EFFECTS OF LTTA TECHNOLOGY TRAINING ON THE PERCEPTIONS OF NEBRASKA SCHOOL PRINCIPALS ABOUT THEIR ABILITY TO SATISFY TECHNOLOGY SKILLS AND NATIONAL TEACHER AND ADMINISTRATOR STANDARDS

By

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University of Nebraska, 2003

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With the daunting task of integrating technology skills into education, administrators are asking for guidance in using educational technology. The Bill and Melinda Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology, "Leadership Talks for Technology Administrators" (LTTA), was accepted and funded in the summer of 2001. The grant's main purpose was to provide professional development in technology use for Nebraska administrators.

The specific purpose of this study was to find whether there were differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not yet participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

Data were gathered through an on-line survey modified from Pawloski's instrument and an adaptation of the national technology standards for teachers and administrators. The samples for this study were two groups from the Leadership Talks Technology Academy, totaling 335 Nebraska school building principals. The samples included 198 building principals who had received LTTA training and 137 building principals who have applied for but not yet received LTTA training. Two hundred and thirty-one surveys were completed on-line (68%). Statistical tests utilized included descriptive statistics, t-tests, and 2 X 2 ANOVAs.

The findings of this study provide evidence that the perceptions of LTTA participants were significantly more positive than the perceptions of non-participants toward their basic technology skills and abilities to satisfy administrative and teaching technology standards. This study did not find that gender or access to technology significantly influenced the perception of principals in their basic technology skills or abilities to satisfy administrative and teaching technology standards.

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CHAPTER 1

Introduction

Technology in its various forms has become an important presence in the life of everyone, adult or child. Today's student has an increased knowledge of technology and its function in society, and teachers are increasing their use of technology to develop a community of learners. Educational leaders are asked to bridge the gap between teacher and student technology literacy to better prepare tomorrow's citizens. Principals across the country are being asked to infuse technology into every aspect of schooling. With the daunting task of integrating technology skills into education, administrators are asking for guidance in using educational technology.

Several organizations have recently adopted Technology Standards for School Administrators (TSSA), developed in 2001, as guidelines for current and aspiring administrators in the use and infusion of technology into education. The TSSA initiative worked to create a national consensus on what school administrators, including building principals, "should know and be able to do to ensure district wide technology leadership" (Bosco, 2002, p. 54). The standards focus on six areas: Leadership and Vision; Learning and Teaching; Productivity and Professional Practice; Support, Management, and Operations; Assessment and Evaluation; and Social, Legal, and Ethical Issues. Each standard has indicators and specific tasks that are germane to the roles of superintendents, district program directors, and principals. These standards will help shape the role of the principal as an instructional leader in the use of technology (Technology Standards for School Administrators, 2001).

Principals are asked to help teachers design effective learning environments that use technology not for its own sake, but to enhance student learning. In many cases principals must first learn how to use technology themselves before they can help teachers use technology as a tool for learning. It is with this understanding that professional educators from the State of Nebraska undertook the task of training administrators in the uses of technology for educational purposes. The Nebraska Department of Education, in conjunction with the Nebraska Council for School Administrators, submitted a competitive grant proposal to the Bill and Melinda Gates Foundation. The Bill and Melinda Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology, "Leadership Talks for Technology Administrators" (LTTA), was accepted and funded in the summer of 2001. The grant's main purpose was to put technology into the hands of Nebraska administrators and train them how to use technology to help them become better educational leaders.

The intent of the grant was to prepare administrators to become proficient users of technology in the quest for stronger educational leadership. Professional development leaders felt that putting technology into the hands of administrators and instructing them in the many uses of technology was the best means of achieving the goals of the grant. Over one million dollars was to be spent on training approximately 900 administrators across the state of Nebraska in technology education over a 3-year period. But a question remains to be answered: Did the professional development activities in the LTTA training provided to selected Nebraska principals help those principals become better instructional leaders insofar as the use of instructional technology is concerned?

Purpose Statement

The general purpose of this study was to determine, if there was enhancement of administrators' technology skills in support of teaching and learning, as related to national teacher and administrative technology standards, through the professional development training offered by the Bill and Melinda Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology.

The main function of the LTTA grant was to help Nebraska's administrators gain skills and knowledge in the use of technology. The two goals of the LTTA grant were to: 1) enhance administrators' technology leadership skills in support of teaching and learning and data-driven decision-making and 2) create learning environments that empower staff to infuse technology into teaching, learning and assessing student outcomes (Nebraska Department of Education and Nebraska Council of School Administrators, 2001). This study focused on the first half of goal #1, which was the enhancement of administrators' technology skills in support of teaching and learning by surveying LTTA participants and non-participants. The specific purpose of this study was to find whether there were differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not yet participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

Research Questions

The following questions were drawn from the literature and used to guide the study:

1. Are there differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards?
2. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their own technology skills when analyzed by gender?
3. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards when analyzed by gender?
4. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by gender?

5. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their personal technology skills?
6. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards?
7. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards?

Theoretical Framework

Studies have indicated that knowledgeable school administrators contribute significantly to the proper integration of technology (Beach & Vacca, 1985). Like yeast is to flour, professional development is the prime ingredient to provoke and support positive change. Technology training for instructional leaders is vital to the successful infusion of technology into the daily instructional and administrative routine of public schools (Bruder, 1990). Researchers agree that a strong professional development plan is the key to the enhancement of teaching and learning through the use of technology (Brooks-Young, 2002; McKenzie, 2001; Terehoff, 2002). However, the traditional methods of professional development that train adults like students in the classroom do not do enough to ensure technology integration. McKenzie (1998) suggests that professional development for administrators be grounded in the adult learning theory of "andragogy".

Andragogy is a term that is synonymous with adult learning made famous in the late 1960s by Dr. Malcolm Knowles, who developed the theory based on a set of assumptions about how adults learn. Before Knowles, others had laid the groundwork for adult learners needing "special teachers, special methods, and a special philosophy" (Knowles, Holton, & Swanson, 1998, p. 59). Knowles emphasizes that adults are self-directed and expect to take responsibility for decisions.

The andragogy theory is based on the following assumptions about the design of learning: (1) adults need to know why they need to learn something, (2) adults need to learn experientially, (3) adults approach learning as problem-solving, and (4) adults learn best when the topic is of immediate value (Knowles et al., 1998). To put this in practical terms, andragogy means that instruction for adults needs to focus more on the process and less on the content being taught (Fidishum, 2002). Case studies, role-playing, simulations, and self-evaluation are all strategies used in adult professional development.

The professional development used in the LTTA training had a direct link to the adult learning theory. The LTTA trainers used the theory of andragogy while teaching with technology to help all participants retain skills and facilitate the implementation of educational technology back in their district/building. They built in case studies, simulations, and self-evaluations within the training that focused less on specific skills and more on the process of educational technology.

Assumption

This study attempted to control both internal and external variables. First, it must be assumed that there is a need to measure the technology skills of administrators and its relationship to building integration or infusion of technology into the classroom. A survey was used to assess building level principals' attitudes and competencies of LTTA year 1 participants and LTTA year 3 participants (non-participants) who are awaiting training. It should be assumed that respondents would be honest in their self-reporting of technology competencies.

Respondents in the category of LTTA participants were surveyed within a year of their last professional development activity. Therefore, the chance of them remembering topics and specific skills within survey questions was probably lessened. Respondents in the category of LTTA non-participants were surveyed prior to any LTTA professional development activity. Therefore, the chance of them having specific knowledge of topics and specific skills within survey questions was lessened. Finally, respondents may have tended to think they have a lower or higher level of skill than they actually possessed; therefore, self-reporting could affect the outcome of the study. It is assumed if administrators believed they had a lower or higher level of skill this would probably be reported consistently.

Delimitations of the Study

The subjects selected to participate in this study were drawn from building principals who participated in the LTTA professional development activities in the 2001-02 school year, and building principals who are awaiting participation in LTTA professional development activities for the 2003-04 school year.

Participants of this study were asked to self-report their perceptions regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

The design for the study was a quasi-experimental/static group comparison. In this kind of a study, two treatment groups are administered a posttest but not a pretest, and the subjects are not randomly assigned.

Limitations of the Study

One limitation of this study was that participants were only representative of building principals employed in the state of Nebraska who were trained, or are awaiting training, in the use of technology through the LTTA grant professional development activities. Participation in the LTTA training was voluntary and it can be assumed that the participants had an interest in gaining new technology skills. Therefore, this study should be considered exploratory.

A second limitation of the study was the reliance on respondents' self-reported attitudinal data. Every attempt was made to guarantee anonymity of the respondents to encourage honest, open responses. However, responses may still have been shaded by respondents' desire to provide socially desired answers (Watkins & Cheung, 1995). Results may have been further influenced by response consistency, a problem commonly encountered in survey research (Carlson, 1999).

A third limitation was that the survey instrument used was web-based, which had the potential to eliminate building principals who had limited knowledge regarding the use of a web-browser.

The study was subject to those weaknesses inherent in a quasi-experimental/static group comparison design, such as the lack of a pretest to determine skills and attitudes prior to treatment and control over nonequivalent control groups.

Definition of Terms

Instructional Technology: Instruction using technological developments, such as computers, audiovisual equipment, and mass media to aid in teaching all subjects concerned with creating the optimum teaching and learning environment through the use of technology. The term instructional technology is interchangeable with educational technology (Dugger, 1999; Newberry, 1999).

LTTA Grant: Leadership Talks for Technology Administrators Grant, sponsored by the Bill and Melinda Gates Foundation.

NETS*A: National Educational Technology Standards for Administrators.

NETS*T: National Educational Technology Standards for Teachers.

TSSA: Technology Standards for School Administrators

Technology Education: Subject or curriculum designed to develop technology literacy through the study of and about technology (Dugger, 1999; Newberry, 1999).

Building Principal: A school administrator – in either a public or private school – who is seen as the chief administrator at the school level and/or as the official leader of a school in charge of daily operations of the building, instructional leadership (including supervision of certified instructional staff), and community relations.

Access to technology: The ratio of computers to students within the school building. This could include connectivity, or the availability of an individual computer to the World Wide Web.

Significance of the Study

Contributions to research. Because the technology standards for school administrators are relatively new, there is little literature available regarding professional development for administrators using national standards in a colleague training design. This study will also contribute to the research literature on principals' attitudes toward their ability to satisfy administrator technology standards, and the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

Contributions to practice. This study should begin to answer some of the questions that educators have concerning the relationships between building principals' 1) gender and 2) their access to technology and the effect these variables have on building principals' attitudes toward personal technology skills and satisfying national standards in technology. This study should stimulate researchers to further investigate the problem of providing meaningful professional development opportunities to building principals in instructional technology for student achievement.

Higher education is sometimes slow in identifying needs within the education profession for which it is training undergraduate or graduate students to practice. Prior to the LTTA training, very few administrators received any formal training in the use of technology for the purpose of enhancing education in the classroom. Institutions involved in the training of aspiring school administrators could use the findings in this body of research to better prepare educators for leadership positions in school administration.

Outline of the Study

Chapter Two presents a review of the literature relative to the principal's role in instructional technology. Chapter Three describes the research design of the survey study and describes the methodology and procedures that were used to gather and analyze the data for the study. Chapter Four presents the research findings and analyses that emerged from the study. Chapter Five contains a summary of the study and findings, conclusions drawn from the findings, and implications.

CHAPTER 2

Review of the Literature

This chapter provides a review of the literature focusing on the synthesis of reports and journal articles on successful integration of technology into the classroom. The following narrative provides highlights of the review related to the state of technology in Prekindergarten-12 education, the role of a building principal in integrating technology into the classroom, the State of Nebraska's efforts to train administrators in the use of technology in education, the national standards for administrators in the use of technology in education, and the effects that gender and access to technology have been found to have on perceptions about educational technology.

Technology in Education

As we begin the 21st century, educators and administrators are challenged to address issues, such as financial burdens and increasing teacher proficiencies, while at the same time deal with teacher shortages, demands for accountability, proof of student achievement, aging facilities, and greater demands to produce a qualified and sophisticated work force. In addition, the rhetoric coming from a variety of sources suggests that education needs to improve its product to create a person that is more competitive in today's work place (Hurd, 2000; Kongshem, 2002; Lowe, 2002). With all this in mind, education has turned to technology for help.

To participate fully in today's workforce and enjoy the new innovative leisure activities, students need to study technology thoroughly (Newberry, 1999). So that students learn to use technology to be productive citizens, education must harness the many powers of technology to improve instruction and create relevant learning environments (Kongshem, 2002). The power of technology as it relates to cross-curricular integration of a student's knowledge base is tremendous. The need to add more problem solving, creative thinking, and cooperative learning into today's educational activities is a challenge that can, in part, be met through the integration of technology into the instructional process.

Educators recognize that students in the information age need to understand more than the traditional kinds of surface, technical, or scholastic knowledge that adequately prepared children for success in the past (Fulton, 1998). Society is demanding that schools not only raise student scores on traditional assessment measures, but also prepare students with higher-order thinking and communication skills to function in the 21st century (International Society for Technology Education (ISTE), 1998, 2000). It is suggested that technology is already fundamentally changing education, regardless of educators' readiness for change (Shank, 2000). Educators are finding technology to be an effective tool for promoting students' intellectual problem-solving skills. However, technology in itself is not the answer to meet these demands. Instructors examining models of best practice that utilize technology are still responsible for determining educational validity. Educators must seek to interweave technology in and around education. Educational technology concentrates on creating the optimum teaching and learning environment through the use of technology (Newberry, 1999).

Technology use and student achievement. Educational technology goes beyond using educational games or accessing computers for a reward. It involves reviewing, selecting, and evaluating the appropriate resources for the curriculum to support the learning objectives. There is research to suggest that with the proper equipment, time for professional development and correct instructional methodology, technology can improve student learning (Apple Corporation, 2002). By engaging students in learning through the use of technology, students spend more time learning and practicing the basic tasks than students who approach the same tasks in a traditional paper-and-pencil manner (Sandholtz, 1997). Even at-risk students have shown gains when technology is introduced into their curriculum. Experts believe the reason for this is that technology provides educators with a way to individualize and customize the curriculum to match learners' developmental needs, and provides a non-threatening and motivating environment for repetitious learning tasks (Sinatra, Beaudry, Pizzo, & Geisert, 1994).

The inclusion of technology in the classroom has been found to create improvements in student achievement on standardized test scores as well. The Missouri Department of Secondary and Elementary Education created a program called "enhancing Missouri's Instructional Network Teaching Strategies," or eMINTS for short. Fourth-grade students who participated in Missouri's eMINTS project (a program that incorporated a wide range of multimedia and computer technologies) consistently scored 10 to 13 points higher on Missouri Assessment Program (MAP) tests than non-eMINTS students. Special education and Title I students enrolled in eMINTS classes scored 10.1 points higher on MAP tests than their non-eMINTS counterparts (eMINTS Team Policy Brief, 2002).

Kulik and Kulik (1991) conducted comprehensive studies on the effectiveness of using computers to increase student achievement. In 81% of the studies examined, the students in the computer-based instruction (CBI) classes had higher norm-referenced achievement test scores than students who were taught by traditional methods without computer technology (control group). The typical student in an average CBI class performed at the 62nd percentile on achievement exams; the average student in a traditionally taught class performed at the 50th percentile on the same exam. Kulik (1994) found that software classified as drill-and-practice significantly improved achievement test scores.

In addition, an 8 year study of Scholastic Aptitude Test I performance-involving students at Brewster Academy showed that students who regularly used laptop computers increased their combined SAT performance by an average of more than 90 points. In the period from 1996 to 2000, the number of high schools where laptops have replaced the computer lab rose to more than 500 nationwide (Thomas, 1998).

The research suggests that computer-based technology could enhance learning and increase students' motivation to learn. In a study that examined the impact of technology on student learning, Statham and Torell (1996) found increases in teacher-student interaction, in cooperative learning, and, most important, in problem solving and inquiry. Technology tools can amplify, extend, and enhance human cognition. They can facilitate access to human, material, and technological resources and help students to store, reshape, and analyze information (Jonassen & Reeves, 1996). Research studies that focused on technology and students' motivation to learn using self-reports of students' attitudes toward computers found, in general, that most students considered computer activities to be highly motivating and interesting (e.g., Gregoire, Bracewell, & Laferriere, 1996; Heidmann, Waldman, & Moretti, 1996; Kendall & Broihier, 1992).

Defining educational technology. Before moving on to the literature more specifically related to instructional technology, it is important to point out some terminology related to this topic. The term instructional technology can be titled several things, such as educational technology, computer technology, and information technology (Newberry, 1999). Technology education is different from educational technology, also called instructional technology. Technology education's main focus is to "develop technological literacy in all students through the study of and about technology" (Newberry, 1999, p. 49). Educational technology involves "using technological developments, such as computers, audiovisual equipment, and mass media to aid in teaching all subjects – is concerned with creating the optimum teaching and learning environment through the use of technology" (Dugger, 1999, p. 58). Other differences are that technology education teaches about technology, whereas educational technology teaches with technology. Although the study of technology literacy is important, the rest of the literature will focus on educational technology.

There are several pedagogical or methodological terms that are used with instructional technology. Student-centered classrooms, problem-based learning, service learning, experiential learning, and constructivism are just a few terms used for this new methodology. Whatever the term, most teachers understand that an effective way to teach is to make knowledge meaningful and relevant (Guild, 1997; McKeown & Beck, 1999). When students believe that the information they are learning is authentic and within their control, they become empowered learners, responsible for their own goals and motivated to identity connections between concepts (Slavkin, 2002).

Instructional technology. Technology has its place in education. With the increase use of technology in all other aspects of life, students need to utilize it in school. Custer writes,

> Today's students are products of an entertainment-intensive and stimulation-rich culture. Unfortunately, many educational experiences pale by comparison. While it is unfair and perhaps even unwise to expect teachers and schools to "entertain" students, it is nevertheless important to attempt to make meaningful connections with the kinds of experiences and activities that engage and capture students' interest. For many students, technological design and problem solving activities serve this purpose. (Custer, 1999, p. 32)

Technology is a simple necessity for living in today's world. Technology has become an important presence in the life of every citizen.

The innovative use of technology is included in the national standards of many disciplines. For example, the National Council of Teachers of Mathematics (2000) have incorporated technology within their standards because they feel that technology allows students to analyze the mathematical relationships more deeply with the ease of manipulating the environment and observing the changes that occur. The American Association for the Advancement of Science (2002) considers technology as a separate topic, with its own standards and specific curriculum.

In the state of Nebraska, where standards have been adopted for key curriculum areas (reading/writing, math, science, and social science) educational technology is mentioned in each of the core subjects. For example, within the preface of the documentation for the mathematics standards, the Nebraska Department of Education states, "Graphing utilities, spreadsheets, calculators, computers, and other forms of technology allow all students to succeed. Technology must be an integral part of teaching and learning" (Nebraska Department of Education, 2002, p. 29). Statements similar to this suggesting that technology be an "integral part" of the curriculum and included in the standards language can be found in many standard's documents (Brooks-Young, 2002; Technology Standards for School Administrators, 2001).

Good instructional technology practices. Even though technology in itself has provided new equipment and software for improvements in management and teaching, and educational technology has provided several new methods to help students learn, one must remember that the teacher is the single most influential factor in the success of a student in the classroom (Moran, 2001; TSSA, 2001; Warger, 1990).

Many technological solutions are available today, but their success still depends on classroom teachers and how they use the technologies to solve real classroom problems (Barbour, 1989). Research suggests information on how students learn that helps promote new methods of instruction. Evolving research on the understanding of the brain suggests that simply applying the traditional approaches to instruction will not be enough to raise student achievement levels to today's public satisfaction (Sousa, 1998). Technology itself does not dramatically affect gains in student achievement, however, there are gains in efficiencies and productivity that can allow a teacher to cover material in a different manner, thus producing opportunities for better instruction (McKeown & Beck, 1999).

Traditional methods for student learning centered on rote memory, in which children memorized predetermined facts presented by their teachers in specific subjects within the classroom. Children of the 21st century need opportunities to learn at deeper levels. Research in student learning has led to new instructional models that involve a number of features: active engagement, real-life tasks, communication, collaborative problem solving, critical thinking and independent exploration (Johnson & Cooley, 2001). New learning models, such as problem-based learning and constructivism, are aided by the use of technology (Dede, 1995; Stover, 1998). Students in technology-supported classrooms have powerful tools to help them gather information, consult with colleagues, and present their findings. Technology, fused into new learning models, can improve student achievement.

Defining the Role of a Principal in Instructional Technology

History of technology in educational administration. The review of literature suggests that the first uses of technology in educational administration date back to the 1950s. The first limited uses of technology were by large school districts for data-processing operations and by colleges and universities to perform routine business tasks such as accounting, payroll, and financial reporting (Bozeman & Spuck, 1991). In the 1960s, technology in education was confined to such tasks as maintaining district personnel records, inventories, student grades, and scheduling. Administrative technology personnel manning operations from the central office had become trained programmers, data-entry workers, technicians, and computer analysis (Bozeman, Raucher, & Spuck, 1991). Yet, many smaller school districts were still without technology. They simply could not afford the hardware nor support staff that the large mainframe computers of this era required.

In the 1970s, technology was becoming more prevalent in school districts across the nation. "With the combination of more sophisticated users, better understanding of the relationship between information and decision-making, more powerful hardware, and improved software, many school districts began to move forward into the integration stage of computer-assisted school administration development" (Bozeman, et al., 1991, p. 65). Although strides were being made to increase administrative uses of technology in education, most administrators were relegated to communicating their needs to central office personnel.

The invention of microcomputers in the late 1970s brought technology to more individuals. Technology was no longer restricted to large mainframes. Computer manufacturers targeted children, developing hardware and software that could be used for entertainment. Electronic games caught the attention of a new younger generation, while at the same time, advancing and increasing the skills of students coming to school (Picciano, 1998). This wave of interest did not go unnoticed by the computer industry that had begun to market products for school use. Parents and community members began to pressure school districts to purchase technology in hopes of reforming the school systems that were under attack in areas of science, math, and technology (Bozeman & Spuck, 1991).

During the 1980s, schools began to make significant investments in computer technology to address community concerns. According to a poll of 328 district superintendents, assistant superintendents, principals, and their assistants conducted in 1987 regarding the role of technology in school administration, three quarters of those responding personally used a computer, mostly for word processing (Barbour, 1987). The survey also inquired as to what these administrators perceived as the main benefit of computer technology. A little over half of those responding identified "the reduction of paperwork" and "the amount of time it saves over conventional paper-based methods" (p. 19). Thirty percent of the administrators pointed to "the ease with which stored information can be accessed...and arranged," while others touted "the accuracy of the information and reports generated as being particularly valuable" (p. 20).

Administrative technology skills and attitudes. The research of literature on administrative technology usage suggests that today's building principal recognizes the ability of technology to efficiently process information. However, there are a few researchers who believe administrators do not possess the necessary skills to effectively utilize computer technology (Bozeman & Spuck, 1991; Trotter, 1997). The review of literature reveals some suggestions on the necessary skills and administrative perceptions related to administrative expertise.

Survey research by Thomas and Knezek (1991) on the role of technology in restructured schools suggests that the definition of technology competence should include the ability of the administrators to use technology for planning and management, scheduling, communications, forecasting, and inventory control. Kearsley and Lynch (1994) suggest that effective technology leaders ensure equal access and appropriate facilities, establish priorities for usage, provide release time for training, and find funding sources for technology. Regardless of the specific tasks or competencies, it is important for administrators to have some level of expertise in educational technology.

Administrators who effectively implement computer technology also possess certain attitudes or perceptions about computer use. Kearsley and Lynch (1994) suggest that educational leaders who effectively utilize computers hold five general perceptions about computer use. Educational leaders who use technology effectively:

- Believe in the computer's capacity to effect meaningful educational reform.
- Develop and articulate a vision of how technology can help achieve educational goals.
- Believe that data are a valuable decision-making resource
- Believe that computer technology can support communication.
- Believe in their own capability to use the computer to complete required tasks.

This research suggests that administrators' perceptions about educational technology are influenced by their beliefs and attitudes.

Leadership role. Given the high expectations placed on schools and school leaders, the diverse and large number of stakeholders with whom they must work, and the complexity of schooling, serving as a principal is a demanding and stressful role. Defining the role that a building principal plays in infusing technology into the curriculum can be best summed up in one word, "leadership." Several studies suggest that the leadership in a district or building is critical to any technology innovation or integration into the classroom (Byrom & Bingham, 2001; Lashway, 2002; TSSA, 2001).

Instructional leadership has the administrator focusing on such things as teaching and learning, professional development, data-driven decision making, and accountability (Institute for Educational Leadership, 2000). With leadership for student learning as the priority, instructional leadership might simply be described as "anything that leaders do to improve teaching and learning in their schools and districts" (King, 2002, p. 62). Strong educational leaders are the leading learners in their building. They participate in regular professional learning experiences to improve teaching and learning. Effective instructional leaders devote significant time to developing instructional leadership capacity in others within their building. They believe leadership resides with the whole school community, rather than solely with those who hold formal positions of authority (Lambert, 1998). The effective principal who is intent on integrating technology into the classroom should have the characteristics of an instructional leader.

Byrom and Bingham (2001) identified six actions taken by leaders whose schools or districts boast effective technology integration. These leaders:

a. Start with a vision of what technology integration can accomplish and share that vision with other stakeholders.
b. Lead by example through modeling personal use of technology, continued participation in professional development, and articulating how technology can be used to support instruction and assessment.
c. Support the faculty by recognizing their efforts to use technology; creating an environment that rewards taking risks, and attending staff development with the staff.
d. Focus on those initiatives most likely to improve instruction and make certain staff members have the resources they need to succeed.
e. Share leadership roles through committee work and decision-making.
f. Use evaluation to further professional growth through teacher self-assessment instruments and classroom observation protocols that encourage effective use of technology. (Byrom & Bingham, 2001, pp. 4-5).

The first means of incorporating technology as an instructional tool is to have a clear vision of what educational technology can and should do for improving student success. Several sources speak to vision as the first step in having a successful integration of technology into the classroom (Brooks-Young, 2002; Cotton, 1995; TSSA, 2001). Once the vision has been developed and communicated to all stakeholders, the administrator must develop a plan for implementation. Successful districts put student learning at the forefront of their planning, and then they design a technology project that combines the best of staff development practices with curriculum development connectivity (McKenzie, 1998). Byrom's and Bingham's (2001) last key to the effective use of technology for teaching and learning is evaluation. Successful educational leaders recognize that good evaluation can provide data that can be useful for purposes beyond determining a program's effectiveness.

A major challenge in the path of bringing schools into the age of educational technology is the lack of vision on the part of school leaders. Research supports the notion that school administrators are catalysts that shape the vision, set the direction, and model the changes that current educational reform efforts reflect (Fullan, 1991). The school administrator is central to key decisions about technology access and use, especially when those decisions involve changes in the culture of the school. The question remains, what should a profile of an administrator's knowledgeable about technology include? Coughlin and Lemke (1999) suggest that following skills and characteristics:

- Administrators at the building and district level model the effective use of technology in support of learning and administrative functions.
- Administrators are able to initiate and support professional development processes that reflect attention to principles of adult learning.
- Administrators are competent in leading and managing systemic change processes at the classroom, school and/or district levels.
- Administrators maintain a solid knowledge of the applications for technology to students learning (p. 37).

In order for technology to be successfully integrated in the schools, someone must lead the efforts.

As stated earlier, attitudes of technology users are also important. While it has not been proven that students who react positively to using technology as a learning tool will significantly increase their learning, negative student reactions most certainly will impede learning (Apple Corporation, 2002). It is increasingly important for the building principal to assess teachers' attitudes about the use of technology in the classroom. Because attitudes toward technology have been linked to such important outcomes as willingness to undertake development in technology-supported activities, resistance to technology use, and success in using technology in a new context (Keith, 1993), understanding the processes that shape these attitudes is essential to developing a staff that integrates technology for student learning.

The Net Generations of children entering schools today intimidate teachers, especially veteran teachers who have gotten along quite well for years without the help of technology (Johnson & Cooley, 2001). Today's students have more technology skills than that of their teachers, which often results in classroom technology sitting idle because the teacher fears its misuse. The role of the principal is to help teachers with the means to successfully integrate technology into the classroom as a tool for an improvement of instruction.

Professional Development

Technological advances are moving rapidly throughout the country and forcing changes in life, work, and education for which many are unprepared. It is suggested that technology is already fundamentally changing education, regardless of educators' readiness for change (Shank, 2000). If educators are to successfully integrate technology into their instructional practices to improve student achievement, then they should start with the fundamentals (Mitchum, 1994; Newberry, 1999). Professional growth is a key to gains in student achievement through the use of technology.

Studies have indicated that knowledgeable school administrators contribute significantly to the proper integration of technology (Beach & Vacca, 1985; Finkel, 1990). Technology training for instructional leaders is vital to the successful infusion of technology into the daily instructional and administrative routine of public schools (Bruder, 1990). A critical component of principals' professional development is familiarity with technology for both instructional and administrative usage (Beckner, 1990). In a survey of building principals developed by Heaton and Washington (1999) to determine administrative technology competence and a principal's role as a technology leader, half of the respondents ranked personal skills as most important. However, 93% of participants ranked learning to be an instructional leader as either first or second.

Finkel (1990) noted that research recognizes that the administrator holds the key to the long-range success of any technology plan. Schools that were successful in integrating technology and teaching had administrators who were strong users of technology themselves (Wiburg, 1997). In-service education for administrators and support for leadership in technology helps. Bloom (1992) found that administrators who participated in an administrative technology academy sponsored on the state level were significantly more likely to perceive technology as being useful in education and to use it themselves.

Research suggests the key to the enhancement of teaching and learning through the use of technology is a strong professional development plan (Brooks-Young, 2002; McKenzie, 2001; Terehoff, 2002). However, the traditional methods of professional development that train adults like young students in the classroom do not do enough to ensure technology integration. McKenzie (1998) suggests that professional development for administrators should be grounded in adult learning theory. Giving principals a choice in what they learn relevant to job related tasks over a longer period of time increases the chances for successful administrative technology integration.

Leadership by school principals has been described as one of the most important factors affecting the effective use of technology in the classroom. However, many administrators do not currently have the preparation necessary to lead the changes that technology requires (Byrom, 1998). Coughlin and Lemke (1999) suggest that most professional development is skills-based training and is essentially wasted, because it provides little support for educators who need help with integration issues. Technology professional development for administrators needs to elevate to data-driven learning levels in order to fully integrate technology for student achievement. Administrators ultimately make key decisions regarding funding levels for technology, and incentives and rewards for teachers' use of technology. Effective professional development can help them make the best decisions.

Leadership Talks for Technology Administrators Grant

Grant information. Bill Gates, the founder and president of Microsoft, and his wife Melinda have set up a foundation for the funding of professional growth opportunities in several educational venues. One of these opportunities is presented in the form of state challenge grants for leadership development. The foundation recognizes the fundamental role good leaders play in a school's success (Bill and Melinda Gates Foundation, 2002).

The Gates Foundation believes that in effective schools, professional development is used to ensure that teachers are comfortable using technology and that technology is used throughout the curriculum as a means of enhancing learning opportunities. The Nebraska Council for School Administrators (NCSA) participated in a joint venture with the Nebraska Department of Education (NDE) in writing a grant to stimulate technological usage among administrators in Nebraska during the spring of 2001. The NCSA and NDE received official notice that they were the recipients of a Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology in the spring of 2001. They appropriately titled the grant, "Leadership Talks for Technology Administrators" or LTTA (Nebraska Department of Education & Nebraska Council of School Administrators, 2001).

The successful application developed by the Nebraska Department of Education and the Nebraska Council of School Administrators, with support from the Governor's Office, received an award of 1.3 million dollars from the Gates foundation. The grant's main purpose was to put technology into the hands of Nebraska administrators and train them how to use the technology to be better educational leaders. The specific goals of the grant are:

- Enhance administrators' technology leadership skills in support of teaching, learning, and data-driven decision-making.
- Create learning environments that empower staff to infuse technology into teaching, learning, and assessing student outcomes (Nebraska Department of Education & Nebraska Council of School Administrators, 2001, p. 2).

Each participating administrator invests $300 toward the training and administrative cost of the project. The Foundation money of $1500 per administrator funds the Nebraska project with a Palm Pilot and a laptop computer for each administrator. Each administrator had his or her choice of platforms for the laptop. The goal for the project was to have 75% of Nebraska's administrators receive training.

LTTA professional development. The breakdown of Nebraska school administrators who took part in the first year of the LTTA training shows a diverse mix of secondary principals, elementary principals and superintendents who participated in the 5 days of training. The secondary principals were the largest group of administrators represented during the first year of training. They totaled 111, adding middle school, 7-12 high school and 9-12 high school together. The secondary principals represented 38.9% of total participants. Elementary principals were the next highest in number of participants with a total of 103. There were 71 school district superintendents in attendance, representing approximately 25% of the total participants (Leadership Talks Technology Academy, 2002).

The project officially began August 1, 2001, as 285 administrators met in Kearney, Nebraska, for a keynote address from a well-known technology expert and futurist, Alan November. The day also included a hands-on session with their Personal Digital Assistants (PDA) and information concerning TAGLIT (*Taking a Good Look at Instructional Technology)* survey instrument. TAGLIT data, gathered from students, teachers, and technology leaders, provided the administrators with a picture of technology usage in their buildings/districts.

The second phase of training was 2 full days of technology training, working on such topics as Internet research, presentation software data collection, using spreadsheet software, and PDA technology. Upon arrival, each administrator was given a laptop computer of his or her platform choice. The laptop became the primary tool for each administrator's training and personal use. Each laptop was connected to the Internet via a wireless telecommunications card. During the first day of training, administrators were instructed on the use of an instructional methodology of using the Internet to research specific topics and the operation of presentation software. The next day, administrators were instructed on the use of a spreadsheet to manipulate data. The data were then used to create a presentation that could be used in the administrator's home school. The last activity for the second session had the superintendents and principals work with their PDA technology.

During the last 2 days of training, exploration of some of the resources available on the Internet for instructional purposes became a primary focus. This included examination of the Marco Polo and Library of Congress websites, and other digital resources, using iMovie software from Apple or Microsoft Publisher for the DOS platform. Administrators were provided a brief training session on the care of the laptop. An Apple representative shared a glimpse of what the work will look like for today's first graders when they graduate from high school. During the sessions, student mentors gathered to discuss and present their vision of what the schools of today should include to best facilitate their learning. After presenting their findings to the administrators, there was a brief question and answer time for all participants to dialogue on the future of schooling with technology.

The training session was developed around the national technology standards. Great care and consideration were given to each activity to ensure that all of the administrative standards were communicated and addressed.

LTTA survey data. Some interesting information was gathered from a LTTA survey of superintendents and principals after the training was completed and was shared in a communication with all participants (Leadership Talks Technology Academy, 2001). To begin training in the LTTA professional development programs, each participant was asked to complete a pre-skills survey. Of the 285 participants, 186 responded. The survey asked each participant to rate his or her comfort level using basic technology skills on a 4-point Likert scale. The average skill level of participants before the training sessions equaled 2.9. The average skill level of participants after the training sessions using the same survey equaled 3.5. This represents an increase in basic technology skills of LTTA participants of 0.6 on a 4.0-likert scale, or approximately a 15% increase.

Adult learning methodologies. The research on the role of administrator leadership in educational technology focused primarily on technology skills and not on the methods in which the skills were taught or learned (Brooks-Young, 2002; Byrom & Bingham, 2001).

Research related to adult learning suggests that acquiring skills, attitudes and knowledge occurs in a variety of modes (Jarvis, 1987). The four learning methods most commonly recognized are formal, non-formal, informal, and self-directed. The two most commonly used in adult training programs are formal and self-directed. Formal learning was defined as the learner having little control over the objectives and means of learning. The self-directed learning method allows the learner to control both the objectives and the means to learning (Jarvis, 1987; Mocker & Spear, 1992).

According to Krathwohl et al. (1956), an enhanced and sophisticated learning experience, rather than just a simple communication, was required for people to achieve a more complex and higher level of learning in the cognitive domain. They suggested that far more activity and participation by the learner was necessary to achieve higher levels of motivation. Incorporating activities and participation for the learner provided more opportunities for individuals to gain insight into the processes the learner uses. Krathwohl et al. (1956) stated, "Demonstrations of appropriate problem-solving processes are not very effective in bringing about actual problem-solving competence" (p. 77).

For adult learners, learning frequently occurs outside the formal setting. This method of learning was referred to as self-directed learning. "It is now acknowledged that self-directed learning is a common event, and is important to regard education and learning as conceptually distinct phenomena" (Jarvis, 1987, p. 8). The key principles to self-directed learning involve two major decisions about the learning event – what is learned and how it is learned. Self-directed learning was defined as the learner having control over both of these events (Brookfield, 1985).

Another term associated with self-directed learning is "Andragogy." Andragogy is synonymous with adult learning, a term made famous by Dr. Malcolm Knowles in the late 1960s. The andragogy theory is based on a set of assumptions about the design of learning: (1) Adults need to know why they need to learn something; (2) Adults need to learn experientially; (3) Adults approach learning as problem-solving; and (4) Adults learn best when the topic is of immediate value. To put this in practical terms, andragogy means that instruction for adults needs to focus more on the process and less on the content being taught. Case studies, role-playing, simulations, and self-evaluation are all strategies used in the LTTA training that have a direct link to the adult learning theory.

The andragogy theory fits the training process that administrators received through the LTTA grant in several ways. First, Knowles theorized that adults needed to know why they should learn something before they were motivated to learn (Knowles, et al., 1998). Given that district budgets are seeing more in funding going toward educational technology and staff utilizing more technology-based instruction in the classroom, administrators are feeling an immediate need to learn about educational technology. Secondly, adults learn new material when they see a need that will help them with a real life task or problem. Making the training available to administrators who ask for the training suggests the training would be directed toward those who have expressed a need to learn something in order to grow within their profession (Fidishun, 2002). Finally, adults are life-centered or problem-centered in their orientation to learning. They want to see how what they are learning will apply to their life. The use of real-life examples and situations that administrators may encounter in their lives or jobs through the use of technology illustrates this assumption of the needs of an adult learner (Fidishun, 2002). The LTTA trainers used the self-directed learning theory of andragogy while teaching with technology to help all participants retain skills and facilitate the implementation of educational technology back in their district/building.

Standards

Technology standards. Many states have developed technology standards for students and educators. In some states, the standards are embedded in the existing curriculum; in others they stand alone and are taught and assessed separately. Almost all states have addressed the ISTE standards (National Educational Technology Standards for Students - NETS*S, and National Educational Technology Standards for Teachers – NETS*T) in one way or another. The NETS for Students were released in June of 1998, NETS for Teachers in June 2000, and NETS for Administrators in November 2001. At the state level, 43 of the 51 states adopted, adapted, aligned with, or otherwise referenced at least one set of standards in their state technology plans, certification, licensure, curriculum plans, assessment plans, or other official state documents (Brooks-Young, 2002).

Technology standards for students and teachers. The National Educational Technology Standards for Students (NETS*S), developed in 1998, were written as a general set of profiles describing technology-literate students at key developmental points in their pre-college education (Thomas, 1998). They assume technology skills are developed by coordinated activities that support learning throughout a student's education. They represent essential, realistic, and attainable goals for lifelong learning that lead to a productive citizenry. The standards and performance indicators are based on input and feedback from educational technology experts, as well as parents, teachers, and curriculum experts. In addition, they reflect information collected from professional literature and local, state, and national documents (International Society for Technology in Education, 2000).

Building on the NETS for Students, the National Educational Technology Standards for Teachers (NETS*T) define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings (see Appendix A). The six standards areas with performance indicators are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. The National Educational Technology Standards for Teachers, as developed by the International Society for Technology in Education, are as follows:

A. TECHNOLOGY OPERATIONS AND CONCEPTS -Teachers demonstrate a sound understanding of technology operations and concepts.

B. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES - Teachers plan and design effective learning environments and experiences supported by technology.
C. TEACHING, LEARNING, AND THE CURRICULUM - Teachers implement curriculum plans, which include methods and strategies for applying technology to maximize student learning.
D. ASSESSMENT AND EVALUATION - Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.
E. PRODUCTIVITY AND PROFESSIONAL PRACTICE - Teachers use technology to enhance their productivity and professional practice.
F. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES - Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice (International Society for Technology in Education, 2000).

The National Educational Technology Standards for Teachers (NETS*T) originally appeared in 1993 in the form of 13 indicators. These standards have undergone two revisions since that time, most recently in 2000 (International Society for Technology in Education, 2000). Teachers and administrators have different responsibilities and areas of concern, and technology standards that are appropriate for classroom teachers cannot simply be applied to administrative situations as well. An understanding of the need for administrator-specific standards led to the formation of the Technology Standards for School Administrators Collaborative (TSSA) with members representing K-12 education, institutions of higher learning, business, and other professional organizations.

Technology standards for school administrators. A comprehensive set of technology standards for school administrators was issued in November of 2001 by the Collaborative for Technology Standards for School Administrators (TSSA, 2001). The standards and competencies identify what administrators need to know about successful technology integration and advise them on how to prudently and effectively manage technology resources to ensure both efficiency and impact (Bosco, 2002). In order for teachers and students to fully use technology to achieve academic goals, they need the support and vision of tech-savvy administrators.

An underlying assumption of these standards is that administrators should be competent users of information and technology tools common to information-age professionals. The effective 21st century administrator is a hands-on user of technology. Much of the benefit of technology is lost for administrators who rely on an intermediary to do their e-mail, manipulate critical data, or handle other technology tasks for them. While technology empowers administrators by the information it can readily produce and communicate, it exponentially empowers the administrator who masters the tools and processes that allow creative and dynamic management of available information (Brooks-Young, 2002).

The standards are the product of a grassroots process where numerous educators, policy makers, association leaders, and industry representatives provided input. The resulting standards represent a national consensus among educational stakeholders of what best indicates accomplished school leadership for comprehensive and effective use of technology in schools. Bosco (2002), chair of the TSSA project, explained how the standards were developed in an article for Scholastic Administrator. He reported that the TSSA collaborative wanted the standards to reflect the best thinking about what school administrators can do to create an educational environment for learning with technology. He goes on to explain the process for the standards development.

> Over a period of about a year, we conducted several forums in various cities in the U.S. These forums brought together administrators, teachers,

> school board members, higher education faculty in administration and leadership departments, state education department officials, and others to generate the content of the standards. We formed a writing team, which met several times to develop the successive drafts of the document. Each draft was placed on the TSSA Web site, where we received many helpful comments and suggestions. (Bosco, 2002, p. 54)

The first published versions of the standards were formally presented in November of 2001. Thirteen institutions collaborated on this document, including the American Association of School Administrators, the national associations for both elementary and secondary school principals, and the National School Boards Association.

Based upon research, national reports, and collaborators' collective knowledge about the role administrators play in effective technology implementation, the standards are designed to support the fact that there are certain skills all administrators need to have, regardless of their current assignment. The preface of the TSSA technology standard document states that the standards move educators from the acknowledgment of importance in the integration of technology into the classroom to "defining the specifics of what administrators need to know and be able to do in order to discharge their responsibility as leaders in the effective use of technology in our schools" (TSSA, 2001, p. 1). Site-level leaders, district-level leaders, and members of the superintendent's cabinet have different demands placed upon them. These similarities and differences are addressed in the text of the standards, performance indicators, and profiles (TSSA, 2001, p.1).

The standards identify six areas that leaders need to address when integrating technology into education. The Technology Standards for School administrator document includes performance indicators for each standard along with descriptive profiles. (see Appendix B) The standards are:

> •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.
> •Learning and Teaching—Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.
> •Productivity and Professional Practice— Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.
> •Support, Management, and Operations—Educational leaders ensure the integration of technology to support productive systems for learning and administration.
> •Assessment and Evaluation—Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.
> •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 (International Society for Technology in Education, 2000).

The purpose of the Technology Standards for School Administrators (TSSA) is to provide guidelines to assist administrators in school reform, particularly as it relates to technology use (TSSA, 2001). While reference is made to technology integration throughout the standards, the leadership skills described are not necessarily technology specific but identify current expectations for how school administrators need to approach all school reform. The goal of an administrator is to weave technology use into the fabric of the educational program whenever it is appropriate. The standards, when used properly, help administrators avoid the use of technology for the sake of using technology, but rather help the administrator take a balanced approach to its use (Brooks-Young, 2002).

The potential audience for the standards is varied. Dr. Don Knezek, Director of the TSSA Standards Project, identifies "school boards, administrators, human resources staff, professional development staff, higher education personnel, and state education agencies" as potential users of this resource, along with "state and federal policymakers, industry representatives and service providers, professional organizations, parents, tax-payers, and other community constituents." (TSSA, 2001, p. 4)

Gender

Gender gaps in school performance have only begun to receive more attention in scholarly research. Addressing the factors related to gender that are involved in school performance is important to ensure that all students succeed. Gender differences in computer use have been associated with the differential socialization of boys and girls in places such as the home and commercial advertising (Sanders, 1993). Education must do what it can to bring equality to the information technology field.

Sources report differences across gender with regard to use of and comfort with computers. A poll of 1,200 families revealed that before the fourth through seventh grades, girls are on the computer 1 hour more per week than boys (Sadker & Sadker, 1995). Studies show that girls' use of computers tends to decrease starting in the middle school years (Holmes, 1991; Sanders, 1993). After the seventh grade, girls lose ground to boys in terms of hours spent on the computer. By high school, girls are less likely than boys to join computer clubs or take computer courses. Boys are thought to prefer games, and more often than girls, view the computer as a "toy". Girls see the computer as a tool, a machine that can do something useful (Sadker & Sadker, 1995).

Weinman and Haag (1999) report that research has found serious gender-based differences in technology use, and suggests that such differences lead to future economic inequities. They indicate that the number of female high school students enrolled in advanced placement courses in computer science is somewhat static and unchanged over time. While male students typically enroll in computer-based, higher-level mathematics and science courses in high school, female students more often enroll in clerical and data-entry courses.

Research suggests several means in which gender biases can be formed. To start with, teachers and parents assume that girls are not as interested as boys in computers, and therefore encourage them less. There are few adult and peer role models for females to follow. Computers are associated with machines and math, both of which are thought of as male domains. Language arts and humanities classrooms, where teachers tend to be female, do not use computers as frequently as do math and science classrooms. All of these perceptions add to the gender imbalance in computer usage (Holmes, 1991).

A study by the American Association of University Woman Education Foundation Commission on Technology (2000) found similar findings. The report suggests that girls have reservations about the computer culture. They tend to be bored with the violence, redundancy, and tedium of computer games. Girls are concerned that the computer promotes social isolation, and question boys' absorption with computers as a substitute for social skills. For girls, a common point of entry to computer use has been courses on tools such as databases, page layout programs, graphics, on-line publishing, and other productivity software. Mastery of these skills may be useful, but technology literacy requires the ability to apply information technology to solve problems across disciplines and subject areas, to understand basic principles of programming, and to continually adapt and learn new technologies as they emerge in the future. In an earlier study, girls were found less likely to use computers outside of school, and girls from all ethnic groups rated themselves considerably lower than boys on technological ability. Current software products are more likely to reinforce these gender stereotypes than to reduce them (American Association of University Women, 1998).

When boys become men and girls become women, gender bias remains the same as each enter college. Although the majority of students attending college are female, the culture is still strongly influenced by male leaders. For example, four out of five full professors are males, more male professors are awarded tenure that female professors, and earnings favor male professors over female professors (American Association of University Women, 1998). Women, on average, enter computer science programs with less programming experience than men. For example, 38% of first-year college students had self-initiated out-of-school programming experience, while only 10% of women had such experience. Women who have equal the amount of programming experience as men are still likely to encounter gender bias, expressed by comments made by their male counterparts (Mayfield, 2001).

Access to Technology

Technology can be a vital tool in educating students for the 21st century. The next step is to find just how much access to technology that today's teachers and students have for this great learning tool of the future.

Assessing the use of technology in American schools at a certain point in time is not an exact science, because the level of use is constantly changing. Since 1994, the National Center for Education Statistics (NCES) has surveyed public schools to measure how many of them are connected to the Internet. In 1995, there were 5.8 million computers in classrooms, or about 1 for every 9 students (National Center for Education Statistics, 1997). Although these figures show marked improvement from the 1980s, when there was an average of 1 computer for every 30 students, schools were still short of the optimum ratio of 1 computer for every 5 students (National Center for Education Statistics, 1996).

By the fall of 2000, National Center for Education Statistics (2001) reported that almost all public schools (98%) in the United States had access to the Internet. The study goes on to report that there were virtually no differences in school access to the Internet by school characteristics (e.g., poverty level and metropolitan status) in 1999 or 2000. In the same survey, the ratio of students to instructional computers in public schools had decreased to 5 to 1, the ratio that experts considered the optimum ratio of computers to students. The ratio improved from a national average of 6 to 1 in 1999.

Congress has spent billions of dollars over the past several years to connect students and schools to the Internet. The increase in Internet access over the years may have been aided by the allocation of funds through the Education rate (E-rate) program. As of February 28, 2001, $5.8 billion had been committed to E-rate applicants throughout the nation (National Center for Education Statistics, 2001). School districts across the nation are increasing their budget to meet the needs of students in the use of technology

(NCES, 2001 & Rosenthal, 2002). In addition, the President of the United States, George W. Bush, suggested a fiscal budget that increased Information Technology (IT) spending by 15.6% over fiscal 2002. This increase is in sharp contrast to the 1 percent increase in IT spending in 2002 (Frank, 2001).

Summary

As technology continues to have a significant role in schools, it becomes increasingly important for educators to acquire knowledge about its power and capabilities and skill to use its features. Although school administrators are busy people, they are not exempt from knowing about technology's power and capabilities. As instructional leaders, it is important for them to demonstrate understanding and familiarity with the features of technological devices. In the push to integrate technology into education, school administrator's level of expertise and ability to facilitate technology's integration into the curriculum emerges as a key component. Recently, states and educational organizations have accepted technology standards depicting what students, teachers and administrators should know and be able to do (ISTE, 1998, 2000). With all the new technological advances, it is becoming increasingly apparent that administrators must improve their technology skills and related instructional methodologies.

Becoming an effective leader in today's educational environment requires sustained effort on the administrator's 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, and instructional practices. The "Technology Standards for School Administrators" were developed by a group of educational leaders from across the United States (Brooks-Young, 2002). These standards represent a national consensus of the things K-12 school administrators need to know and be able do so they can effectively support technology integration in schools. These standards are being used across the country as the framework for administrators professional development programs.

The State of Nebraska is providing superintendents and principal's professional development training in technology through the Bill and Melinda Gates Foundation Grant. The main goal of the grant was to prepare administrators to become proficient users of technology in the quest for stronger educational leadership. The Nebraska Leadership Talks for Technology Administrator grant has serviced 290 administrators in the 2001-02 school year and will provide professional growth for approximately 600 more administrators by 2005.

There is no longer a question whether technology will play a major role in K-12 education. The question today is whether technology is being used in ways that are likely to lead to optimum results. A decade ago, schools were content to create computer labs and to hire one or more teachers who knew how to use computers. This was an important first step, but is no longer sufficient. Today, teachers must incorporate an element of technology into their instructional practices. Administrators must support sound teaching and learning practices through the use of educational technology to ensure that today's students become tomorrow's leaders.

CHAPTER 3

Methodology

Introduction

The general purpose of this study was to determine, through the use of a survey, if there was enhancement of administrators' technology skills in support of teaching and learning, as related to national teacher and administrative technology standards, through the professional development training offered through the Bill and Melinda Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology.

The main function of the LTTA grant was to help Nebraska's administrators gain skills and knowledge in the use of technology. The two goals of the LTTA grant were to: 1) enhance administrators' technology leadership skills in support of teaching and learning and data-driven decision-making and 2) create learning environments that empower staff to infuse technology into teaching, learning and assessing student outcomes (Nebraska Department of Education and Nebraska Council of School Administrators, 2001). This study focused on the first half of goal #1, which was the enhancement of administrators' technology skills in support of teaching and learning by surveying LTTA participants and non-participants. The specific purpose of this study was to find whether there were differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not yet participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

Research Questions

1. Are there differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards?
2. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their own technology skills when analyzed by gender?
3. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards when analyzed by gender?
4. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by gender?

5. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their personal technology skills?
6. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards?
7. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards?

Research Design

This study used a quasi-experimental design. A quasi-experimental design allows for a predetermined group of subjects to be assigned to experimental and control groups, rather than random assignment of subjects to the experimental and control groups as in a true experimental study (Campbell & Stanley, 1963). Specifically, this study was a static-group comparison design within the quasi-experimental design family. The static-group comparison design, as explained by Borg and Gall (1989), is a type of experiment in which two treatment groups (participants in year one of LTTA training and non-participants) are given a posttest, but not a pretest. In addition, the subjects in the study are not randomly assigned as in a true experimental study; rather, their choosing to participate in the LTTA training predetermines them.

The study used a cross-sectional survey procedure to explore the effects of technological training on principals' attitudes in the use of educational technology in relationship to instructional leadership. The survey was used to quantitatively describe and examine the relationship between those building principals who received training by participating in the LTTA grant and those building principals who have not yet received training through the LTTA grant. The survey was divided into three parts: 1) basic technology skills; 2) principals' perceptions of their ability to satisfy administrator technology standards (which were based upon the National Educational Technology Standards for Administrators (NETS*A)); and 3) principals' perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards (which were based upon the National Educational Technology Standards for Teachers (NETS*T)). Demographic information regarding gender, years of experience in administration, education level, and the school's level of computer access were also collected.

All of the information for this study was collected through a web-based survey. This allowed for rapid collection of sizable amounts of information from a diverse group. A web-based survey has a number of benefits: rapid and automatic entry of data as it is sent to a server; the possibility of reaching respondents who might not be amenable to traditional methods; and the possibility of "real time" data collection reports (Graf, 2001). The design of this study collected data on-line from a targeted population that already had, or will be participating in the LTTA training to use technology for administrative purposes. The data collected are summarized and reported in Chapter 4.

Population and Sample

The populations for this study included approximately 600 Nebraska school administrators who have participated in the LTTA grant training and 300 administrators who have not yet received training, but are enrolled in the grant program. A goal of the LTTA grant was to enhance administrators' technology leadership skills in support of teaching and learning. Participation in the LTTA grant is voluntary and requires 5 days of training. The LTTA participants are comprised of elementary and secondary building principals, and superintendents.

The samples consisted of two groups of Nebraska school administrators: approximately 200 building principals who enrolled and completed the training for the State of Nebraska LTTA Bill and Melinda Gates Foundation Grant from August 2001 to February 2002 and approximately 140 building principals who have registered, but have not yet participated in the State of Nebraska LTTA grant training. The Bill and Melinda Gates Foundation funded the academy with the purpose of training Nebraska school administrators to use technology more effectively. As inferred by the title of the grant, all principals are from the state of Nebraska. Building principals were divided based upon their participation, gender, and access to technology. Both public and nonpublic principals were invited to participate in the training and thus are included in the sample.

Permission to survey the building principals who participated or are awaiting participation in the professional development training for the State of Nebraska LTTA

Bill and Melinda Gates Foundation Grant was obtained from the co-directors and steering committee for the grant.

In reviewing the databases for both year one and year three LTTA participates, it was noted that there were several duplications, position changes, and omissions of information. E-mail and telephone contacts to several questionable participants listed in the original database revealed the following information: (1) of the year one building principals, three had moved to a central office position, two had left the state of Nebraska, and two had left education all together, (2) of the year three building principals, one did not provide an e-mail address, and two were no longer building principals. With all this taken into consideration, the final database consisted of 198 building principals for year one and 137 building principals for year three.

The response rate for building principals who received training by participating in the LTTA grant was 69.7% (138 out of 198). The response rate for building principals who have not yet received training through the LTTA grant was 67.9% (93 out of 137). As a result, 231 of the 335 LTTA building principals that were asked to complete the survey responded, which amounted to a 68.9% return.

<u>Data Collection</u>

This is a convenience sample in that the researcher, as a member of both the Steering and Curriculum Committees of the State of Nebraska LTTA Bill and Melinda Gates Foundation Grant, had access to this population. The co-directors of the Gates Foundation Grant in the course of their communications promoted the completion of the on-line survey with the training participants.

The method chosen to communicate the research study was through all electronic means. E-mail and the Internet were used for all communications and the collection of data. E-mail messages were used to communicate with the sample population, and the survey instrument was posted on an Internet web site for quick and easy access. The survey design, using a multiple five-point Likert scale, provided an easy, logical format for participants to access, complete, and submit the survey within a very short amount of time. By using a survey instrument, results could be used to generalize from a sample of respondents to the total population of building principals in Nebraska.

In January of 2003, approximately 340 building principals were contacted via e-mail message regarding the purpose of the survey (see Appendix C). Approximately 60% of the participants completed the professional development training for the Gates Foundation Grant, while the other 40% are awaiting participation in the LTTA training. The e-mail message covered the basic purpose of the study and included a login and hyperlink for building principals to click on to a link of the formal Institutional Review Board (IRB) cover letter (2003-01-137 EX) that explains in detail the purpose of the study (see Appendix D). Placed within the IRB cover letter was a hyperlink that sent the participants directly to the survey pages on the website. By going to the survey website, the participants acknowledged their willingness to complete the survey instrument.

The login page asked participants to record their initials and last four digits of their school building phone number. The login page was used to maintain anonymity and was completely separate from the on-line survey. Two separate databases were created so that when the respondent entered his or her password, the researcher could keep track of how many people responded. General e-mail reminders were sent to those who had not yet participated. There were two general reminders sent on a weekly basis to those participants who had not yet participated in the survey (see Appendix E and Appendix F). The responses to the survey were stored in a separate database that was not linked to the respondents' password database. The University of Nebraska at Omaha College of Education hosted the survey on their web server. The data collection process took approximately 4 weeks to complete.

Instrumentation

The review of literature revealed several different surveys that have been used to measure technology skills used by administrators (Byrom & Bingham, 2001; Lemke & Coughlin, 1998). The researcher also found surveys that measured the integration of technology into the classroom using national standards for educational technology (Byrom & Bingham, 2001). None of these surveys specifically addressed the purpose of this study.

The first objective of the survey was to collect personal data about the respondents. These general questions consisted mainly of questions about the administrator's personal experience and his or her work setting. Personal demographic data about the respondent's tenure in administration, highest educational degree, and gender were collected. Data were collected about student access to technology and technology professional development opportunities for administrators. The next section of the survey contained the questions pertaining to the building principals' attitudes toward their own technology skills. The third section of the survey asked building principals to rate their attitudes toward their individual ability to satisfy administrator technology standards. The final section of the survey contained the questions pertaining to the ability of a majority of teachers under the building principal's supervision to satisfy teacher technology standards.

The Likert survey that was used in this study is a combination of questions from a previously administered survey, as well as newly developed questions (see Appendix G). Pawloski (2000) completed a previous survey on pre-service teachers. Although that study was of pre-service teachers' perceptions of their abilities in integration of technology within their schools, a number of the questions were applicable, with minor modification, to this study. Survey questions asking participants to rate their ability to satisfy administrator technology standards were constructed using the National Educational Technology Standards for Administrators (NETS*A) as a guide.

The web-based version was developed using FileMaker Pro, a database program, and was delivered via the Internet through an html interface. It was tested for access with Netscape and Internet Explorer web browsers. The web-based survey contained three types of answering mechanisms. There were yes/no answers in radio button format, a Likert-type scale using radio buttons with five choices, and pull-down menus to select from a pre-set range of options. The Likert scale ranged from 5 to 1, with 5 equaling highly skilled and 1 equaling no skills.

Content validity and reliability tests were conducted on the survey. After newly developed questions were combined with the questions chosen from the Pawloski survey, a panel of experts in the field of administrative technology reviewed the instrument. Following this review, modifications were made to the survey instrument based on the review panel's comments and suggestions. A pilot study was done and reliability tests were conducted.

Content validity. The content validity of the survey was tested by a panel consisting of nine nationally known experts in the field of educational technology (see Appendix H). Each expert was given a copy of the survey instrument and asked to rate each question on a 3-point Likert scale as to the appropriateness and clarity of the question (see Appendix I). The panel of experts was also instructed to make comments about the survey questions relationship to the research questions. Questions that average a 2.5 or lower on the 3-piont Likert scale and/or received critical comments were either modified or dropped from the survey instrument.

In addition to the expert review, the survey was tested for technical competence. It passed a stress test on the server. This was conducted by asking a group of people to take the survey at the same time. This tested the server's capability to handle multiple and simultaneous respondents.

Reliability. To provide an estimate of reliability, a pilot study was conducted on the instrument in January of 2003. The pilot group consisted of 30 randomly selected Nebraska building administrators. Both participants and non-participants of the LTTA training were part of the pilot study. After an explanation of the purpose of the survey, the group was asked to take the survey on-line and then provide feedback as to the appropriateness and clarity of each question.

Cronbach's alpha was used to compute reliability of the instrument. Cronbach's alpha is a test used to measure internal consistency on surveys where the respondents use a Likert scale. The 9-item subscale on technology skills had a reliability coefficient of .89. The 13-item subscale on administrators' ability to satisfy administrator technology standards had a reliability coefficient of .94. The 13-item subscale on administrators' ability of a majority of teachers under their supervision to satisfy teacher technology standards had a reliability coefficient of .92. All three of these are high coefficients, indicating high reliability for the survey instrument.

Variables

Independent variables. The three independent variables were (1) group (LTTA participants and LTTA non-participants), (2) gender, and (3) technology access, as measured by the student to computer ratio in the administrator's building.

Dependent variables. The three dependent variables were building administrators' perceptions of (1) their own technology skills, as measured by mean scores on the 9 items pertaining to that variable, (2) their ability to satisfy administrator technology standards, as measured by mean scores on the 13 items pertaining to that variable, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards, as measured by mean scores on the 13 items pertaining to that variable.

Data Analysis

Data were collected and analyzed using the SPSS 10.0 statistics software. Responses to the survey items were compiled and analyzed with respect to the research questions. Research question one used a independent measures t-test with participants' and non-participants' mean scores on perceptions of (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards as the dependent variables.

Research questions 2, 3, 4, 5, 6, and 7 used two-way analyses of variance (ANOVAs) to determine the relationship across groups that gender and access to technology have in determining administrators' mean scores on perceptions of (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

The researcher used an alpha of .01 due to the number of statistical tests that were run. This was done in an effort to decrease the likelihood of a Type I error.

Summary

The specific purpose of this study was to find whether their were differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not yet participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

In order to identify the answers to these questions, the Leadership Talks Technology Academy participants were asked to participate in this study. They were asked to complete an on-line survey. The data collected from this survey were analyzed using descriptive statistics and statistical tests. The findings from this data analysis are reported in Chapter 4.

Chapter 4

Findings

The specific purpose of this study was to find whether there were differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not yet participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards. The samples for this study were two groups totaling 335 Nebraska school building principals. One sample included building principals who had received training by participating in the LTTA grant, and the other sample included those building principals who have not yet received training through the LTTA grant.

Survey Participants

The purpose of the Grant is to train Nebraska school administrators to use technology more effectively. The medium of data collection used in this study was through the use of electronic e-mail with a survey instrument located on an Internet web site. The web-based survey allowed for rapid collection of data from a diverse population.

Survey responses were tabulated and frequencies were calculated on the demographic data provided by respondents. The sample represents a diverse set of school administrators in Nebraska who encompass a wide range of experiences. The LTTA groups chosen for the study are a cross-section of administrators from Nebraska.

They are from urban, suburban, and rural districts that represent a variety of schools, both elementary and secondary, and both public and private. Also represented are administrators from schools with varied student populations, ranging from schools with fewer than 100 students to schools with more than 2000 students.

Respondents were asked to report their gender. This study asked a series of questions related to the differences in perceptions between males and females. There were 150 males and 81 females who participated in the study. Table 1 reports the respondents' gender broken into two groups (participants and non-participants).

Respondents were asked to report their total years of experience as a building administrator. A dropdown menu listing years in class intervals of width five (i.e. 1 –5, 6 –10, 11 –15) was provided. Fifty-six percent of the building principals reported having 10 or fewer years of experience as a building administrator. Table 2 reports the respondents' years of experience as a building administrator.

Respondents were asked to report their highest degree earned. Identifying the highest degree earned would reveal the number of building administrators who have completed a degree beyond the required level of a Masters Degree needed for certification as an administrator. Twenty-five percent of the respondents reported having their Specialist or Doctoral degree, with only two percent holding only a Bachelors Degree. Table 3 reports a summary of the results.

Table 1

Participants and Non-Participants by Gender

Group	Gender	Frequency	Percent
Participants	Male	95	68.8
	Female	43	31.2
	Total	138	100.0
Non-Participants	Male	55	59.1
	Female	38	40.9
	Total	93	100.0

Table 2

Summary of Years Experience as a Building Administrator

Years	1 - 5	6 - 10	11 - 15	16 - 20	21- 25	26 or more
n = 231	80	49	48	20	16	17
%	34.6	21.2	20.8	8.7	6.9	7.4

Table 3

Summary of Highest Degree Currently Held

Degrees	Bachelor	Masters	Specialist	Doctorate
n = 230	5	168	45	12
%	2.2	73.0	19.6	5.2

Respondents were asked to select from two methods of adult learning related to where they acquired the majority of their knowledge and/or skills. Based on the basic skills rated as important to the role of a building administrator, participants were asked to identify whether the predominant method of learning had been through a formal education process or through self-directed learning.

The formal education learning was described as a method where the student had no control over what was learned, or when or how it was learned. The second option of self-directed learning was identified as a method where the learner determined what to learn, as well as where and when the learning occurred. Of the 231 participants in the study, 84% identified self-directed learning as the primary means they used to obtain the technology skills needed as a building administrator. Table 4 reports a summary of the results broken into two groups (participants and non-participants).

Table 4

Adult-Learning Preference as Broken down by Group (Participants and Non-Participants)

Groups	Learning Preference	Frequency	Percent
Participants	Self-directed	128	92.8
	Formal	10	7.2
Non-Participants	Self-directed	87	93.5
	Formal	6	6.5

<u>Research Questions</u>

The specific research questions for this study were:

1. Are there differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards?
2. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their own technology skills when analyzed by gender?
3. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards when analyzed by gender?
4. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by gender?

5. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their personal technology skills?
6. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards?
7. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards?

When performing statistical analyses of the data collected for each subscale, means were computed from the usable responses. The mean substitution process was employed for the purpose of being able to use a particular respondent's scores if he/she left some of the items blank.

Findings of the Study

In order to clarify the results of the responses to the on-line survey, the data were analyzed and displayed with respect to the initial seven research questions.

Research question one. Are there differences between the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology

Administrators) training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards?

Table 5 lists the means and standard deviations for each of the three survey subscales for the 231 respondents. For the 138 respondents who were trained in the use of technology in education during year one and the 93 respondents who have not participated in any LTTA training, independent t-tests of their mean scores were conducted on the three survey subscales. There was a statistically significant difference in participants' mean ratings when compared to non-participants on the 9-item basic skills subscale ($t(229) = 5.382$, $p < .0005$). There was a statistically significant difference in participants' mean ratings when compared to non-participants on the 13-item administrator technology standards subscale ($t(229) = 3.255$, $p < .0005$). There was a statistically significant difference in participants' mean ratings when compared to non-participants on the 13-item teacher technology standards subscale ($t(229) = 5.884$, $p < .0005$). The findings of this study show a difference in the perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training as compared to the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards

Table 5

Means and Standard Deviations of Basic Skills, Administrator Technology Standards, and Teacher Technology Standards Scores for Participants and Non-Participants

Subscales	Group	N	Mean	Std. Deviation
Basic Skills	Participants	138	3.6731	0.6229
	Non-Participants	93	3.2001	0.7001
Administrator Standards	Participants	138	2.9560	0.5990
	Non-Participants	93	2.6737	0.7115
Teacher Standards	Participants	138	3.6860	0.5981
	Non-Participants	93	3.1604	0.7552

Research question two. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their own technology skills when analyzed by gender?

The means and standard deviations for the survey subscale that measures the principals' perceptions of their own technology skills broken down by group (LTTA participants in year one versus non-participants in year three) and gender (male and female) are presented in Table 6. The results of the 2 x 2 ANOVAs for the principals' perceptions of their own basic technology skills indicated that there was a statistically non-significant group by gender interaction ($F(1,227)=.038, p=.846$) and gender main effect ($F(1,227)=.933, p=.335$), but there was a statistically significant group main effect ($F(1,227)=26.926, p<.0005$). Participants in the LTTA training ($M=3.67, SD=.62$) were significantly more positive than non-participants ($M=3.20, SD=.70$) in their perceptions of their own technology skills (see Table 6).

Table 6

Means and Standard Deviations of Basic Skills Scores for Males and Females of Participants and Non-Participants

Group	Gender	Mean	SD	n
LTTA Participants	Male	3.6510	0.6470	95
	Female	3.7219	0.5704	43
	Total	3.6731	0.6229	138
LTTA Non-Participants	Male	3.1566	0.6848	55
	Female	3.2632	0.7263	38
	Total	3.2001	0.7001	93

Research question three. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards when analyzed by gender?

The means and standard deviations for the survey subscale that measures the principals' perceptions of their ability to satisfy administrator technology standards broken down by group (LTTA participants in year one versus non-participants in year three) and gender (male and female) are presented in Table 7. The results of the 2 x 2 ANOVAs for the principals' perceptions of their ability to satisfy administrator technology standards indicated that there was a statistically non-significant group by gender interaction ($F(1,227)=.100$, $p=.752$) and gender main effect ($F(1,227)=3.891$, $p=.050$), but there was a statistically significant group main effect ($F(1,227)=9.191$, $p=.003$). Participants in the LTTA training ($M=2.96$, $SD=.60$) were significantly more positive than non-participants ($M=2.67$, $SD=.71$) in their perceptions of their ability to satisfy administrator technology standards (see Table 7).

Table 7

Means and Standard Deviations of Administrator Technology Standards Scores for Males and Females of Participants and Non-Participants

Group	Gender	Mean	SD	n
LTTA Participants	Male	3.0025	0.5871	95
	Female	2.8533	0.6192	43
	Total	2.9560	0.5990	138
LTTA Non-Participants	Male	2.7579	0.7005	55
	Female	2.5517	0.7190	38
	Total	2.6737	0.7115	93

Research question four. Are there differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by gender?

The means and standard deviations for the survey subscale that measures the principals' perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards broken down by group (LTTA participants in year one versus non-participants in year three) and gender (male and female) are presented in Table 8. The results of the 2 x 2 ANOVAs for the principals' perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards indicated that there was a statistically non-significant group by gender interaction ($F(1,227)=.973$, $p=.325$) and gender main effect ($F(1,227)=.059$, $p=.808$), but there was a statistically significant group main effect ($F(1,227)=34.613$, $p<.0005$). Participants in the LTTA training ($M=3.67$, $SD=.60$) were significantly more positive than non-participants ($M=3.16$, $SD=.76$) in their perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards (see Table 8).

Table 8

Means and Standard Deviations of Teacher Technology Standards Scores for Males and Females of Participants and Non-Participants

Group	Gender	Mean	SD	n
LTTA Participant	Male	3.6644	0.6066	95
	Female	3.7338	0.5830	43
	Total	3.6860	0.5981	138
LTTA Non-Participant	Male	3.2073	0.7477	55
	Female	3.0926	0.7709	38
	Total	3.1604	0.7552	93

Research question five. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their personal technology skills?

The means and standard deviations for the survey subscale that measures the principals' perceptions of their own technology skills broken down by group (LTTA participants in year one versus non-participants in year three) and access to technology (ratio of students to computers) are presented in Table 9. The results of the 2 x 2 ANOVAs for the principals' perceptions of their own basic technology skills indicated that there was a statistically non-significant group by access to technology interaction ($F(1,220)=.337$, $p=.853$) and access to technology main effect ($F(1,220)=.851$, $p=.494$), but there was a statistically significant group main effect ($F(1,220)=22.777$, $p<.0005$). Participants in the LTTA training ($M=3.67$, $SD=.62$) were significantly more positive than non-participants ($M=3.2$, $SD=.70$) in their perceptions of their personal technology skills (see Table 9).

Table 9

Means and Standard Deviations of Basic Skills Scores for Access to Technology of Participants and Non-Participants

Group	Student/CPU	Mean	SD	n
LTTA Participants	0 to 3.00	3.7297	0.6545	37
	3.01 to 4.00	3.6667	0.6534	39
	4.01 to 5.00	3.7956	0.6220	25
	5.01 to 7.00	3.5067	0.5854	25
	7.01 and up	3.6111	0.5025	12
	Total	3.6731	0.6229	138
LTTA Non-Participants	0 to 3.00	3.2560	0.6877	23
	3.01 to 4.00	3.1830	0.8570	17
	4.01 to 5.00	3.1959	0.7273	19
	5.01 to 7.00	3.0611	0.4466	20
	7.01 and up	3.3932	0.8298	13
	Total	3.2071	0.7007	92

Research question six. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding their ability to satisfy administrator technology standards?

The means and standard deviations for the survey subscale that measures the principals' perceptions of their ability to satisfy administrator technology standards broken down by group (LTTA participants in year one versus non-participants in year three) and access to technology (ratio of students to computers) are presented in Table 10. The results of the 2 x 2 ANOVAs for the principals' perceptions of their ability to satisfy administrator technology standards indicated that there was a statistically non-significant group by access to technology interaction ($F(1,220)=.143$, $p=.966$) and access to technology main effect ($F(1,220)=2.325$, $p=.057$), but there was a statistically significant group main effect ($F(1,220)=31.267$, $p<.0005$). Participants in the LTTA training ($M=2.96$, $SD=.60$) were significantly more positive than non-participants ($M=2.67$, $SD=.71$) in their perceptions of their ability to satisfy administrator technology standards (see Table 10).

Table 10

Means and Standard Deviations of Administrator Technology Standards Scores for Access to Technology of Participants and Non-Participants

Group	Student/CPU	Mean	SD	n
LTTA Participants	0 to 3.00	3.0542	0.6427	37
	3.01 to 4.00	2.9112	0.5195	39
	4.01 to 5.00	3.0154	0.6786	25
	5.01 to 7.00	2.8062	0.5113	25
	7.01 and up	2.9872	0.7140	12
	Total	2.9560	0.5990	138
LTTA Non-Participants	0 to 3.00	2.7592	0.6255	23
	3.01 to 4.00	2.9255	0.7813	17
	4.01 to 5.00	2.6110	0.8456	19
	5.01 to 7.00	2.4308	0.6296	20
	7.01 and up	2.6331	0.6566	13
	Total	2.6701	0.7146	92

Research question seven. Is there a relationship between access to technology and the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards?

The means and standard deviations for the survey subscale that measures the principals' perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards broken down by group (LTTA participants in year one versus non-participants in year three) and access to technology (ratio of students to computers) are presented in Table 11. The results of the 2 x 2 ANOVAs for the principals' perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards indicated that there was a statistically non-significant group by access to technology interaction ($F(1,220)=.794$, $p=.530$) and access to technology main effect ($F(1,220)=1.611$, $p=.173$), but there was a statistically significant group main effect ($F(1,220)=9.610$, $p=.002$). Participants in the LTTA training ($M=3.67$, $SD=.60$) were significantly more positive than non-participants ($M=3.16$, $SD=.76$) in their perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards (see Table 11).

Table 11

Means and Standard Deviations of Teacher Technology Standards Scores for Access to Technology of Participants and Non-Participants

Group	Student/CPU	Mean	SD	n
LTTA Participants	0 to 3.00	3.8054	0.6117	37
	3.01 to 4.00	3.6997	0.4942	39
	4.01 to 5.00	3.7138	0.6671	25
	5.01 to 7.00	3.4369	0.6597	25
	7.01 and up	3.7340	0.5221	12
	Total	3.6860	0.5981	138
LTTA Non-Participants	0 to 3.00	3.2823	0.8186	23
	3.01 to 4.00	3.1335	0.5940	17
	4.01 to 5.00	3.3228	0.6387	19
	5.01 to 7.00	2.9000	0.7454	20
	7.01 and up	3.1302	0.9972	13
	Total	3.1586	0.7592	92

Table 12 in Appendix J shows the rank order of skills and standards of LTTA participants in comparison to non-participants by mean and standard deviation. These data show that respondents are strong in specific skills like e-mail and word processing. The data show that respondents, regardless of training, do not perceive themselves particularly strong in certain technology standards like ethical use of technology and evaluating technology resources.

Summary

This study presents the differences between perceptions of principals who have participated in the LTTA (Leadership Talks for Technology Administrators) training and of principals who have not yet participated in the LTTA training. The samples for this study were two groups totaling 335 Nebraska school building principals. Two hundred thirty-one usable surveys were returned (68.9%). The response rate for building principals who received training by participating in the LTTA grant was 69.7% (138 out of 198). The response rate for building principals who have not yet received training through the LTTA grant was 67.9% (93 out of 137). Analysis of the survey questions included t-tests and two-way analyses of variance (ANOVAs). The major finding of this study was participants of the LTTA training were significantly more positive about their perceptions of their own technology skills and abilities to satisfy technology standards than non-participants. The results of the study provided no support for the proposition that gender or access to technology had a significant effect on the building principals' perceptions related to technology use.

It is also important to note that results of this study need to be used carefully. The use of technology standards in professional development for administrators is an emerging trend in education, and there is a general lack of research in this area. In addition, building principals' lack of knowledge about the standards can also be a limitation. Chapter five will present a summary of the results, as well as discussion and interpretation of the results of the study.

Chapter 5

Summary, Discussion, Conclusions, and Recommendations

This chapter presents a summary of the study, conclusions drawn from the findings, and recommendations for further research.

Summary

The general purpose of this study was to determine if there was enhancement of administrators' technology skills in support of teaching and learning, as related to national teacher and administrative technology standards, through the professional development training offered through the Bill and Melinda Gates Foundation State of Nebraska Challenge Grant for Leadership Development in Technology.

The main function of the LTTA grant was to help Nebraska's administrators gain skills and knowledge in the use of technology. The two goals of the LTTA grant were to: 1) enhance administrators' technology leadership skills in support of teaching and learning and data-driven decision-making and 2) create learning environments that empower staff to infuse technology into teaching, learning and assessing student outcomes (NDE & NCSA, 2001). This study focused on the first half of goal #1, which was the enhancement of administrators' technology skills in support of teaching and learning by surveying LTTA participants and non-participants.

Data were gathered through a written survey modified from a previously administered survey (Pawloski, 2000) and newly developed questions using the International Society of Technology Educators NETS-A technology standards as a guide. The sample for this study was two groups totaling 335 Nebraska school building principals. Two hundred thirty-one usable surveys were returned (67%). The response rate for building principals who received training by participating in the LTTA grant was 69.7% (138 out of 198). The response rate for building principals who have not yet received training through the LTTA grant was 67.9% (93 out of 137). The dependent variables were building administrators' perceptions of (a) their own technology skills, (b) their ability to satisfy administrator technology standards, and (c) their perceptions of the ability of a majority of teachers under their supervision to satisfy teacher technology standards. Independent variables were (a) groups (LTTA participants and LTTA non-participants), (b) gender, and (c) technology access, as measured by the student-to-computer ratio in the administrator's building. Statistical analyses included t-tests and two-way analyses of variance (ANOVAs).

An analysis was conducted to determine if there was a significant difference in those that participated in the LTTA training and those that had not yet participated in the training. Three subscales were created within the survey that examined principals' perceptions towards their own basic technology skills, the ability to satisfy administrator technology standards, and the ability of a majority of teachers under their supervision to satisfy teacher technology standards. A comparison of the mean scores for the subscales of two demographic areas was also performed to determine if differences in gender and access to technology affected perceptions. This study found that participants of the LTTA training were significantly more positive about their perceptions of their own technology skills and abilities to satisfy technology standards than non-participants. The results of the study provided no support for the proposition that gender or access to technology had a significant effect on the building principals' perceptions related to technology use.

Literature Review

The literature review covered four separate areas of research. The primary focus was to locate research to provide evidence that professional development in the use of technology would increase the perception of administrators in their own technology skills and their ability to satisfy administrator and teacher technology standards. Numerous articles were found regarding the role of the building principal in educational technology and the use of standards, but few were research-based.

Technology in its various forms has become an important presence in the life of everyone, adult or child. With the increasing use of technology in education, principals everywhere are asking for guidance with the daunting task of integrating technology skills into the education setting. This guidance has come from a variety of sources; however, the one that is most widely adopted is the Technology Standards for School Administrators (TSSA). The TSSA initiative worked to create a national consensus on what school administrators, inclusive of building principals, "should know and be able to do to ensure district wide technology leadership" (Bosco, 2002, p. 54).

The literature suggests that the first uses of technology in educational administration date back to the 1950s. The first limited uses of technology were for data-processing operations by large school districts, colleges and universities (Bozeman & Spuck, 1991). In the 1960s, technology in education was confined to such tasks as maintaining district personnel records, inventories, student grades and scheduling

(Bozeman et. al, 1991). The invention of microcomputers in the late 1970s brought technology to more individuals. During the 1980s, schools began to make significant investments in computer technology to address community concerns. Yet, most of the work administrators did with technology was confined to the simple task of word processing (Barbour, 1987).

Technology is fundamentally changing education, regardless of educators' readiness for change. Professional growth is a key to gains in student achievement through the use of technology (Shank, 2000). Studies have indicated that knowledgeable school administrators contribute significantly to the proper integration of technology (Beach & Vacca, 1985; Finkel, 1990). Technology training for instructional leaders is vital for the successful infusion of technology into the daily instructional and administrative routine of public schools (Bruder, 1990). However, many administrators currently do not have the preparation necessary to lead the changes that technology requires (Byrom, 1998). Coughlin and Lemke (1999) suggest that most professional development is skills-based training and is essentially wasted, because it provides little support for educators who need help with integration issues. A critical component of principals' professional development is familiarity with technology for both instructional and administrative usage (Beckner, 1990). Bloom (1992) found that administrators who participated in an administrative technology academy sponsored at the state level were significantly more likely to perceive technology as being useful in education and to use it themselves.

Weinman and Haag (1999) report that research demonstrates serious gender-based differences exist in technology use, and suggests that such difference lead to future economic inequities. They suggest that males tend to enroll in more computer-based, higher level mathematics and science courses in high school, while females often enroll in more clerical and data-entry courses. When boys become men and girls become women, gender bias remains upon entering college. Although the majority of students attending college are female, the culture is still strongly influenced by male leaders. For example, four out of five full professors are males, more male professors are awarded tenure than females professors, and male professors earn more than female professors (American Association of University Women, 1998).

Since 1994, the National Center for Education Statistics (NCES) surveyed public schools to measure what proportions of them are connected to the Internet. In 1995, there were 5.8 million computers in classrooms or about 1 for every 9 students. Although these figures show marked improvement from the 1980s, when there was an average of 1 computer for every 30 students, schools were still short of the optimum ratio of 1 computer for every 5 students (National Center for Education Statistics, 1997). The ratio of students to instructional computers in public schools had decreased 6 to 1 in 1999. The ratio improved to a national average to 1 to 5 by the year 2000, the ratio that experts considered the optimum ratio of computers to students (National Center for Education Statistics, 2001).

In order to help teachers design effective learning environments that use technology to enhance student learning, principals must first learn how to use technology themselves. It is with this understanding that professional educators from the State of Nebraska undertook the task of training administrators in the uses of technology for educational purposes. The Nebraska Department of Education, in conjunction with the Nebraska Council for School Administrators, submitted a competitive grant proposal to the Bill and Melinda Gates Foundation. The grant's main purpose was to put technology into the hands of Nebraska administrators and train them how to use technology to help them become better educational leaders.

Discussion

Research Method. A database listing building principal participants in the initial year of training and building principals who were awaiting training in the third year of the LTTA (Leadership Talks for Technology Administrators) training was obtained from the co-directors of the State of Nebraska LTTA Bill and Melinda Gates Foundation Grant. The decision to survey this population was driven by the fact that the Bill and Melinda Gates Foundation funded the academy to train Nebraska school administrators in the use of educational technology. Every attempt was made to contact all participants in both groups of the LTTA training.

The survey instrument consisted of 36 questions divided into four parts. Respondents used a 5-point Likert scale to rate each item with a 1 for "no skills", 3 for "moderate skills", and 5 for "highly skilled". A rating of 2 and 4 were used by respondents that felt their skill level was somewhere in between the provided descriptions. The first page included all demographic information needed to conduct the study. The second section, or part I, was comprised of 10 questions that asked respondents to rate themselves regarding their perception of their basic technology skills. The third section, or part II, was comprised of 13 questions that asked respondents to rate themselves regarding their perception of their ability to satisfy administrator technology standards. Finally, the last section, or part III, was comprised of 13 questions that asked respondents to rate themselves regarding the perception of their ability of a majority of their teachers under their supervision to satisfy teacher technology standards.

The first e-mail message was sent to select building principals outlining the purpose of the study and included a login and hyperlink for respondents to click on to a link of the formal Institutional Review Board (IRB) cover letter (2003-01-137 EX) that explained in detail the purpose of the study. Placed within the IRB cover letter was a hyperlink that sent the participants directly to the survey pages on the website. By going to the survey website, the participants acknowledged their willingness to complete the survey instrument.

Data were collected over a 4-week period of time. Two general e-mail reminders were sent to those participants who had not yet participated in the survey. The responses were stored on a separate database that was not linked to the respondents' password database. The responses to the survey were placed in a Microsoft spreadsheet for ease of analysis.

Reliability. The results of this study indicate that the perceptions of building principals in their ability to satisfy technology skills and standards can be assessed with an acceptable degree of reliability. The reliability coefficients for all three survey subscales were greater that .85 indicating that respondents were consistent in their responses to the survey items. Cronbach's alpha was used to compute reliability of the data from the pilot study. On the differences between the perceptions of LTTA training participants and non-participants regarding their own technology skills 9-item subscale, the reliability coefficient was .89. On the differences between the perceptions of LTTA training participants and non-participants regarding their ability to satisfy administrator technology standards 13-item subscale, the reliability coefficient was .92. On the differences between the perceptions of LTTA training participants and non-participants regarding the ability of a majority of teachers under their supervision to satisfy teacher technology standards 13-item subscale, the reliability coefficient was .90. These are high coefficients, indicating high reliability for the instrument.

Findings. Two hundred and thirty-one respondents or 67% of the sample receiving an e-mail message requesting their participation in the study completed the survey. Of the 231 respondents, 138 participated in the initial LTTA training and 93 had not participated in any LTTA training. Further review of the demographics revealed a total of 81 females and 150 males. Fifty-six percent of the building principals reported having 10 years or less of experience as a building principal. A majority (73%) of the respondents' reported having a Masters degree while 25% of the respondents reported having their Specialist or Doctoral degree, with only 2% holding a Bachelors degree.

Respondents were asked to select from two adult learning methods related to the acquisition of their knowledge in the field of technology use. Eighty-four percent identified self-directed learning as the primary means to obtain the technology skills needed by a building administrator. Self-directed learning is defined as the learner determining what to learn, as well as where and when the learning occurred.

The general purpose of this study was to determine if there was enhancement of administrators' technology skills in support of teaching and learning, as related to national teacher and administrative technology standards, through the professional development training offered through Gates Foundation Grant. The two sample groups selected for this study were Nebraska principals who have participated in the LTTA training and principals who have not yet participated in the LTTA training.

The results of this study found a statistically significant difference in the perception of the principals who have participated in the LTTA training compared to the perceptions of principals who have not yet participated in the LTTA training in all three subscales.

Bruder (1990) suggests that technology training for instructional leaders is vital to the successful infusion of technology into the daily instructional and administrative routine of public schools. Beach and Vacca (1985) and Finkel (1990) indicated that knowledgeable school administrators contribute significantly to the proper integration of technology. Bloom (1992) found that administrators who participated in an administrative technology academy sponsored on the state level were significantly more likely to perceive technology as being useful in education and to use it themselves. This is supported by the findings of this study that suggest participants of the LTTA training in all three subscales (M=3.67, SD=.62, M=2.96, SD=.60, and M=3.69, SD=.60, respectfully) were more positive than non-participants (M=3.20, SD=.70, M=2.67, *SD*=.71, and *M*=3.16, *SD*=.76, respectfully) in their perceptions of their own basic technology skills and abilities to satisfy technology standards (see Table 5).

Research questions 2, 3 and 4 asked if there were differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by gender.

This study did not find that gender significantly influenced the perception of principals in their own technology skills, their ability to satisfy administrator technology standards, or the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

This was an unexpected result. The report from Weinman and Haag (1999) suggest that there are gender-based differences in technology use, based on the fact that males tend to enroll in more computer-based, higher level mathematics and science courses in high school, while females more often enroll in clerical and data-entry courses. This would leave researchers to believe that females, would in fact, score lower than their male counterparts.

The American Association of University Women (1998) reported that 38% of first-year men had self-initiated out-of-school programming experience, while only 10% of women had such experience. Women who have as much programming experience as men are still likely to encounter gender bias, through comments made by their male counterparts (Mayfield, 2001). This would leave researchers to believe that males would score higher than their female counterparts. The findings also point out the fact that the mean scores of the perceptions of building principals' ability to satisfy administrator technology standards were the lowest of the three subscales (see Table 5). This may be attributed to the lack of knowledge related to the administrative technology standards due to the recent development of the administrative standards themselves.

Research questions 5, 6 and 7 asked if there were differences between the perceptions of principals who have participated in the LTTA training and the perceptions of principals who have not participated in the LTTA training regarding (1) their own technology skills, (2) their ability to satisfy administrator technology standards, and (3) the ability of a majority of teachers under their supervision to satisfy teacher technology standards when analyzed by access to technology.

This study did not find that access to technology significantly influenced the perception of principals in their own technology skills, their ability to satisfy administrator technology standards, or the ability of a majority of teachers under their supervision to satisfy teacher technology standards.

The research on access to technology was limited to student achievement and not specifically related to administrative access to technology. Research suggests that more access to technology would result in a stronger positive perception toward technology (Apple Corporation, 2002). Experts suggest that the optimal computer to student ratio is 1 to 5 (National Center for Education Statistics, 2001). An assumption could be made that those administrators with a optimal number of computers in their building would perceive themselves more positively than those with less than an optimal ratio.

Conclusions

The findings of this study provide a snap shot of building principals' perceptions toward their own basic technology skills, their ability to satisfy administrator technology standards, and the ability of a majority of teachers under their supervision to satisfy teacher technology standards. The constant change associated with technology suggests that the results of this study may be relevant for only a short time. The relative newness of standards for technology use by teacher and administrators and the broad interpretations and recommendations for implementation related to the standards may also have an impact on the findings of the study.

The review of literature suggested that building principals who participated in administrative technology professional development were significantly more likely to perceive technology as being useful in education and to use it themselves (Beckner, 1990; Bloom, 1992). To begin training in the LTTA professional development programs, each participant was asked to complete a pre-skills survey. The survey asked each participant to rate his or her comfort level using basic technology skills on a 4-point Likert scale. The average skill level of year 1 participants before the training sessions equaled 2.90 (Leadership Talks Technology Academy, 2001). The average skill level of year 2 participants before the training sessions equaled 2.91 (Leadership Talks Technology Academy, 2002). This finding suggests that year 1 administrators' perceptions of their basic technology skills are similar to year 2 administrators before they enter into the training program.

The findings of this study provide evidence that the perceptions of LTTA participants were significantly more positive than the perceptions of non-participants toward their basic technology skills and abilities to satisfy administrative and teaching technology standards. The pre-data provided by the Leadership Talks for Technology Academy (2001, 2002) suggest that participants entered the program with equivalent perceptions about their basic technology skills. In order to make a true statistical determination about the enhancement of administrators' technology skills in support of teaching and learning, as related to national teacher and administrative technology standards, through the LTTA training, the research design for a study should use a pre-test and post-test. However, research can be linked together to provide supporting evidence that the grant did enhance the perceptions of principals in their own technology skills by noting that participants entered into the program with equivalent perceptions of their own technology skills, and those who participated the LTTA training were more positive than non-participants.

The assumption was that men would demonstrate a positive significant difference in their perceptions towards basic technology skills and abilities to satisfy teacher and administrator technology standards. This study did not find a significant difference between male and female perceptions related to technology skills or standards.

Research suggested that principals with more access to technology within their building would demonstrate a positive significant difference in their perceptions towards basic technology skills and abilities to satisfy teacher and administrator technology standards. This study did not find a significant difference in respondents that had a computer to student ratio at or below the optimal level (1 computer to 5 students) as compared to those above the optimal level related to technology skills or standards.

The fact that the findings of this study fall short of statistical significance in six of the seven questions does not necessarily argue that they are without merit. There is often a tendency in educational research to equate importance with statistical significance, a bias that can be misleading (Sterling & Rosenbaum, 1995). This study was conducted to determine if there was a significant difference between the dependent variables (administrators' perceptions of their own technology skills, their ability to satisfy administrator technology standards, and the ability of a majority of teachers under their supervision to satisfy teacher technology standards) and the independent variables (groups - LTTA participants and LTTA non-participants, gender, and technology access). The lack of a significant difference found within this study can be valuable to future professional development because it provides an answer to a researchable question.

The results of this study can be generalized for the building principal population in the state of Nebraska due to the consistency in responses based on participation and non-participation in the LTTA training.

Recommendations

It is recommended that the leaders of professional development for administrative technology integration use the findings of this study to develop future workshops and in-service programs. Improvements and target activities in future administrative technology training could be developed by analyzing strengths and weaknesses in the finding of this study. In addition, the National Educational Technology Standards for Administrators (NETS*A) and the National Educational Technology Standards for Teachers (NETS*T) could be incorporated by colleges and universities in establishing guidelines for undergraduate and graduate level teacher and administrative preparation programs.

If this study were to be replicated, it would be recommended that the survey sample be expanded to include building administrators from all states who were involved in the Bill and Melinda Gates Foundation grants for the improvement of technology use by administrators. This wider body of research would provide valuable data for researchers who could develop professional training for current and future administrators.

Those involved in the professional development of administrators in the use of technology should examine the findings of this study to determine areas of strengths and weaknesses related to principals' perceptions of their ability to satisfy basic technology skills and technology standards. This data should be used to improve future technology training for educational leaders.

The role of the building principal as an educational technology leader is continually evolving due to the rapid changes in the field. Research, similar to this study, should be conducted on a regular basis to determine trends or significant changes concerning technology integration and perceptions related to technology standards. These findings can be beneficial to improving standards for educational technology and future professional development for administrative technology use.

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Appendix A

Technology Standards for Teachers

Framework, Standards, and Performance Indicators

I. Technology Operations and Concepts:

Teachers demonstrate a sound understanding of technology operations and concepts.

Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Educational Technology Standards for Students).
B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. Planning and Designing Learning Environments and Experiences:

Teachers plan and design effective learning environments and experiences supported by technology.

Teachers:

A. design developmentally appropriate learning opportunities that apply technology- enhanced instructional strategies to support the diverse needs of learners.
B. apply current research on teaching and learning with technology when planning learning environments and experiences.
C. identify and locate technology resources and evaluate them for accuracy and suitability.
D. plan for the management of technology resources within the context of learning activities.
E. plan strategies to manage student learning in a technology-enhanced environment.

III. Teaching, Learning and the Curriculum:

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.

Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.
B. use technology to support learner-centered strategies that address the diverse needs of students.
C. apply technology to develop students' higher-order skills and creativity.
D. manage student learning activities in a technology-enhanced environment.

IV. Assessment and Evaluation:

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.

Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. Productivity and Professional Practice

Teachers use technology to enhance their productivity and professional practice.

Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. Social, Ethical, Legal, and Human Issues:

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice.

Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity.
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

Appendix B

Technology Standards for School Administrators

Framework, Standards, and Performance Indicators

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.

Educational leaders:

A. facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision.
B. maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long-range, and systemic technology plan to achieve the vision.
C. foster and nurture a culture of responsible risk-taking and advocate policies promoting continuous innovation with technology.
D. use data in making leadership decisions.
E. advocate for research-based effective practices in use of technology.
F. advocate, on the state and national levels, for policies, programs, and funding opportunities that support implementation of the district technology plan.

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

Educational leaders:

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-level 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.

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

Educational leaders:

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.

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

Educational leaders:

A. develop, implement, and monitor policies and guidelines to ensure 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.

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

Educational leaders:

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.

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.

Educational leaders:
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.

Appendix C

First e-mail message:

Hi! My name is Terry Haack and I am conducting research for my doctoral dissertation at the University of Nebraska-Lincoln. The purpose of this study is to explore the differences between the perceptions of principals who have participated in the LTTA training and LTTA non-participants regarding technology skills, and their ability to satisfy administrator and teacher technology standards. You and your peers across the state are being asked to provide insight into this complex arena where there is very little data to provide direction for future professional development training in the State of Nebraska.

Your assistance in participating in this study will provide input that can have a powerful impact on the future preparation of pre-service and degreed educators who desire to provide technology leadership in K-12 Nebraska schools. The survey instrument is available on-line and takes approximately 10-15 minutes to complete. A cover letter and hyperlink to the survey are available by clicking on this hyperlink.

http://portfolio.unomaha.edu/survey

If you are not the current building principal for your district and/or a participant (graduate or in waiting) in the LTTA professional development training, please help me out by replying to this message with the correct contact information.

terry.haack@elkhornmail.esu3.org

Please take a few minutes from your busy schedule to provide your input.

Thanks!

Appendix D

IRB # 2003-01-137 EX

Dear Technology Leader,

You are invited to participate in this statewide research study designed to assist in the development of curriculum for post-secondary and in-service education programs for Nebraska's PK-12 leaders. As an educational leader, you can appreciate the importance of having the appropriate skills and knowledge to provide effective leadership in educational technology integration within your school or school district. The purpose of this study is to explore the effects of technology training (specifically, Leadership Talks for Technology Administrators) on principal's attitudes in relationship to instructional leadership. The study will focus on the enhancement of administrators' technology skills in support of teaching and learning, and the perceptions of building principals regarding their ability to satisfy administrator and teacher technology standards.

I am asking you to take 15-20 minutes of your time to complete an on-line survey questionnaire via the Internet. Realizing the value of your time, this survey instrument is designed to take minimal effort and time on your part. The results of the survey may be published in educational journals or presented at educational conferences. Information collected, which could identify you, will be kept strictly confidential. Participants will not be identified individually, but by demographic classifications. There are no anticipated risks associated with the completion of this survey. Benefits to taking this survey will add to research data on technology training and aide future professional development of school administrators.

You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with myself as the investigator, participation in LTTA training, or the University of Nebraska-Lincoln. Your decision will not result in any loss of benefits to which you are otherwise entitled. If you agree to participate in the research study, please return to the previous page of this site by using the back arrow button on the browser. Enter the last 4 digits of your work phone number in the box provided at the bottom of the page as well as your initials, then click login to take the survey.

If you have any questions about your rights as a research subject that has not been answered by the investigator, you may contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965. You may also contact my doctoral committee advisor, Dr. Don Uerling, at (402) 472-0970 should you have any questions regarding this research. I may be reached at terry.haack@elkhornmail.esu3.org or at (402) 289-4239.

Please give strong consideration to participating in this study that can have a powerful influence on the future preparation of pre-service and degreed educators who wish to provide leadership to educational technology integration in Nebraska's K-12 schools.

Sincerely,

Terry L. Haack
Doctoral Candidate

Appendix E

TO: LTTA Survey Participants
RE: Completion of Online Survey
DATE: February 2, 2003

This is a follow-up to an e-mail you received regarding a request to complete a survey designed to gather information from former and future LTTA Academy participants. Your feedback is valuable in helping to assess the current status of professional development in technology for Nebraska's building administrators. A copy of the original e-mail is included for you to read. Please consider completing the survey prior to February 17 – the survey only takes a few minutes to complete!!

Original e-mail message:

Hi! My name is Terry Haack and I am conducting research for my doctoral dissertation at the University of Nebraska-Lincoln. The purpose of this study is to explore the differences between the perceptions of principals who have participated in the LTTA training and LTTA non-participants regarding technology skills, and their ability to satisfy administrator and teacher technology standards. You and your peers across the state are being asked to provide insight into this complex arena where there is very little data to provide direction for future professional development training in the State of Nebraska.

Your assistance in participating in this study will provide input that can have a powerful impact on the future preparation of pre-service and degreed educators who desire to provide technology leadership in K-12 Nebraska schools. The survey instrument is available on-line and takes approximately 10-15 minutes to complete. A cover letter and hyperlink to the survey are available by clicking on this hyperlink.

http://portfolio.unomaha.edu/survey

If you are not the current building principal for your district and/or a participant (graduate or in waiting) in the LTTA professional development training, please help me out by replying to this message with the correct contact information.

terry.haack@elkhornmail.esu3.org

Please take a few minutes from your busy schedule to provide your input.

Deadline: February 17, 2003

Thanks!

Appendix F

TO: LTTA Survey Participants
FROM: Terry L. Haack
RE: Completion of Online Survey
DATE: February 9, 2003

Your help is needed! This is a follow-up to an e-mail you received regarding a request to complete a survey designed to gather information from former and future LTTA Academy participants. I would like to have a larger percentage of returns in order to make a strong statement about the importance of the job you hold as an instructional technology leader for your district.

The survey seeks to gain information about the differences between the perceptions of principals who have participated in the LTTA training and LTTA non-participants regarding technology skills, and their ability to satisfy administrator and teacher technology standards. Your feedback is valuable in helping to assess the current status of professional development in technology for Nebraska's building administrators.

Please try to complete the survey within the next week so the data can be analyzed and used to provide staff development direction for this fall's Leadership Talks Technology Academy. The formal cover letter and hyperlink to the survey are available by clicking on this hyperlink.

http://portfolio.unomaha.edu/survey

If you are having trouble with the login page or any other part of the process to complete the survey, please contact me at:

terry.haack@elkhornmail.esu3.org

In advance, I thank you very much for taking time out of your busy schedule to provide your input.

Deadline: February 17, 2003

Appendix G

Dissertation Survey

1. What is your gender: (Button selection with the following options)

Male	Female

2. How many years of experience do you have in administration? (Drop down menu with the following ranges)

1-5	6-10	11-15	16-20	21-25	26 & over

3. What is the highest degree you currently hold? (Drop down menu with the following options)

Bachelor's Degree	Master's Degree	Specialist	Doctorate	Other

4. What was the student enrollment count in your building the last Friday in September 2002 (As used by the Nebraska Department of Education for Fall Student Enrollment)? (Box to type in number)

5. How many computers are in your building for student use? (Box to type in number)

6. How would you rate the training you received from the Leadership Technology Talks Academy conducted during the 2001-02 school year? (Drop down menu with the following options)

Very Inadequate	Inadequate	Adequate
More than Adequate	Excellent	Did not take LTTA training

7. Were you a participant in the 2001-2002 LTTA training, sponsored by the Gates Foundation through the State of Nebraska? (Button selection with the following options)

YES	NO

8. How many hours of professional development in educational technology did you participate in during the 2001-2002 school year other than the LTTA training? (Drop down menu with the following options)

1 to 2	3 to 4	5 to 6	7 to 10	11 to 15	16 or more

Part I

Directions: Each question presents three different levels of a skill or professional practice relating to specific areas of educational technology. Click on the button to indicate your position on the five-point scale in each row. Columns 2 and 4 are left blank to allow you to indicate that your perception of your skills and practice lie somewhere between the provided descriptions.

<u>Basic Skills</u>

1	2	3	4	5
No Skills		Moderate Skills		Highly Skilled

<u>Basic Skills</u>					
Word Processing	1	2	3	4	5
Databases	1	2	3	4	5
Spreadsheets	1	2	3	4	5
E-mail	1	2	3	4	5
Multimedia/presentation software (i.e.: PowerPoint)	1	2	3	4	5
Web page browsing	1	2	3	4	5
Finding information with web searches	1	2	3	4	5
Evaluating new software programs	1	2	3	4	5
Troubleshooting hardware problems	1	2	3	4	5

Based on the comfort level with using these basic skills in technology, where did you acquire the majority of your knowledge and/or skills? (Drop down menu with the following options)

- Formal education (no control over what was learned, or when or how this was learned)
- Self-directed learning (you determined what to learn, as well as where and when)

Part II

Directions: Each question presents three different descriptions of a skill level or professional practice relating to specific areas of educational technology. Columns 2 and 4 are left blank to allow you to indicate that your perception of your skills and practice lie somewhere between the provided descriptions. Click on the button to indicate **your** position on the five-point scale in each row.

Technology vision and planning

1. I do not have knowledge of a district wide plan that clearly defines expectations for technology use.
2.
3. I have knowledge of a district wide plan that clearly defines expectations for technology use, but do not know the procedures to implement the plan.
4.
5. I participated in an inclusive district process through which stakeholders formulated a shared vision that clearly defines expectations for technology use and use the district technology plan as a guide for educational technology in the building.

Promoting effective technology practices

1. I recognize the value of effective practices in technology integration among faculty, but lack the skills and strategies to do so.
2.
3. I am somewhat familiar with effective practices in technology integration, and ask faculty to use them when they can.
4.
5. I promote highly effective practices in technology integration among faculty and other staff.

Using technology for student instruction

1. I lack the expertise or background in the use of technology to access, analyze, and interpret student performance data to modify instructional practices for my staff.
2.
3. I sometimes recognize where the use of technology to access, analyze, and interpret student performance data may be used to modify instructional practices for my staff.
4.
5. I can assist faculty in using technology to access, analyze, and interpret student performance data, and in using results to appropriately design, assess, and modify student instruction.

Professional development practices for technology use

1. While I understand the importance of professional development for my staff, I do not normally participate in the design of training programs that integrates technology for student learning.
2.
3. I take some responsibility for the design and implementation of professional development and occasionally participate in a training program that effectively integrates technology for improved student learning.
4.
5. I can design, implement, support, and participate in professional development for all instructional staff that institutionalizes effective integration of technology for improved student learning.

Applies technology to increase information management

1. I recognize the value of using technology-based management systems but lack the skills to use them.
2.
3. I occasionally use technology-based management systems to access and maintain personnel and student records.
4.
5. I use technology-based management systems to access and maintain personnel and student records whenever possible.

Technology communication tools

1. I recognize the value of electronic communication tools, but I lack the training or necessary support to use them.
2.
3. I use the basics of electronic communication tools such as creating, sending and reading e-mail messages.
4.
5. I am able to use a variety of media and formats, including telecommunications and the school Web site to communicate, interact, and collaborate with peers, experts, and other educational stakeholders.

Campus-wide staff development

1. I am aware of the value of professional development in my building, but I lack the strategies for implementing a comprehensive professional development program for technology use.
2.
3. I have begun implementing a professional development program in my building, but would like additional educational technology strategies.
4.
5. I have implemented a campus-wide staff development program for sharing work and resources across commonly used formats and platforms and sometimes serve as a resource for others.

Ensure continuous improvement in technology

1. I am aware of the need to develop a plan to provide adequate resources for technology use, but lack the strategies to do so.
2.
3. I follow the districts procedures to drive continuous improvements of technology systems when necessary.
4.
5. I have implemented procedures to drive continuous improvements of technology systems and to support technology replacements cycles.

Evaluating technology resources for student learning

1. I am not familiar with multiple methods for evaluating technology resources for student learning and productivity.
2.
3. I occasionally use technology resources to access, analyze and interpret data for student learning and productivity.
4.
5. I promote and model the use of technology to access, analyze and interpret data to focus on efforts for improving student learning and productivity.

Evaluating staff use of technology

1. I am not comfortable observing and evaluating staff use of technology in support of learning.
2.
3. I am comfortable observing and evaluating staff use of technology in support of learning and occasionally offer professional development suggestions.
4.
5. I have implemented evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning.

Using technology usage in assessing instructional performance

1. I lack the expertise or background to prescribe uses of instructional technology for my staff.
2.
3. I sometimes recognize where technology might be valuable as a solution to a learning problem encountered by my staff and confer with them as to how those technologies might be used.
4.
5. I include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff.

Equitable technology access

1. I recognize the importance of allowing each student to have equitable access to the available technology but lack organizational strategies to do so.
2.
3. I develop or follow a schedule to provide each student with equitable access to available technology.
4.
5. I locate and schedule technologies to provide each student with the necessary resources to support their individual learning needs.

Ethical use of technology

1. I recognize the ethics related to the use of technology, but do not have a depth of understanding to deal with those on a daily basis.
2.
3. I recognize the ethics related to the use of technology and follow the districts acceptable use policy whenever possible.
4.
5. I adhere to and enforce among staff and students the districts acceptable use policy and other policies and procedures related to the use of technology.

Part III

Directions: Each question presents three different descriptions of a skill level or professional practice relating to specific areas of educational technology. For each item, click on the button, which best represents, your assessment of the current skill level or professional practice in the area described for the most (50 % or more) or majority of the teachers in your building. Columns 2 and 4 are left blank to allow you to indicate that your perception lie somewhere between the provided descriptions. Click on the button to indicate your position on the five-point scale in each row.

Technology Use – Most of the teachers in my building . . .

1. Currently use technology at a novice level. (Teachers often find tasks are easier to complete without technology.)
2.
3. Currently use technology at an intermediate level. (Teachers can use suite of office applications and believe that these applications have improved efficiency.)
4.
5. Currently use technology at an advanced level. (Teachers are able to choose tools that are appropriate for instruction and often serve as a resource to others.)

Technology Concepts – Most of the teachers in my building . . .

1. Have little interest in learning new technology concepts.
2.
3. Participate in technology training when it is offered.
4.
5. Share their expertise and collaborated with others to integrate technology.

Technology-enhanced instructional strategies – Most of the teachers in my building . . .

1. Are not familiar with technology-enhanced instructional strategies in a classroom.
2.
3. Have observed technology-enhanced instructional strategies that support the diverse needs of learners.
4.
5. Feel comfortable designing technology-enhanced instructional strategies that support the diverse needs of learners.

Locating and evaluating technology resources – Most of the teachers in my building . . .

1. Do not feel comfortable locating and evaluating technology resources.
2.
3. Have some experience in locating and evaluating technology resources.
4.
5. Frequently locate and evaluate technology resources and use them in their instructional practices.

Using technology that addresses content standards and student technology standards – Most of the teachers in my building . . .

1. Are unfamiliar with using technology-enhanced lessons to meet content standards.
2.
3. Are learning how to use technology-enhanced lessons that meet content standards.
4.
5. Use technology-enhanced lessons to meet content standards and share experiences with others.

Using technology to develop students' higher order thinking skills – Most of the teachers in my building . . .

1. Use technology for drill and practice only, or not at all.
2.
3. Use technology to have students complete traditional classroom work assisted by computer applications.
4.
5. Enable students to use technology to creatively demonstrate comprehension of complex thought processes.

Use technology to collect data, interpret results, and communicate findings to maximize student learning – Most of the teachers in my building . . .

1. Do not know how to use technology to collect, compile, and analyze student data.
2.
3. Are comfortable in using technology to collect, compile, and analyze student data.
4.
5. Are comfortable demonstrating to others how to use technology to collect, compile, and analyze student data.

Evaluating technology resources for student learning – Most of the teachers in my building . . .

1. Are not familiar with any methods for evaluating technology resources for student learning, communication and productivity.
2.
3. Are learning how to evaluate technology resources for student learning, communication and productivity.
4.
5. Are proficient in using a wide variety of methods for evaluating technology resources for student learning, communication and productivity.

Apply technology to increase productivity – Most of the teachers in my building . . .

1. Have not used productivity technology tools to enhance instruction and efficiently complete administrative tasks.
2.
3. Can use productivity technology tools to enhance instruction and efficiently complete administrative tasks.
4.
5. Can share with others ways to use productivity tools to enhance instruction and efficiently complete administrative tasks.

Use of technology to communicate and collaborate with audience at-large – Most of the teachers in my building . . .

1. Do not understand how to use technology to enhance school, home, and community communications.
2.
3. Have learned how to use technology to enhance school, home, and community communications.
4.
5. Are proficient in using technology to enhance school, home, and community communications.

Ethical and societal issues related to technology – Most of the teachers in my building . . .

1. Do not have sufficient knowledge or training to guide students in the consideration of the social and legal issues related to the use of technology.
2.
3. Occasionally involve students in the consideration of social and legal issues related to the use of technology.
4.
5. Always involve students in the consideration of the social and legal issues related to the use of technology.

Equitable access to technology resources – Most of the teachers in my building . . .

1. Do not see a way that they can support equal access to technology issues.
2.
3. Have sometimes tried to be an advocate for equal access to technology for students in our schools, communities and home.
4.
5. Are always advocates for equal access to technology for students in our schools, communities and home.

The following continuum is used as a model for ways teacher's structure instruction as they move toward technology integration. Columns 2 and 4 are left blank to allow you to indicate that your perception lie somewhere between the provided descriptions. Most of the teachers in my building fall into the category of:

1. Entry – Teachers are aware of the possibilities that technology holds for improving achievement, yet learning, teaching and the system remain relatively unchanged by technology.
2.
3. Adaptation – Technology is thoroughly integrated into existing practice.
4.
5. Transformation – Technology is a catalyst for significant changes in learning practices.

Appendix H

Experts in the Field

Baker, Rowland; Center for Administrative Leadership

Berg, L.B.; The Virginia Educational Technology Alliance College of William and Mary

Bosco, Jim; University of Western Michigan

Brooks-Young, Susan; Consultant

Cory, Sheila; Principals' Executive Program

Knezek, Don; Chief Executive Officer of ISTE

McLeod, Scott; University of Minnesota

Nolan, Lynn; Professional Development Director of ISTE

Scott, Steve; Pittsburgh State University

Appendix I

PRINCIPAL TECHNOLOGY STANDARDS PERCEPTION SURVEY (PTSP) CONTENT VALIDITY PROCEDURES

The PTSP items were developed around the six technology performance indicators for teachers and administrators developed by the International Society of Technology in Education (ISTE).

Technology Standards for Teachers:

1. **Technology Operations and Concepts** – Teachers demonstrate a sound understand of technology operations and concepts.
2. **Planning and Designing Learning Environments and Experiences** – Teachers plan and design effective learning environments and experiences supported by technology.
3. **Teaching, Learning, and the Curriculum** – Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.
4. **Assessment and Evaluation** – Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.
5. **Productivity and Professional Practice** – Teachers use technology to enhance their productivity and professional practice
6. **Social, Ethical, Legal, and Human Issues** – Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply that understanding in practice. (International Society for Technology in Education, 2000)

Technology Standards for Administrators:

1. **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.
2. **Learning and Teaching** - Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.
3. **Productivity and Professional Practice** - Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.
4. **Support, Management, and Operations** - Educational leaders ensure the integration of technology to support productive systems for learning and administration.
5. **Assessment and Evaluation** - Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.
6. **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 (International Society for Technology in Education, 2002).

Directions: Please use the following scale to rate each item in terms of their appropriateness in assessing the effects of technology training (specifically Leadership Talks for Technology Administrators) on principal's attitudes in regards to personal technology skills (Part I), principal perception of average teacher technology ability (Part II), and administrative standard perception (Part III). If possible, please provide ways to improve items that you rate "1" or "2".

1 = Not Appropriate   2 = Marginally Appropriate   3 = Very Appropriate

Part I

Directions: Each question presents three different levels of a skill or professional practice relating to specific areas of educational technology. Click on the button to indicate your position on the five-point scale in each row. Columns 2 and 4 are left blank to allow you to indicate that your perception of your skills and practice lie somewhere between the provided descriptions.

Basic Skills

1	2	3	4	5
I can't do this		I am comfortable working through this on my own.		I feel comfortable helping others with this topic.

Basic Skills

Word Processing	1	2	3	4	5 – 1 2 3
Databases	1	2	3	4	5 – 1 2 3
Spreadsheets	1	2	3	4	5 – 1 2 3
E-mail	1	2	3	4	5 – 1 2 3
Attach files to E-mail	1	2	3	4	5 – 1 2 3
Multimedia/presentation software (PowerPoint)	1	2	3	4	5 – 1 2 3
Web page browsing	1	2	3	4	5 – 1 2 3
Finding information with web searches	1	2	3	4	5 – 1 2 3
New features in software programs	1	2	3	4	5 – 1 2 3
Troubleshooting software problems	1	2	3	4	5 – 1 2 3
Troubleshooting hardware problems	1	2	3	4	5 – 1 2 3

Part II

Directions: Each question presents three different descriptions of a skill level or professional practice relating to specific areas of educational technology. For each item, click on the button, which best represents, your assessment of the current skill level or professional practice in the area described for the majority (50 % or more) or most of the teachers in your building. Columns 2 and 4 are left blank to allow you to indicate that your perception lie somewhere between the provided descriptions. Click on the button to indicate your position on the five-point scale in each row.

Technology Use – Most of the teachers in my building . . .

1. Currently use technology at a novice level
2.
3. Currently use technology at an intermediate level.
4.
5. Currently use technology at an advanced level.

1 2 3

Technology Concepts – Most of the teachers in my building . . .

1. Have little interest in learning new technology concepts.
2.
3. Participate in technology training when it is offered.
4.
5. Share their expertise and collaborated with others to integrate technology.

1 2 3

Technology Literature – Most of the teachers in my building . . .

1. Do not read any literature on technology.
2.
3. Read some literature on technology.
4.
5. Read journals, periodicals, books and the latest research on technology.

1 2 3

Technology-enhanced instructional strategies – Most of the teachers in my building . . .

1. Are not familiar with technology-enhanced instructional strategies in a classroom.
2.
3. Have observed technology-enhanced instructional strategies that support the diverse needs of learners.
4.
5. Feel comfortable designing technology-enhanced instructional strategies that support the diverse needs of learners.

1 2 3

Use of current technology research in planning strategies – Most of the teachers in my building . . .

1. Have never had the opportunity to discuss how educational technology research could be incorporated into lesson plans.
2.
3. Have discussed with fellow teachers or mentors how to implement educational technology research in lesson plans.
4.
5. Have implemented educational technology research in lesson plans.

1 2 3

Locating and evaluating technology resources – Most of the teachers in my building . . .

1. Do not feel comfortable locating and evaluating technology resources.
2.
3. Have some experience in locating and evaluating technology resources.
4.
5. Frequently locate and evaluate technology resources and use them in their instructional practices.

1 2 3

Using technology that addresses content standards and student technology standards – Most of the teachers in my building . . .

1. Are unfamiliar with using technology-enhanced lessons to meet content standards.
2.
3. Are learning how to use technology-enhanced lessons that meet content standards.
4.
5. Use technology-enhanced lessons to meet content standards and share experiences with others.

1 2 3

Using technology that addresses the diverse needs of students – Most of the teachers in my building . . .

1. Do not know of any technology tools that could help them in differentiating instruction.
2.
3. Are aware of technology tools that would differentiate instruction to meet the diverse needs of students.
4.
5. Are able to teach with a variety of technology tools that would differentiate instruction to meet the diverse needs of students.

1 2 3

Using technology to develop students' higher order thinking skills – Most of the teachers in my building . . .

1. Use technology for drill and practice only, or not at all.
2.
3. Use technology to have students complete traditional classroom work assisted by computer applications.
4.
5. Enable students to use technology to creatively demonstrate comprehension of complex thought process.

1 2 3

Applying technology in assessing student learning – Most of the teachers in my building . . .

1. Do not know how to demonstrate the understanding of subject material through technology-based productions.
2.
3. Have learned how to demonstrate the understanding of subject material through technology-based productions.
4.
5. Can now teach a student how to demonstrate the understanding of subject material through technology-based productions.

1 2 3

Use technology to collect data, interpret results, and communicate findings to maximize student learning – Most of the teachers in my building . . .

1. Do not know how to use technology to collect, compile, and analyze student data.
2.
3. Are comfortable in using technology to collect, compile, and analyze student data.
4.
5. Are comfortable demonstrating to others how to use technology to collect, compile, and analyze student data.

1 2 3

Evaluating technology resources for student learning – Most of the teachers in my building . . .

1. Are not familiar with multiple methods for evaluating technology resources for student learning, communication and productivity.
2.
3. Are comfortable with evaluating technology resources for student learning, communication and productivity.
4.
5. Are comfortable demonstrating to others how to use a wide variety of methods for evaluating technology resources for student learning, communication and productivity.

1 2 3

Evaluating professional practices regarding student learning – Most of the teachers in my building . . .

1. Have never evaluated or reflected on the use of technology to support student learning.
2.
3. Have occasionally evaluated and reflected on different ways they can efficiently use technology to support student learning.
4.
5. Continually evaluated and reflected on different ways they can efficiently use technology to support student learning.

1 2 3

Apply technology to increase productivity – Most of the teachers in my building . . .

1. Have not used productivity technology tools to enhance instruction and efficiently complete administrative tasks.
2.
3. Can use productivity technology tools to enhance instruction and efficiently complete administrative tasks.
4.
5. Can share with others ways to use productivity tools to enhance instruction and efficiently complete administrative tasks.

1 2 3

Use of technology to communicate and collaborate with audience at-large – Most of the teachers in my building . . .

1. Do not understand how to use technology to enhance school, home, and community communications.
2.
3. Have learned how to use technology to enhance school, home, and community communications.
4.
5. Are proficient in using technology to enhance school, home, and community communications.

1 2 3

Ethical and societal issues related to technology – Most of the teachers in my building . . .

1. Do not have sufficient knowledge or training to guide students in the consideration of the social and legal issues related to the use of technology.
2.
3. Occasionally involve students in the consideration of social and legal issues related to the use of technology.
4.
5. Always involve students in the consideration of the social and legal issues related to the use of technology. 1 2 3

Equitable access to technology resources – Most of the teachers in my building . . .

1. Do not see a way that they can be a part of the equal access to technology issues.
2.
3. Have sometimes tried to be an advocate for having equal access to technology for students in our schools, communities and home.
4.
5. Are always an advocate for having equal access to technology for students in our schools, communities and home.

1 2 3

The following continuum is used as a model for ways teacher's structure instruction as they move toward technology integration. Most of the teachers in my building fall into the category of:

1. Automation – technology is little more than an electronic worksheet
2.
3. Expansion – students become more actively engaged in searching for information and writing reports
4.
5. Data-driven virtual learning – students engage in authentic project/problem-based learning and assume responsibility for managing their own learning

1 2 3

Part III

Directions: Each question presents three different descriptions of a skill level or professional practice relating to specific areas of educational technology. Columns 2 and 4 are left blank to allow you to indicate that your perception of your skills and practice lie somewhere between the provided descriptions. Click on the button to indicate **your** position on the five-point scale in each row.

Technology vision and planning – 1a

1. I do not have knowledge of a district wide plan that clearly defines expectations for technology use.
2.
3. I have knowledge of a district wide plan that clearly defines expectations for technology use, but do not know the procedures to implement the plan.
4.
5. I participated in an inclusive district process through which stakeholders formulated a shared vision that clearly defines expectations for technology use and use the district technology plan as a guide for educational technology in the building.

1 2 3

Promoting effective technology practices – 1c

1. I recognize the value of effective practices in technology integration among faculty, but lack the skills and strategies to do so.
2.
3. I am somewhat familiar with effective practices in technology integration, and ask faculty to use them when they can.
4.
5. I promote highly effective practices in technology integration among faculty and other staff.

1 2 3

Using technology for student instruction – 2a

1. I lack the expertise or background in the use of technology to access, analyze, and interpret student performance data to modify instructional practices for my staff.
2.
3. I sometimes recognize where the use of technology to access, analyze, and interpret student performance data may be used to modify instructional practices for my staff.
4.
5. I can assist faculty in using technology to access, analyze, and interpret student performance data, and in using results to appropriately design, assess, and modify student instruction.

1 2 3

Professional development practices for technology use – 2b

1. While I understand the importance of professional development for my staff, I do not normally participate in the design of training programs that integrates technology for student learning.
2.
3. I take some responsibility for the design and implementation of professional development and occasionally participate in a training program that effectively integrates technology for improved student learning.
4.
5. I can design, implement, support, and participate in professional development for all instructional staff that institutionalizes effective integration of technology for improved student learning.

1 2 3

Applies technology to increase information management – 3a

1. I recognize the value of using technology-based management systems but lack the skills to use them.
2.
3. I occasionally use technology-based management systems to access and maintain personnel and student records.
4.
5. I use technology-based management systems to access and maintain personnel and student records whenever possible.

1 2 3

Technology communication tools – 3b

1. I recognize the value of electronic communication tools, but I lack the training to use them.
2.
3. I use the basics of electronic communication tools such as creating, sending and reading e-mail messages.
4.
5. I am able to use a variety of media and formats, including telecommunications and the school Web site to communicate, interact, and collaborate with peers, experts, and other educational stakeholders.

1 2 3

Campus-wide staff development – 4a

1. I am aware of the value of professional development in my building, but I lack the strategies for implementing a comprehensive professional development program for technology use.
2.
3. I have begun implementing a professional development program in my building, but would like additional educational technology strategies.
4.
5. I have implemented a campus-wide staff development program for sharing work and resources across commonly used formats and platforms and sometimes serve as a resource for others.

1 2 3

Technology Funding – 4b

1. I provide some funding for the use of technology in my building, but cannot fund all the needs of my staff.
2.
3. I allocate funds for new technology and upkeep of existing technology, but lack adequate funds to fully implement the district technology plan.
4.
5. I allocate district budget, discretionary funds and other resources to advance implementation of the district technology plan.

1 2 3

Ensure continuous improvement in technology- 4c

1. I am aware of the need to develop a plan to provide adequate resources for technology use, but lack the strategies to do so.
2.
3. I follow the districts procedures to drive continuous improvements of technology systems when necessary.
4.
5. I have implemented procedures to drive continuous improvements of technology systems and to support technology replacements cycles.

1 2 3

Evaluating technology resources for student learning – 5a

1. I am not familiar with multiple methods for evaluating technology resources for student learning and productivity.
2.
3. I occasionally use technology resources to access, analyze and interpret data for student learning and productivity.
4.
5. I promote and model the use of technology to access, analyze and interpret data to focus on efforts for improving student learning and productivity. 1 2 3

Evaluating staff use of technology – 5b

1. I am not comfortable observing and evaluating staff use of technology in support of learning.
2.
3. I am comfortable observing and evaluating staff use of technology in support of learning and occasionally offer professional development suggestions.
4.
5. I have implemented evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning.

1 2 3

Using technology usage in assessing instructional performance –5c

1. I lack the expertise or background to prescribe uses of instructional technology for my staff.
2.
3. I sometimes recognize where technology might be valuable as a solution to a learning problem encountered by my staff and confer with them as to how those technologies might be used.
4.
5. I include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff.

1 2 3

Equitable technology access – 6a

1. I recognize the importance of allowing each student to have equitable access to the available technology but lack organizational strategies to do so.
2.
3. I develop or follow a schedule to provide each student with equitable access to available technology.
4.
5. I locate and schedule technologies to provide each student with the necessary resources to support their individual learning needs.

1 2 3

Ethical use of technology – 6b

1. I recognize the ethics related to the use of technology, but do not have a depth of understanding to deal with those on a daily basis.
2.
3. I recognize the ethics related to the use of technology and follow the districts acceptable use policy whenever possible.
4.
5. I adhere to and enforce among staff and students the districts acceptable use policy and other policies and procedures related to the use of technology.

1 2 3

Technology environmentally safe practices - 6c

1. I recognize the need to develop facility plans that support and focus on health and environmentally safe practices related to the use of technology, but I lack the strategies to do so.
2.
3. I am somewhat familiar with the development of facility plans that support and focus on health and environmentally safe practices related to the use of technology.
4.
5. I participate in the development of facility plans that support and focus on health and environmentally safe practices related to the use of technology.

1 2 3

Appendix J

Table 12.

Rank Order of Skills and Standards of LTTA Participants in Comparison to Non-Participants by Mean and Standard Deviation

Part I-Basic Skills	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
	LTTA Participants		**Non Participants**	
E-mail	4.53	0.61	4.09	0.90
Word Processing	4.43	0.68	4.04	0.83
Web page browsing	4.09	0.90	3.59	1.03
Web searches	4.04	0.82	3.68	0.92
Multimedia	3.65	0.99	2.99	1.27
Spreadsheets	3.40	1.00	2.91	1.12
Software programs	3.21	0.94	2.69	1.12
Databases	3.07	1.01	2.68	1.06
Hardware problems	2.63	1.04	2.13	1.05

Part II-Administrative Technology Standards	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
	LTTA Participants		**Non Participants**	
Promoting technology practices	3.54	0.88	3.09	0.32
Equitable technology access	3.29	1.00	3.14	1.23
Vision & planning	3.17	0.67	2.87	0.92
Communication tools	3.17	0.86	2.84	0.92
Student instruction	3.11	0.70	2.76	0.98
Professional development	3.11	0.95	2.67	0.93
Evaluating staff use	2.92	0.96	2.90	1.02
Assessing instructional performance	2.86	1.01	2.74	1.05
Information management	2.83	0.87	2.51	1.00
Evaluating technology resources	2.83	0.91	2.43	1.00
Ethical use of technology	2.59	0.85	2.29	0.89
Continuous improvement	2.58	0.86	2.45	0.99
Staff development	2.49	1.01	2.09	0.90

Part III-Teacher Technology Standards				
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
	LTTA Participants		**Non Participants**	
Using technology that addresses standards	4.30	0.96	3.42	1.31
Higher order thinking skills	4.22	0.81	3.67	0.88
Technology concepts	3.86	0.98	3.27	1.30
Instructional strategies	3.68	0.97	3.30	1.16
Technology use	3.65	1.08	3.14	1.23
Locating technology resources	3.62	0.99	3.03	1.09
Increase productivity	3.57	1.09	2.91	1.17
Evaluating technology resources	3.49	0.98	2.94	1.14
Equitable access	3.44	1.09	2.89	1.01
Ethical issues	3.38	0.90	2.90	1.03
Communicate and collaborate	3.32	0.80	2.92	0.95
Maximize student learning	3.08	0.98	2.53	0.94