional release time, increased budgetary support, and/or increased public recognition to teachers. Never

21. As principal of my high school, I survey staff members for their technology staff development needs. Never

22. As principal of my high school, I review periodicals, websites, professional publications, and other resources that provide information on research-based technology integration practices.
Never

23. As principal of my high school, I provide times in campus or department meetings for teachers to share their experiences with integrating technology with the rest of the staff.
Never

24. As principal of my high school, I encourage staff to be innovative in the use of technology as an instructional tool. Never

25. As principal of my high school, I communicate with other campus leaders in or out of my district regarding the integration of technology into the curriculum and instructional practice.
Never

26. As principal of my high school, I review lesson plans and/or observe instructional practice specifically to determine the types of technology use and level of technology use for students.
Never

27. As principal of my high school, I advocate for teachers to use technology-enhanced, project-based collaborative lessons. Never

28. As principal of my high school, I inform teachers that technology can promote higher order thinking and individualized learning for students. Never

29. As principal of my high school, I review lesson plans and/or use classroom observations to review the implementation of student-centered, individualized learning projects being required by teachers. Never

30. As principal of my high school, I evaluate how campus use of technology encourages higher-order thinking, problem solving, and decision-making skills. Never

31. As principal of my high school, I arrange for training to teachers on higher-order thinking, problem-solving, and decision making skills. Never

32. As principal of my high school, I arrange for technology staff development to teachers.
Never

33. As principal of my high school, I use a word processor software program to type correspondance. Never

34. As principal of my high school, I use communication technologies (e-mail and school website) with colleagues, staff, parents, students, and others. Never

35. As principal of my high school, I use a computerized student management program (i.e., WinSchool, RSCCC, etc…) Never

36. As principal of my high school, I access the Internet for information from list serves, professional web-sites, or other sites that provide me information on my profession.
Never

37. As principal of my high school, I use a multimedia projector and presentation software for teacher's meetings, staff development, student presentations, and/or parent presentations.
Never

38. As principal of my high school, I use the computerized student management, integrated student gradebook, and/or attendance programs to analyze data. Never

39. As principal of my high school, I report findings from data analysis using campus based technology to the staff. Never

40. As principal of my high school, I inform staff and students of the components of the campus Acceptable Use Policy. Never

41. As principal of my high school, I inform campus staff of hardware and software compatibility issues. Never

42. As principal of my high school, I ensure that all students have equal access to the various technologies of the campus. Never

43. As principal of my high school, I provide staff with information regarding equal access for students regardless of sex, race, economic status, or academic capability. Never

44. As principal of my high school, I enforce the district's acceptable use policy and other policies related to the security, copyright, and technology use. Never

45. As principal of my high school, I review copyright and intellectual property laws with staff.
Never

46. As principal of my high school, I provide information regarding the school's Acceptable Use Policy to teachers. Never

Demographic Data - Please select one answer from the drop down menu.

47. In which Education Service Center does your present school reside? Region I

48. What University Interscholastic League classification does your present school fall into?
A

49. Which of the following best represents your experience as a building principal (do not include experience as an assistant principal, director, or central office administrator)?

0 - 5 years

50. Which of the following best represents your current age? 35 or younger

51. Which of the following best describes your educational level?

Masters in Educational Administration

52. What is your gender? Male

53. What is your ethnicity? American Indian or Alaskan Native

54. Have you participated in the Technology Leadership Academy sponsored by the Texas Association of School Administrators and the Texas Business and Education Coalition?

◉ Yes ○ No

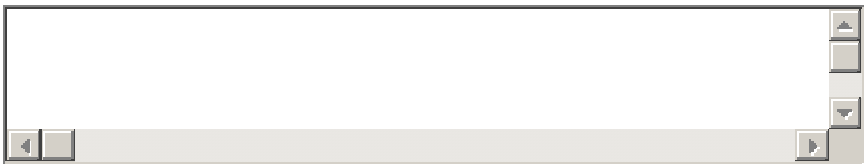
If you answered "Yes" to question 54, please answer the following questions in the space provided.

55. How are you implementing the concepts and skills you learned during the Technology Leadership Academy?

56. Of the concepts and skills that you learned or improved upon during the Technology Leadership Academy, which ones have been most beneficial?

57. What supports have you taken advantage of that have helped you implement the training you received in the Technology Leadership Academy?

58. What challenges have you had as you have attempted to provide technology leadership on your campus?



Submit Reset

APPENDIX E: INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY of NORTH TEXAS

Office of Research Services

August 20, 2003

Alan Seay
Department of Teacher Education and Administration
University of North Texas

RE: Human Subjects Application No. 03-049

Dear Mr. Seay,

Your proposal titled "A Study of the Perceptions of Texas High School Principals on Their Role as Technology Leader" has been approved by the Institutional Review Board and is exempt from further review under 45 CFR 46.101. **Federal policy 45 CFR 46.109(e) stipulates that IRB approval is for one year only.**

Enclosed is the consent document with stamped IRB approval. Please copy and **use this form only** for your study subjects.

U.S. Department of Health and Human Services regulations require that you submit annual and terminal progress reports to the UNT Institutional Review Board. Further, the UNT IRB must re-review this project annually and/or prior to any modifications you make in the approved project. Please contact me if you wish to make such changes or need additional information.

Sincerely,

Marcia J. Staff

Marcia J. Staff,
Chair
Institutional Review Board

MS:sb

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