School Leaders' Effect on Technology

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SCHOOL LEADERS’ EFFECT ON TECHNOLOGY

by

Irene Amos Causey

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
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ABSTRACT

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Because of increasing heavy investments in technology during an era of accountability within K-12 public schools, school leaders are expected to be flexible and innovative in order to produce the most effective and efficient use of technology. School leaders in this research study included principals, assistant principals, and technology coordinators from intercoastal elementary, middle, and high public schools in South Mississippi. This causal comparative study examined whether or not a correlation existed among school leaders’ attitude toward technology use and years of technology training, confidence and comfort using technology and school accreditation level, school leaders’ preparation for technology use and administrative experience, and school leaders’ confidence and comfort using technology and age. Finally, this study examined whether there was a more positive attitude of technology among school leaders in schools that received Cisco funding versus Non-Cisco school leaders. Using the School Leader Survey of Technology Use survey instrument, respondent data was analyzed via Pearson Correlation, Spearman Rho Correlation Coefficient, and an independent samples t test.

Principal dissertation findings include: (a) school leaders’ attitude toward technology use was not related to years of technology training ($r(67) = .123, p = .320$); (b) school leaders’ confidence and comfort using technology was not related to their school accreditation level ($r(68) = -.012, p = .921$); (c) school leaders’ preparation for technology use was not related to their administrative experience ($r(66) = -.081, p = .520$)
(d) school leaders’ confidence and comfort using technology was less positive as age increases ($\rho(70) = -.277, p = 0.019$); and (e) there was not a more positive correlation between school leaders’ attitude toward technology in Cisco schools versus school leaders’ attitude toward technology in non-Cisco schools No significant difference was found ($t(70) = -.859, p = .393$). The mean of the Cisco school leaders’ attitude toward technology ($m = 4.31, sd = .42$) was not significantly different from the mean of the Non-Cisco school leaders’ attitude towards technology ($m = 4.39, sd = .35$).
DEDICATION

To each of my deceased parents, Tanner Allen Amos and Clara Lee Amos, in each of your individual ways, you inspired and motivated me in very special and unique ways. For that I am eternally grateful; I love and miss you both.
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CHAPTER I

INTRODUCTION

The International Society for Technology in Education (ISTE) and its National Educational Technology Standards (NETS) Team announced the National Education Technology Standards for Administrators (NETSA) Project in 2002. A significant beginning to the NETSA Project was the publication of the *Technology Standards for School Administrators* (TSSA) document. The intent of the document was to identify knowledge and skills that constitute the *core* of what every K-12 administrator needs to know regardless of specific job title. These standards are indicators of effective leadership for technology in schools. They do not define the minimum or maximum level of knowledge and skills required of a principal, but rather represent a consensus among educational leaders of what best indicates effective school leadership for the effective and efficient use of technology in schools (Alvy & Robbins, 2003).

According to Quality Education Data (QED) surveys of U.S. district expenditures, over $6 billion was spent (not including E-rate funds) in 2002-2003 on educational technology in schools (Anderson & Dexter, 2003). This heavy investment in technology suggests that school leaders feel that it shows some promise for contributing to schools’ effectiveness and improvement efforts.

In the 1980s, economic research on school expenditures suggested that different patterns or amounts of spending did not have major effects on student learning (Hanushek, 1989). However, a growing body of research argued that expenditure patterns—particularly how schools spend their funds—did have consequences for teaching and learning (Hedges & Greenwald, 1996; Ladd, 1996; National Research Council, 1999). Research on such questions is difficult, and has yet to be applied to particular areas of
expenditure such as how schools spend funds for information and communication technologies. Yet for two decades, schools spent increasing portions of their discretionary funds to acquire computer equipment, software, and related supplies and services (Pelavin, 1997), and they were under continuing pressure to make those expenditures count. Some policy panels recommended dramatic increases in spending rates with the expectation that the result would clearly improve student academic accomplishment. For instance, the President’s Committee of Advisors on Science and Technology: Panel on Educational Technology (1997) recommended a three-fold increase in public spending on technology-related resources and services.

The vast majority of school technology-related expenditures had been devoted to building up the hardware infrastructure of computers, peripherals, and network connections. Much of this expenditure was to keep up with an ever-changing market supplying newer and more capable computer-related equipment. Estimates of K-12 spending on educational technology during the early 1990s were that nearly two-thirds of all investments in technology had been for this technical infrastructure (McKinsey & Co., 1995). Beginning in the mid-1990s, American schools added expenditures for Internet access to their technology budgets. Thus the share of technology-related dollars spent for hardware is greater now than before Internet connections became widespread in schools (Leithwood & Riehl, 2003).

The widespread consensus among those in government and research who have been studying computer use in education is that effective use of educational technology depends most strongly on the human element—on having teachers and support personnel who not only have technical skills in using computers but also practical pedagogical knowledge about designing computer activities that create intellectually powerful learning environments for students (Leithwood & Riehl, 2003).
Similarly, Stiroh (2001) emphasized there are several reasons why education leaders are expected to know and utilize instructional technology, especially those technologies related to computer use for accessing and finding information and for creating and communicating new knowledge. These reasons include the following:

1. The need to prepare students to function in an information-based, Internet-using society;

2. The need to make students competent in using tools found in almost all work areas; and

3. The need to make education more effective and efficient (Stiroh, 2001).

The Office of Technology Assessment (OTA) Report on Teachers and Technology concluded, for example, “To use technology effectively, teachers need more than just training about how to work the machines and technical support. They need hands-on learning, time to experiment, easy access to equipment, and ready access to support personnel…” (1995, p.129). The President’s Committee of Advisors on Science and Technology: Panel on Educational Technology (1997) and the CEO forum (1999) drew similar conclusions. The Department of Education’s (2000) National Technology Plan made improving “the instructional support available to teachers who use technology” a national goal (Anderson & Dexter, 2007). The Teaching, Learning, and Computing, (TLC) Report by Ronkvist, Dexter, and Anderson (2000) summarized the critical ingredients of quality support and showed how important such support can be to successful technology integration.

Furthermore, when school leaders hire technology experts or outside consultants who are not familiar with the school’s curriculum and instruction, there can be a loss of continuity in the training and support offered to faculty and staff. Such “flavor of the month”
approaches can impede the success of technology implementation within a school. Faculty and staff are typically not as receptive to information from “experts” who are not familiar with their classroom environment. Technology implementation that works successfully in one school may not necessarily be beneficial in another school. Teaching and learning should be the driving force for successful technology implementation. Input from teachers within the school is an excellent resource for the best technology investment for school administrators (Creighton, 2003).

The costs of technology are not equal in different types of schools. Low-income school districts are likely to require greater expenditures due to having older facilities and higher security problems (Pelavin, 1997). In addition, schools serving communities with poverty and high mobility may not be able to develop exceptional financing methods such as corporate donations and parent fundraising activities. Moreover, the schools with the greatest need are the ones whose students are also least likely to have access to computers and the Internet at home (Leithwood & Riehl, 2003).

The No Child Left Behind (NCLB) Act of 2001, established Title II Part D known as Enhancing Education Through Technology (The Facts About 21st-Century Technology, 2001; NCLB, 2001). This legislation lists as a primary goal, “to improve student academic achievement through the use of technology in elementary schools and secondary schools” (NCLB, 2001, p. 221). Other goals include having students exit eighth grade technologically literate and integrating technology effectively into teacher preparation and curriculum development. Technology resources must be aligned to state standards, and the effectiveness of those resources in improving student achievement must be measured with quantitative methods (Cradler, 2003). Unfortunately, large-scale scientific studies called for in NCLB are expensive
and local and federal funding for this required research is limited (Bitter & Pierson, 2005).

In order to meet NCLB goals, students and teachers must have reliable connectivity and adequate access to current technology. In 2001, 99% of U.S. public schools reported access to the Internet, up from 35% in 1994 (Kleiner & Farris, 2002). Of those with access somewhere in the building in 2001, 87% of schools had Internet access in all instructional rooms. Overall, the ratio of students to Internet-ready instructional computers was 5.4 to 1, and three-quarters of public schools posted a website in 2001. Somewhat surprising is the fact that newer teachers, those with less than five years’ experience, are no more likely to use technology than are teachers who have been in the classroom over 20 years (Fatemi, 1999). This statistic hints at a more complex challenge than can be met by simply purchasing adequate hardware (Bitter & Pierson, 2005).

Moss Kanter argued that,

Too often, new technologies have been used to kill time instead of teach better. Too often, technology (e.g., software) has promoted glitz, glamour, and graphics instead of serious learning. Too often, the Internet has promoted the surfing culture where users click their way across an ocean of information, feeling overwhelmed by the vastness of it all and never dipping below the surface. (as cited in Creighton, 2003, p. xii)
To really influence reform in schools, the principal as technology leader must stay focused on the individual needs of local teachers and students, rather than race to adopt the “flavor of the month” program (Creighton, 2003, p. 5). There are good reasons to focus on school leadership. The importance of the principal's role has never been greater, taking into consideration national accountability standards for schools and the likelihood that job vacancies for principals will increase in the near future. Not only do effective principals focus attention on curriculum and teaching, they also understand teaching and possess credibility in the eyes of their staff (Mazzeo, 2003).

Recently, Cisco Systems, Inc. has taken steps to help principals influence reform in public schools. Cisco Systems, Inc. is an American-based multinational corporation that designs and sells consumer electronics, networking, voice, and communications technology and services. Headquartered in San Jose, California, Cisco has more than 70,714 employees and annual revenue of $40 billion as of 2010. By most measures (e.g., revenue, market capitalization, number of employees), Cisco is one of the world's biggest technology corporations (Cisco Systems, Inc., 1992-2011).

Furthermore, at Cisco Systems, Inc. customers come first and an integral part of its goal is creating long-lasting customer partnerships and working with them to identify their needs and provide solutions that support their success. The concept of solutions being driven to address specific customer challenges has been with Cisco since its inception. Husband and wife Len Bosack and Sandy Lerner, both working for Stanford University, wanted to email each other from their respective offices located in different buildings but were unable to due to technological shortcomings. A technology had to be invented to deal with disparate local area protocols; and as a result of solving their challenge - the multi-protocol router was born. Since
then Cisco has shaped the future of the Internet by creating unprecedented value and opportunity for its customers, employees, investors and ecosystem partners and has become the worldwide leader in networking-transforming how people connect, communicate and collaborate (Cisco Systems, Inc., 1992-2011).

For this reason on October 25, 2005, Cisco Systems, Inc. announced a $40 million commitment in a multi-phase, three-year education initiative in the Mississippi Gulf Coast region to aid in post Hurricane Katrina rebuilding activities. Through its 21st Century Schools (“21S”) Initiative, Cisco Systems, Inc. aimed to improve the quality of education for the affected communities. Cisco committed $20 million specifically for the Mississippi Education Initiative (MEI) to rebuild, improve, and expand the learning opportunities for students in 36 schools in Mississippi. The project included educational technology, online curriculum materials, and professional development to facilitate innovative and effective teaching and learning (Carless, 2005a).

In the second phase, Cisco committed an additional $20 million in 2011 to expand within the area devastated by Hurricane Katrina. This funding was made available consistent with plans agreed upon by senior leaders at the state and regional level and with leaders of educational institutions for the rebuilding and modernization of their educational systems (Carless, 2005a).

Anderson and Becker’s (2001) report documented the relative neglect of spending for software and technology support. Without both greater attention to improving the quality of support for teachers and their instructional applications of new technology, schools will lack the capacity to take advantage of technology’s potential for improving instruction. The lack of investment in software in particular seemed striking, given that teacher directed student use of
computers during class time, teacher professional involvement with computers, and their perceptions of the effects computers have had on their teaching practice were all much more a function of their school’s investment in software than in hardware. A major digital divide in technology investment with poorer schools spending far less on technology than richer ones was also documented. Furthermore, the digital divide was widest in one of the two most critical areas, which was technology support. Schools with large concentrations of lower income students spent a smaller portion of their technology funds on teacher training and support than schools that served wealthier students. This finding suggested that not only does this lower the capacity of poorer schools to utilize the technology that they now have, but they are less likely to be able to evaluate and adapt to new technologies as they emerge in the future. Finally, the Clinton administration in the early 1990s appealed to the nation to close digital divides (Anderson & Becker, 2001).

Along with the digital divide, attitude towards technology use within the school setting are an important and often overlooked component of successful curriculum integration of technology. Much of the research done on successful technology integration assumes that once appropriate technological tools are in place in the classroom, students, teachers, and parents will overwhelmingly support the change toward a technologically based curriculum (Alexiou-Ray, Peirano, Wilson, & Wright, 2003).

Leadership, especially from the principal, is generally acknowledged as an important influence on a school’s effectiveness, a belief that is supported by empirical evidence (Hallinger & Heck, 1996, 1998; Leithwood & Riehl, 2003). Studies of school improvement also point to the importance of principals’ leadership in such efforts (Berman & McLaughlin, 1978; Fullan, 2001; Fullan & Stiegelbauer, 1991; Louis, 1994).
For years educators have been discussing the importance of technology preparation for school administrators (Hope, Kelly & Kinard, 1999; Riedl, Smith, Ware, Wark, & Yount, 1998). However, colleges and schools of education have not been responding fast enough to meet the overwhelming need of including technology in their educational leadership programs (Becker, Dikkers, Hughes, Logan, Mayrose, McLeod, Quinn, & Richardson, 2005). These programs must recognize their responsibility in preparing future technology leaders and develop technology leadership as an integral component of administrator preparation and licensure. Some educational leadership programs started to infuse technology into their programs a few years ago (Chan & Redish, 2007).

Research Questions

The following questions will guide this research study:

1. Is there a positive correlation between school leaders’ attitude toward technology use and their years of technology training?
2. Is there a positive correlation between school leaders’ confidence and comfort using technology and their school accreditation level?
3. Is there a negative correlation between school leaders’ preparation for technology use and their administrative experience?
4. Is there a negative correlation between school leaders’ confidence and comfort using technology and their age?
5. Is there a more positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude towards technology in Non-Cisco schools?
Hypotheses

H1: As the number of years of technology training of school leaders increases, the school leaders’ attitude towards technology will be more positive.

H2: As the school accreditation level increases, the school leaders’ confidence and comfort towards using technology will be more positive.

H3: As the number of years of administrative experience of school leaders increases, the number of years for preparation for technology use will decrease.

H4: As their age increases, the school leaders’ confidence and comfort using technology will be less positive.

H5: Cisco school leaders will have a more positive attitude towards technology than Non-Cisco school leaders.

Definitions

Accreditation Level: A level of performance assigned by the Mississippi Department of Education’s accreditation system that rates public schools from 5 to 1: superior, exemplary, successful, under-performing, and low performing (Mississippi Department of Education, 2005).

Cisco Schools: Refers to public schools in South Mississippi that received a Cisco grant between 2005 and 2008 (Carless, 2005a).

Educational Technology: Multimedia technologies or audiovisual aids used as tools to enhance the teaching and learning process (Dennen & Spector, 2007). For the purpose of this study, educational technology will refer to computers, Internet, word processing, PowerPoint, electronic spreadsheets, computer programs, computer software, and computer accessories such as Promethean Boards, interactive whiteboards, and computer projectors.
**Educational Technology Coordinator:** An individual who develops and validates new methods and techniques to systematically improve learning and instruction; someone who takes responsibility and acts as a change agent for technology innovation and integration within a school (Dennen & Spector, 2007).

**Intercoastal Schools:** For the purpose of this study, are elementary, middle, and high schools in or around the Mississippi Gulf Coast.

**Instructional Technology:** Tools other than the teacher, chalkboard, or textbook that are used to present and enhance instruction (Reiser & Dempsey, 2002).

**Minority:** For the purpose of this study refers to non-white students in the school.

**Non-Cisco schools:** For the purpose of this study will include public schools in Mississippi located in school districts that did not receive a Cisco grant between 2005 and 2008.

**School Level:** Refers to a school’s type based on the grade levels served by the school and includes elementary, middle, and high schools (Mississippi Department of Education, 2005).

**SES:** An acronym for socioeconomic status; SES is assigned to schools based on the income level of households within the school’s zip code as reported in the Quality Education Data (Anderson & Dexter, 2003).

**Technology:** For the purpose of this study is the computers, computer software, Internet, Promethean Boards, interactive white boards, and computer accessories such as writing tablets, computer projectors, and digital video cameras.

**Technology Budget:** A district budget for technology costs over which the principal or someone else in the school had sole discretionary authority (Anderson & Dexter, 2007).

Delimitations
In this study, the following delimitations were established:

1. Only individuals listed as the principal, assistant principals, and education technology coordinator of the selected school at the time of the study were included. Lead teachers and other administrators were not included.

2. The study included public schools in Mississippi characterized as Cisco schools or non-Cisco schools.

3. The study of technology included public schools in Mississippi designated as intercoastal elementary, middle, and high schools.

4. The study used survey methodology; survey instruments were mailed to participants with a self-addressed stamped return envelope and/or were sent by email.

Assumptions

1. Principals, assistant principals, and education technology coordinators responded honestly and accurately to the questionnaire.

2. Cisco Systems, Inc. accurately identified participating schools (i.e., Cisco Schools).

3. Accreditation levels provided in the Mississippi Report Card were accurate and complete.

Justification

In 1983, the U.S. Department of Education’s National Commission on Excellence in Education published the landmark report, A Nation at Risk. It warned that “the educational foundations of our society are being eroded by a rising tide of mediocrity that threatens our
very future as a nation and a people” (p. 125). It made the case that students were not being challenged with high quality mathematics and science curricula and many students were not learning the basic skills. According to the National Commission on Education (1983) the majority of secondary school students in the United States were not grade-level proficient in reading, mathematics, or science.

Changes are occurring in public schools as a result of a growing digital marketplace, the rapid development of “virtual” schools, and the enthusiasm of a generation of students weaned on the marvels of technology. As technology natives, these students have literally forced schools to adapt and change in ways never before imagined. Despite the very real challenges that remain, present evidence suggests strongly that the United States may be entering a new golden age in American education (A Nation on the Move, 2006).

No Child Left Behind, signed into law by then President George Bush in January 2002, is already having a major impact on public education. Its ambitious goals, to end the achievement gap between rich, poor, white, and minority students and to improve the academic performance of all students by 2014, are requiring states and school districts across the country to reexamine their standards, set targets for improvement, introduce rigorous testing, and give options to parents (No Child Left Behind Act, 2002).

The NCLB Act (Title II, Part D, Subpart 1) set forth three goals for educational technology:

1. Use technology to improve the academic achievement of students in elementary and secondary schools.

2. Ensure that every student—regardless of race, ethnicity, gender, family
income, geographic location, or disability—is technologically literate by the end of the eighth grade.

3. Encourage the effective integration of technology with teacher training and curriculum development to establish widely implemented, research-based best practices.

Educational technology has become increasingly commonplace in classrooms, and Congress has spent billions to give schools access to technology and online learning opportunities (No Child Left Behind Act, 2002).

In conclusion, according to then President George W. Bush,

We cannot assume that our schools will naturally drift toward using technology effectively. We must commit ourselves to staying the course and making the changes necessary to reach our goals of educating every child. These are ambitious goals, but they are goals worthy of a great nation such as ours.

Together, we can use technology to ensure that no child is left behind. (U.S. Department of Education, 2004, p. 1)

As outlined in *EnGauge 21st Century Skills: Literacy in the Digital Age* (Lemke, 2002), school leaders should strive to help students become technologically literate. To that end, school leaders should also consider strategies to increase teachers’ technology skills and should model technology initiatives after nationally accepted guidelines such as the *National Educational Technology Standards for Teachers* (Valdez, 2004).

Summary

Technology plays a very significant role in every facet of life. Federal and state entities have developed technology education standards for students, teachers, and school leaders. This
study can help school leaders better understand the strong influence they have on utilizing technology which can lead students and teachers to greater educational excellence and increase the chances of meeting the technology goals of 2014 in the No Child Left Behind Act.

In conclusion, technology leadership is critical for effective use of technology and adhering to federal and state guidelines for public school educational systems. Factors such as attitude and years of technology training, confidence and comfort and school accreditation level, experience and years of preparation, and confidence and comfort and age that may affect effective and efficient utilization of technology by school leaders will be examined. Another factor examined will be school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude toward technology in non-Cisco schools.
CHAPTER II
REVIEW OF THE LITERATURE

Role of the School Leader

The effect of principals is considered second only to that of teachers in facilitating student learning (Leithwood, Seashore Louis, Anderson, & Wahlstrom, 2004; Marzano, Waters, & McNulty, 2005). Highly effective principals are considered to be "the key to initiating, implementing, and sustaining school success" (Tucker & Codding, 2002, p. 253); they are "imperative to high student achievement" (Anthes, 2005, p. 1). Consequently, principals are expected to promote and develop the school vision, empowering stakeholders to build and maintain the conditions necessary for the success of all students.

The nature of the principal's role has changed significantly in the past two decades, from primarily a managerial role to that of management and leadership (Lashway, 2002; Murphy, 2003; Shellard, 2003; Tucker & Codding, 2002). Despite the recent emphasis on instructional leadership, principals continue to be responsible for traditional duties such as facility management, budgeting, school safety, and student discipline—tasks that continue to absorb a considerable amount of time (Doyle & Rice, 2002; Lashway, 2002; Tirozzi & Ferrandino, 2001).

For example, due to the increasing number of responsibilities required of principals, it is not surprising to find that long hours are spent on the job. Elementary school principals work an average of 62 hours per week (Groff, 2001) while middle and high school principals spend successively greater amounts of time on the job (DiPaola & Tschannen-Moran, 2003). Although it is generally agreed that the principals' role has evolved in recent years, there is no clear definition of that role and no method to balance the responsibility of instructional
leadership with the myriad of other demands on their time (DeArmond, Gundlach, Portin, & Schneider, 2003). Given the competing demands for precious time, it is imperative not only for principals to do their work well, but also that they do the right work.

Furthermore, the role of principal has swelled to include a staggering array of professional tasks and competencies. Principals are expected to be educational visionaries, instructional and curriculum leaders, assessment experts, disciplinarians, community builders, public relations and communications experts, budget analysts, facility managers, special programs administrators, as well as guardians of various legal, contractual, and policy mandates and initiatives. In addition, principals are expected to serve the often conflicting needs and interests of many stakeholders, including students, parents, teachers, district office officials, unions, and state and federal agencies. As a result, many scholars and practitioners argue that the job requirements far exceed the reasonable capacities of any one person. The demands of the job have changed, so that traditional methods of preparing administrators are no longer adequate to meet the leadership challenges posed by public schools (American Association of Colleges for Teacher Education [AACTE], 2001; Elmore, 2000; Levine, 2005; Peterson, 2002).

Effective principals make student success pivotal to their work and, accordingly, pay attention to and communicate about instruction, curriculum, and student mastery of learning objectives, and are visible in the school. Learning needs to occur throughout organizations, and principals need to become participants in the learning process in order to shape and encourage the implementation of effective learning models in their schools. To illustrate, effective principals don't just arrange for professional development; rather, they participate in staff training provided to their staffs. Additionally, good principals foster the idea of working
together as a valuable enterprise because they understand that this kind of collaborative learning community ultimately will build trust, collective responsibility, and a school-wide focus on improved student learning (Prestine & Nelson, 2003).

In fact, effective principals—support instructional activities and programs by modeling expected behaviors and consistently prioritizing instructional concerns day-to-day. They strive to become a learner among learners. Involvement in curriculum, instruction, and assessment are crucial to the idea of instructional leadership. As part of their ongoing instructional leadership responsibilities, effective school principals are highly visible through contact and interaction with teachers, students, and parents, thus promoting the concept of a learning community (Marzano et al., 2005).

The demands that accompany high-stakes testing compel principals to guide their schools to learn from their results and experiences. Doing so will lead to coherence within a school and offer better opportunities to sustain results (Fullan, 2005). Finally, effective principals skillfully gather information that determines how well a school organization is meeting goals and use that information to refine strategies designed to meet or extend the goals. Thus, they find themselves in a constant state of analysis, reflection, and refinement. They challenge their staff to reexamine assumptions about their work and how it can be performed (Leithwood & Riehl, 2003).

Meanwhile, researchers and current writers on leadership have coined the term e-leadership (Avolio, 2000; Moss Kanter, 2001; Quinn-Mills, 2001). Harvard Business School professor Quinn-Mills (2001) contended that the core of e-leadership “requires leaders to identify those who are expert in the new technology and support them, even stepping out of the way if necessary---and letting new people point the direction giving them initiative---and
to build an organizational framework (positions and culture) in which the new can displace the old‖ (p. v).

Avolio (2000) discussed the relationship between leadership and technology and suggested that leaders must play a more proactive role in implementing technology, and more specifically, strive to interface the human and information technology components. In doing so, some have overemphasized the technological aspect at the exclusion of the human resource function. Avolio warned of the creation of “information junkyards” associated with such practices (p. 4). The essence of e-leadership is not to exclude human aspects, rather to produce a change in attitude, feelings, thinking, behavior, and performance of individuals.

Leadership plays a key role in successful reform. Knezek (2001), director of the Technology Standards for School Administrators project, stated,

Integrating technology throughout a school system is, in itself,

significant systemic reform. We have a wealth of evidence attesting to the importance of leadership in implementing and sustaining systemic reform in schools. It is critical, therefore, that we attend seriously to leadership for technology in schools. (p. 5)

Today's rapidly changing environment requires the principal as technology leader to become involved in discovering, evaluating, installing, and operating new technologies of all kinds, while keeping teaching and student learning as the guide and driving force behind it all. Vaill (1998) issued a similar caution: “The technologies the organization employs entail learning time to exploit their productive and economic potential” (p. 45). If schools are constantly upgrading their technologies, they may never reach a productive flow of instruction, a flow on which effective teaching and student learning is based (Creighton, 2003).
In conclusion, there are good reasons to focus on school leadership. The importance of the principal's role has never been greater, taking into consideration national accountability standards for schools and the likelihood that principal job vacancies will increase in the near future. Not only do effective principals focus attention on curriculum and teaching, they also understand teaching and possess credibility in the eyes of their staff (Mazzeo, 2003).

Theoretical Framework

The type of leader an organization has can affect the level of performance of the organization. The theoretical framework used for this research study includes the work of James McGregor Burns in 1978 that was enhanced by Bernard Bass and Bruce Avolio in 1985. Transformational and transactional leadership occur when leaders interact with followers at many different levels (Bass & Avolio, 1994).

According to Burns (1978), some define leadership as leaders making followers do what followers would not otherwise do, or as leaders making followers do what the leaders want them to do. Leadership is leaders inducing followers to act for certain goals that represent the values and the motivations—the wants and the needs, the aspirations and the expectation—of both leaders and followers. And the genius of leadership lies in the manner in which leaders see and act on their own and their followers’ values and motivation. Leadership, unlike naked power-wielding, is thus inseparable from followers’ needs and goals. The essence of the leader-follower relation is the interaction of persons with different levels of motivation and of power potential, including skill, in pursuit of a common or at least joint purpose. That interaction, however, takes two fundamentally different forms (Burns, 1978).
First of all, transactional leadership occurs when one person takes the initiative in making contact with others for the purpose of an exchange for valued things. The exchange could be economic, political, or psychological in nature: a swap of goods or of one good for money; a trading of votes between candidate and citizen or between legislators; hospitality to another person in exchange for willingness to listen to one’s trouble. Each party to the bargain is conscious of the power resources and attitude of the other. Each person recognizes the other as a person. Their purposes are related, at least to the extent that the purposes stand within the bargaining process and can be advanced by maintaining that process. But beyond this the relationship does not go. The bargainers have no enduring purposes that hold them together; hence they may go their separate ways. A leadership act took place, but it was not one that binds leader and follower together in a mutual and continuing pursuit of a higher purpose (Burns, 1978).

In contrast, transforming leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality. Their purposes, which might have started out as separate but related, as in the case of transactional leadership, become fused. Power bases are not linked as counterweights but as mutual support for common purpose. Various names are used for such leadership, some of them derisory: elevating, mobilizing, inspiring, exalting, uplifting, preaching, exhorting, and evangelizing. The relationship can be moralistic, of course. But transforming leadership ultimately becomes moral in that it raises the level of human conduct and ethical aspiration of both leader and led, and thus it has a transforming effect on both. Perhaps the best modern example is Gandhi, who aroused and elevated the hopes and demands of millions of Indians and whose life and personality were enhanced in the process.
Transcending leadership is dynamic leadership in the sense that the leaders throw themselves into a relationship with followers who will feel elevated by it, and often become more active leaders themselves, thereby creating new cadres of leaders (Burns, 1978).

Burns (1978) and much of the current literature make the point that the way leaders influence followers is based on their shared sense of what is important, worth doing well, and expending energy on it. In a sense the more significant the endeavor, the more the undertaking itself takes on an importance greater than either the follower or leader. “Such leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality. Their purposes, which might have started out as separate but related, as in the case of transactional leadership, become fused” (Burns, 1978, p. 6). The goals, then, take on a life of their own. In business, this leads to market domination and profit. In the military, this leads to professionals leading inspired subordinates through tough budgets, difficult deployments, the rigors of combat, and ultimately victory. Burns (1978) recognized that “transformational” leadership does not stand alone in the leadership lexicon. As mentioned, he coined another leadership term, “transactional” (Burns, 1978, p. 3).

Transformational leadership and transactional leadership are not at odds with one another, but complement each other as the circumstance dictate. There is no magic formula or checklist that dictates when one is more relevant than the other in any given situation. When to make the transition is an art borne of experience and education (Burns, 1978). Bernard Bass, a disciple of Burns, points out the relationship between transactional and transformational leadership. “The best leadership is both transformational and transactional. Transformational leadership augments the effectiveness of transactional leadership; it does
not replace transactional leadership” (Walsman, Bass, & Yammarino, 1990, p. 40). “Transaction” continues to be an effective tool, and a necessary tool, for leaders at all levels. Transformational leaders, whose choice would be to gain agreement by appealing to the values of the followers or peers, finding the road blocked, may resort to the transactional style. “When the transformational leaders see themselves in a win-lose negotiation he or she tries to convert it into a win-win problem solving situation. If this is not possible, then he or she can display the transactional skills necessary as an effective negotiator” (Walsman et al., 1990, p. 41). On the surface it appears that the “transactional” style provides the basis of most leader-follower encounters. Why, if the transactional style “works,” not just stick to the tried and true?

Bernard Bass has four interrelated components that he views as essential for leaders to move followers into the transformational style:

- First is idealized influence. He maintains that genuine trust must be built between leaders and followers. “If the leadership is truly transformational, its charisma or idealized influence is characterized by high moral and ethical standards” (Bass, 1997, p. 7). Trust for both leader and follower is built on a solid moral and ethical foundation (Bass, 1997).

- The second component is inspirational motivation. “Its [transformational leadership’s] inspirational motivation provides followers with challenges and meaning for engaging in shared goals and undertakings (Bass, 1997, p. 7).” The leader’s appeal to what is right and needs to be done provides the impetus for all to move forward (Bass, 1997).
Next, is intellectual stimulation. “Intellectual stimulation helps followers to question assumptions and to generate more creative solutions to problems (Bass, 1997, p. 7).” The leader’s vision provides the framework for followers to see how they connect to the leader, the organization, each other, and the goal. Once they have this big picture view and are allowed freedom from convention they can creatively overcome any obstacles in the way of the mission (Bass, 1997).

Lastly, is individual consideration. “Individual consideration treats each follower as an individual and provides coaching, mentoring and growth opportunities” (Bass, 1997, p. 9). This approach not only educates the next generation of leaders, but also fulfills the individual’s need for self-actualization, self-fulfillment, and self-worth. It also naturally propels followers to further achievement and growth (Bass, 1997).

Developmental Theory: Transactional vs. Transformational Leadership

While the transactional style may be the most prevalent, it produces results that may not be as high as with the transformational style. To explain this phenomenon, Karl Kuhnert and Phillip Lewis examined Robert Kegan’s six stage developmental theory. Kegan’s theory is that people may develop higher-order leadership traits as they mature. The six stages range from 0-5; Khunert and Lewis explored stages 2, 3, and 4. They used these stages to examine “transactional (stage 2),” “higher-order transactional (stage 3),” and "transformational (stage 4),” leadership traits (Bass, 1997, p. 8). It may be useful to use Kegan’s model of these stages to distinguish between the previously mentioned leadership traits.

A stage 2 leader, for example, is explicitly transactional. What they do for the organization is done for whatever the organization has promised in return for the person’s
output. In other words, their “commitment to the organization is one of reciprocity” (Bass, 1997, p. 8). A stage 3 leader, however, is the bridge between a stage 2 transactional leader and a stage 4 transformational leader. The stage 3 leaders are able to operate apart from personal goals and agendas to focus on being connected to their followers and even sacrifice their personal goals to maintain those connections. Trust and respect between leader and follower develop and form the bond between them, resulting in mutual support, promises, expectations, obligations, and rewards. This creates a hazard for a stage 3 leader most easily exacerbated in an ethical dimension. “Stage 3 leaders may feel ‘torn’ in situations of conflicting loyalties (e.g., loyalty to the organization versus loyalty to their subordinates)” (Bass, 1997, p. 8). This feeling of competing loyalties may tempt these leaders to engage in situational leadership to resolve the dilemma of conflicting loyalties.

Stage 3 leaders, while being transactional, do exhibit some of the qualities of a transformational relationship with their followers. For example,

They [the stage 3 leaders] use relational ties to motivate followers to believe work is more than the performance of certain duties for certain concrete payoffs. Followers may perform at exemplary levels with little immediate payoff in order to maintain the respect of their leader. (Bass, 1997, p. 8)

This begins to look like a transformational relationship, however, a key element is missing for this to be a stage 4 transformational relationship.

Although followers who are persuaded by higher level transactional leaders may expend extraordinary effort to maintain a certain level of mutual regard with their leader, their beliefs and goals typically have not changed. (Bass, 1985, p. 8)
It is this factor that differentiates transformational leadership from the higher-order transactional style. In the transformational relationship, followers integrate the leader’s goals and values.

Leaders that are at stage 4 do not have competing loyalties. They have developed an internal compass of where they are going and why.

This is because stage 4 leaders have developed a subjective frame of reference (organizing process) that defines their selves, not in terms of their connections to others (the hallmark of stage 3), but in terms of their internal values or standards; that is what Burns (1978) called end values. At this stage, leaders are able to take an objective view of their goals and commitments; they can operate from a personal value system that transcends their agendas and loyalties. (Bass, 1985, p. 9.)

Transformational leaders have internalized a sense of commitment to their goals and articulate this in such a way to their followers so as to convert their followers to a high level of commitment as well. As stated earlier by Bass, leaders learn to use the best style of leadership for the situation. “Sometimes transformational leaders use transactional methods to lead, but stage 4 leaders have the ability to understand the available options and to act in the manner that is most appropriate to the situation” (Bass, 1985, p. 9).

Attitude of School Leaders and Effective Technology Programs

Attitude of students, school personnel, and parents toward technology use within schools are an important and often overlooked component of successful curriculum integration of technology. Much of the research done on successful technology integration assumes that once appropriate technological tools are in place in the classroom, students,
teachers, and parents will overwhelmingly support
the change toward a technologically based curriculum (Alexiou-Ray et al., 2003).

Due to negative responses toward increased technology use in her classroom, one
teacher engaged in an action research study to explore why students, parents, and other school
personnel were resistant to technology integration. Students, once accustomed to the changed
classroom environment, were excited to be engaged in new types of learning experiences.
School personnel were pleased with the accessibility of classroom information and support
services technology provided. Lastly, parents noted that though the style of teaching was
different, it offered many new possibilities for their children. From the results of the surveys,
it appears that much of the initial resistance to technology integration derived from discomfort
with the unknown (Alexiou-Ray et al., 2003).

Additionally, using the 1998 Teaching, Learning, and Computing (TLC) national
survey of teachers, it was empirically confirmed that the frequency, variety, and increased use
of technology in the classroom associated with the availability of quality technology support.
These results suggest that if technology leaders hope teachers will integrate technology, they
should attend to the instructional aspects of technology support, such as professional
development opportunities and learning environments, as well as its technical components
(Anderson, Dexter, & Ronnkvist, 2002).

The widespread consensus among those in government and research who have been
studying computer use in education is that effective use of educational technology depends
most strongly on the human element—on having teachers and support personnel who have not
only technical skills in using computers, but also practical pedagogical knowledge about
designing computer activities that create intellectually powerful learning environments for students (Leithwood & Riehl, 2003).

The OTA (1995) Report on Teachers and Technology concluded, for example, “To use technology effectively, teachers need more than just training about how to work the machines and technical support. They need hands-on learning, time to experiment, easy access to equipment, and ready access to support personnel” (p. 129). The President’s Committee of Advisors on Science and Technology & Panel on Educational Technology (1997) and the CEO forum (1999) drew similar conclusions. The Department of Education’s (2000) National Technology Plan made improving “the instructional support available to teachers who use technology” a national goal (p. 65). A report by Ronnkvist et al., summarized the critical ingredients of quality support and showed how important it is to successful technology integration (Office of Technology Assessment, 1995).

In other words, providing strong technology leadership has become one of the many requirements of an effective school leader. According to Mehlinger and Powers (2002), “It is no longer possible for administrators to be both naïve about technology and be good school leaders” (p. 218). In the past, teachers had to bear the responsibility alone for the success of technology programs. Today, however, administrative leadership is considered an important factor affecting the successful integration of technology into schools (Bingham & Byron, 2001). The research clearly indicated that schools with effective technology programs also had strong leadership who supported the program and understood the benefits of technology (Office of Technology Assessment, 1995). Schools that have made the most progress toward technology adoption and integration have school leaders with a vision of what is possible through the use of technology. These school leaders model the use of technology, support best
practices in instruction and assessment and provide professional learning opportunities for their staff. The Southeast Initiatives Regional Technology in Education Consortium (SEIR*TEC), an organization that works collaboratively to help communities of learner use technology effectively, has had the greatest impact working with schools whose leaders are committed to helping students and teachers use technology effectively (Bingham & Byram, 2001). Sandholz, Ringstaff, and Dwyer (1997) found school leadership crucial in determining whether or not teachers would integrate technology. School leaders are in a unique position to inspire a vision for technology and allocate the financial and human resources to ensure complete and sustained implementation of the vision (Creighton, 2003).

Moreover, school leaders must take into account the many components of an educational setting. Tolmie (2001) maintains that the same forms of technology will not necessarily yield comparable results in every educational environment. Technology is not used in isolation for teaching and learning, and the impact of technology on education is largely determined by the established educational setting. To be successful, a teacher attempting to integrate technology into a classroom environment must consider factors, such as administration, teacher, student, and parental attitude towards technology; the educator's teaching style and philosophy; the subject and concepts taught; and the learning styles of the students. Finally, reflective evaluation of current and future practices, as well as staying abreast of current research will help provide the best education for all students (Tolmie, 2001).
Cost of Technology

In the 1980s, economic research on school expenditures suggested that different patterns or amounts of spending did not have major effects on student learning (Hanushek, 1989). However, a growing body of research argued that expenditure patterns—particularly how schools spend their funds—did have consequences for teaching and learning (Hedges & Greenwald, 1996; Ladd, 1996; National Research Council, 1999). Research on such questions is difficult and has yet to be applied to particular areas of expenditure, such as how schools spend information and communication technologies. Yet for two decades, schools spent increasing portions of their discretionary funds to acquire computer equipment, software, and related supplies and services (Pelavin, 1997), and they were under continuing pressure to make those expenditures count. Some policy panels recommended dramatic increases in spending rates with the expectation that the result would clearly improve student academic accomplishment. For instance, the President’s Committee of Advisors on Science and Technology & Panel on Educational Technology (1997) recommended a three-fold increase in public spending on technology-related resources and services.

The vast majority of school technology-related expenditures had been devoted to building up the hardware infrastructure of computers, peripherals, and network connections. Much of this expenditure was to keep up with an ever-changing market supplying newer and more capable computer-related equipment. Estimates of K-12 spending on educational technology during the early 1990s were that nearly two-thirds of all investments on technology had been for this technical infrastructure (McKinsey & Co., 1995). Beginning in the mid-1990s, American schools added expenditures for Internet-access to their technology
budgets. Thus, the share of technology-related dollars spent for hardware is greater now than before Internet connections became widespread in schools (Leithwood & Riehl, 2003).

The costs of technology are not equal in different types of schools. Low-income school districts are likely to require greater expenditures due to having older facilities and higher security problems (Pelavin, 1997). In addition, schools serving communities with poverty and high mobility may not be able to develop exceptional financing methods such as corporate donations and parent fundraising activities. Moreover, the schools with the greatest need are the ones whose students are also least likely to have access to computers and the Internet at home (Leithwood & Riehl, 2003).

Anderson and Becker (2001) described instruction related technology spending of American schools and showed how its pattern varies across different types of schools in *Teaching, Learning, and Computing (TLC): 1998 National Survey Report #8*. The main focus was on differentiating software and training and support costs from hardware costs; they also explored the implications of relative spending in these areas. One important question was whether or not the digital divide was being widened by the investment strategies taken by schools. The findings of their report moved researchers closer to being able to answer such questions.

Anderson and Becker’s (2001) data came from a TLC survey which involved principals, building level technology coordinators, and a sample of teachers from a national probability sample of schools and from two targeted or purposive samples of schools: (a) high-end technology using schools and (b) schools that were participating (or where teachers were participating) in one of 52 identified national and regional educational reform programs. The national probability sample of schools consisted of 898 public, private, and parochial
schools selected from a national database of 109,000 schools supplied by the firm of Quality Education Data (QED) of Denver, Colorado, a marketing information division of Scholastic Corporation. Thus, the entire survey database included information from 1,150 schools including completed questionnaires from approximately 4,100 teachers, 800 technology coordinators, and 867 principals (Anderson & Becker, 2001).

One unique aspect of Anderson and Becker’s (2001) study was their ability to contrast technology expenditures with information from the technology coordinators on what they thought should be spent on each of the three expenditure categories that included hardware, software, and support. While an average of 74% of the technology budget was spent on hardware, the average school’s technology coordinator thought only about 40% of the budget should be spent on hardware. Likewise the technology coordinators thought that the relative amount spent on software and support should be much greater than it actually was. In this regard, it was significant that the opinions of the technology coordinators were consistent with the conclusions of several major national studies including the Presidents Committee of Advisors on Science and Technology (1997) and the U.S. Congress’s OTA report of 1995.

The relative amounts spent on hardware, software, and support was essentially the same for the three main school levels: elementary, middle, and high school. High schools spent more on technology overall than middle schools which spent quite a bit more than elementary schools. Even though high schools and middle schools spent on average quite a bit more on technology than elementary schools, they did not spend much more than elementary schools on support. In other words, elementary schools spent a higher portion of technology dollars on teacher support than secondary schools. While American schools are spending billions of dollars annually on technology, this amounted to a mere $133 per student in 1998. Compared
to information-intensive businesses, this is a drop in the bucket, and until spending levels rise substantially, the impact on students is likely to be severely constrained.

Anderson and Becker’s (2001) report documented the relative neglect of spending for software and technology support.

Without both greater attention to improving the quality of support for teachers and their instructional applications of new technology, schools will lack the capacity to take advantage of technology’s potential for improving instruction. The lack of investment in software in particular seemed striking given that teacher-directed student use of computers during class time, teacher professional involvement with computers, and their perceptions of the effects computers have had on their teaching practice were all much more a function of their school’s investment in software than in their school’s hardware installed base. A major digital divide in technology investment with poorer schools spending far less on technology than richer ones was also documented. Furthermore, the digital divide was widest in one of the two most critical areas, which was technology support. Schools with large concentrations of lower income students spent a smaller portion of their technology funds on teacher training and support than schools that served wealthier students. This finding suggested that not only does this lower the capacity of poorer schools to utilize the technology that they now have, but they are less likely to be able to evaluate and adapt to new technologies as they emerge in the future. (p. 10)

Most educational researchers, especially those who have examined large numbers of studies (meta-analyses) agree that if used appropriately, technology can improve education in the effect-size range of between 0.30 and 0.40 (Kulik, 2002; Waxman, Connell, & Gray,
In order to make effect size more meaningful for nonstatisticians, Kulik (2002), in a section on methodology, stated the following:

An effect size specifies the number of standard deviation units separating outcome scores of an experimental and control group. Effect sizes are positive when the experimental group outperforms the control group and negative when the control group comes out on top. Slavin, an expert in educational evaluation, considers effect size above 0.25 large enough to be educationally significant. Cohen, a pioneer in the use of effect size in the social sciences, classifies effect sizes of around 0.2 as small, 0.5 as moderate in size, and 0.8 as large. (p. 1)

To approach such effect sizes, school leaders must make certain that there is sufficient availability of technology and appropriate software, in that the uses of technology have linkages to important educational learning expectations, and most of all, that teachers have the necessary skills and knowledge to effectively model and teach exemplary uses of technology (Valdez, 2004).

Despite a substantial body of research focusing on the use of technology in schools, definitions of “technology-use” vary widely and many discussions centering on technology-use in schools employ a broad definition of teachers' technology-use. As highlighted in the Office of Technology Assessment (OTA, 1995) report Teachers and Technology: Making the Connection, previous efforts to examine teachers' use of technology used different categorizations and definitions of what constituted technology-use in the classroom. As an example, a 1992 survey conducted by the International Association for the Evaluation of Educational Achievement (IEA) defined a “computer-using teacher” as someone who “sometimes” used computers with students (p. 16). In 1994, Becker constructed a more
sophisticated classification to identify computer-using teachers. Comparing the two measures, the OTA found that while the IEA study classified 75% of teachers as “computer-using teachers,” Becker's measure classified only 25% of teachers this way. In recent years, the expansion of the Internet and e-mail access, the universal availability of software programs that are easier to use, and the growth of an entire industry dedicated to the production of educational software has further confounded the definition of “technology use” (OTA, 1995, p. 80).

Despite the challenges associated with defining technology use, the increasingly large expenditures on and growing access to technology raise important questions about the extent to which technology is being used for educational practices and what factors are influencing these uses. Seminal work by Becker, Anderson, Ravitz, & Wong (1998, 1999) and work by Matthews (1996) and Matthews and Guarino (2000) explored these questions. Valuable insight is provided for factors that affect uses of technology by elementary school teachers. Although a large percentage of the variability in teachers’ uses of technology results from factors that exist at the teacher level, the four models identify several factors that reside outside of the classroom that have a significant effect on technology uses. More importantly from a leadership perspective, these school- and district-level factors are alterable. While there is still much to learn with respect to how schools and districts can increase the uses of the expensive technologies in which they have invested, the findings presented here indicate that responsibility for increasing use does not reside solely on the shoulders of teachers. Instead, through strategic decisions regarding the focus and range of professional development opportunities, the ease with which technology is made available within schools, and the outward expression of the importance of technology use by principals,
superintendents, and other school leaders, these analyses suggest that technology use by elementary school teachers will increase (Becker et al., 1998, 1999).

In 2000, the National Education Association (NEA) conducted an analysis of school modernization needs. The NEA estimated that a total of $321.9 billion would be needed nationwide to fully modernize school facilities. It categorized this figure into two major components, $268.2 billion for school infrastructure and $53.7 billion for educational technology. Moreover, the NEA found considerable differences in the facility needs by state. For instance, New York had the largest funding need among the 50 states, with modernization requiring over $50 billion ($47.6 billion for infrastructure and $3 billion for technology). California had the second largest total need, amounting to nearly $33 billion ($22 billion for infrastructure and $10.9 billion for technology). Seven states were estimated to need more than $10 billion to meet their school modernization needs, and more than 40 percent of the total need was accounted for by five states—New York, California, Ohio, New Jersey, and Texas (National Education Association, 2000).

Criticisms of Technology Use in Schools

Fool’s Gold: A Critical Look at Computers in Childhood (Cordes & Miller, 2000), Oversold and Underused: Computers in the Classroom (Cuban, 2001), and The Flickering Mind (Oppenheimer, 2003) are three books that have received considerable attention as serious criticisms of technology use in schools. The main criticism highlighted in these three books focuses on whether computers are as cost-effective as other interventions such as smaller class size. These books also note the obsolescence factor of computers and the ongoing costs of upgrading both hardware and software.

Technology equipment requires extensive support structures that take money away
from basic expenditures for other and possibly better uses in the classrooms. Money spent on technology could be invested in the arts, science laboratories, shop classes, and additional hands-on learning opportunities and anything else that could improve learning. Some critics assert that technology literacy is highly overrated in its importance and that people who need to use technology will learn to do so by using task applications involving real work. This criticism is especially strong for computer use by younger students. With the exceptions of assistive technology for special education students, some critics suggest students younger than the third grade should not use much, if any, technology. This has been propagated by the idea that teachers have used computers to entertain students with irrelevant and unconnected activities because it made their teaching lives easier, not because it benefited students in learning important content (Kirkpatrick & Cuban, 1998).

In “Myths and Realities About Technology in K-12,” Glenn Kleiman (2001) indicated while there are some realities to these criticisms, many of the criticisms were the result of poor implementation of technology. He noted:

The central theme underlying all these myths is that while modern technology has great potential to enhance teaching and learning, turning that potential into reality on a large scale is a complex, multifaceted task. The key determinant of our success will not be the number of computers purchased or cables installed, but rather how we define educational visions, prepare and support teachers, design curriculum, address issues of equity, and respond to the rapidly changing world. As is always the case in efforts to improve K-12 education, simple, short term solutions turn out to be illusions; long-term, carefully planned commitments are required. (p. 7)

Lou Gerstner (1994), CEO of IBM, believes that nothing matters more to America's
schools than finding competent principals to lead them. Looking closely at principal preparation programs at our universities, the role of the principal as technology leader is only mentioned in passing. The topic is generally mentioned in a course such as “The Principalship,” but for the most part, such a discussion highlights the principal's need to use technology for personal management skills. Budgets are prepared on spreadsheets, parent letters require a word processor, and occasionally the principal must use a database for compiling certain kinds of administrative data. Rarely, though, are principals in training provided any education related to the importance of creating a school environment conducive to maximizing the use of technology in the curriculum. Many school technology programs are led by technology directors or specialists, rather than the principal (Creighton, 2003).

For years educators have been discussing the importance of technology preparation for school administrators (Hope, Kelley, & Kinard, 1999; Riedl, Smith, Ware, Wark, & Yount, 1998). However, colleges and schools of education have not been responding fast enough to meet the overwhelming need of including technology in their educational leadership programs (Becker, Dikkers, Hughes, Logan, Mayrose, McLeod, Quinn, & Richardson, 2005). These programs must recognize their responsibility in preparing future technology leaders and develop technology leadership as an integral component of administrator preparation and licensure. Some educational leadership programs started to infuse technology into their programs a few years ago (Chan & Redish, 2007).

With the proliferation of technology throughout the curriculum, how does the principal know if it is being used effectively to teach students? The International Society for Technology in Education (ISTE) has identified standards and performance indicators that classroom teachers should be prepared to meet in order to demonstrate effective utilization of
technology in the classroom. An observation tool based on the ISTE standards and performance indicators has been developed to assist the principal in determining the degree to which teachers are integrating technology into the classroom and their professional lives. The Technology Standards for School Administrators (TSSA) collaborative proceeded the development of teacher and student standards with the development of administrator professional standards. TSSA fits with and complements the exemplary work done by the ISTE in the National Educational Technology Standards (NETS) projects. TSSA provides specific leadership guidelines for school administrators including principals, district program directors, and superintendents (Bitter & Pierson, 2005).

Because of school leaders’ influence and active roles within the schools, their perception of technology could be linked to the success of No Child Left Behind (NCLB) Act of 2001 that established technology literacy as fundamental to learning. This legislation called for academic excellence in the context of technological advances. Lemke (2003) outlined four skill clusters for surviving in the twenty-first century: digital-age literacy, inventive thinking, effective communication, and high productivity. These skills are emphasized as a critical pathway to success in a highly technological age. NCLB has a strong accountability component for which technology will play a significant role.

In 2003, the *Learning for the 21st Century* report outlined six key elements of twenty-first-century learning:

1. Emphasize core subjects.
2. Emphasize learning skills.
3. Use twenty-first-century tools to develop learning skills.
4. Teach and learn in a twenty-first-century context.
5. Teach and learn twenty-first-century content.


These reports emphasize the role that technology is expected to play in education. Furthermore, Charles Dede (2003) states that “the fundamental barriers to employing technology effectively for learning are not technical or economic, but psychological, organizational, political, and cultural” (p. 9).

Conclusion

From the review of the literature, it is apparent that based on the premise that K-12 leadership and leadership decisions can be a force affecting successful integration of technology, this study is designed to investigate whether a correlation exists among school leaders’ perception of technology and years of technology training, administrative experience, school accreditation level, and age. This investigative study also focuses on whether there is a more positive perception of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding.
CHAPTER III

METHODOLOGY

Overview

This study focused on whether a correlation existed among school leaders’ perception of technology and years of technology training, administrative experience, school accreditation level, and age. This study also focused on whether there was a more positive perception of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding.

Setting

To date, Hurricane Katrina of the 2005 Atlantic Hurricane Season was the costliest, as well as, one of the five deadliest hurricanes, in the history of the United States. Preliminary damage estimates were well in excess of $100 billion. In response, Cisco, the Cisco Foundation, and Cisco employees combined to donate approximately $4 million to Gulf Coast relief efforts. Subsequently, Cisco made a long-term commitment to the region through its 21st Century Schools Program (21S) to assist schools in Louisiana and Mississippi.

In Mississippi, Cisco invested $20 million to modernize 36 targeted schools within school districts impacted by Hurricane Katrina. Collectively, these schools included nearly 20,000 students (21st Century Schools, 2005).

Cisco’s intention was to help lead a coalition of public, private, and nonprofit organizations to provide a holistic approach to rebuilding the educational systems with a “21st century” approach.

This research study focused on the school leadership of both Cisco and non-Cisco schools in South Mississippi.
Participants

The participants in this research study were principals, assistant principals, and technology coordinators for intercoastal elementary, middle, and high schools located in the state of Mississippi. These intercoastal schools were located in the nine counties closest to the Mississippi Gulf Coast area. Thirty-four educational facilities in Mississippi received Cisco funding for technology; of these, three did not meet the criteria of being classified as an elementary, middle, or high school and, therefore, were excluded from this study. The exclusions included two alternative schools and one community resource center. The 31 remaining schools were included in this study and were referred to as Cisco schools.

For comparative purposes, additional schools that did not receive Cisco funding were systematically chosen from an alphabetical list of Mississippi K-12 schools in the intercoastal counties. Every third school was selected until an adequate sample was achieved. The alphabetical list of intercoastal Mississippi K-12 schools was identified from the Mississippi Department of Education website. These 31 schools were referred to as Non-Cisco Schools.

The principal, assistant principal, and the education technology coordinator from each Cisco and non-Cisco school were the school leaders surveyed in this study. There were 76 administrators from Cisco schools and 64 administrators from non-Cisco schools.

Research Design

The design of the study was a correlation or causal comparative design. Permission was granted from the Human Subjects Review Committee at The University of Southern Mississippi (Appendix A) to conduct this research. The School Leaders’ Survey of Technology (Appendix B) was used to collect data.
Instrumentation

The researcher created The School Leaders’ Survey of Technology (Appendix B) for this study. Prior to its use, input from a panel of fifteen experts was sought to determine the content and face validity of the instrument. The questionnaire was piloted with school leaders from fifteen schools in South Mississippi. Participants were purposefully chosen from a list of K-12 schools not included in this study, and none of the pilot participants were included in this study. The panel of experts consisted of two elementary principals, two middle school principals, two high school principals, two elementary assistant principals, two middle school assistant principals, two high school assistant principals, and three school district education technology coordinators. Members of the panel were provided copies of the instrument and asked:

1. Are the directions concise? If no, please explain.
2. Are the directions clear? If no, please explain.
3. Are the directions complete? If no, please explain.
4. Does the survey contain language that can be understood by the participants? Is the reading level appropriate?
5. Does the survey address specific and appropriate issues?
6. Are any statements obtrusive or offensive?
7. Are there any statements that you would exclude from the survey?
8. Are there other statements that you would add to the survey?
9. Should the participants understand the response choices?
10. How long, in minutes, did it take you to complete the survey?
11. Do you have other comments?

Pilot questionnaires were reviewed by the researcher to help establish the validity of the
instrument. The results of the pilot study were used to make final revisions to the questionnaires before the questionnaires were administered to the sample group.

The School Leader’s Survey of Technology included 41 questions and was divided into three sections. Section One, Demographics, was used to obtain demographic information such as gender, race, education level, years of administrative experience, age, and school accreditation level.

Section Two, School Leader Preparation for Technology Use, questions 1-16, used a Likert-type scale of Not at all, To a small extent, To a moderate extent, To a great extent, and Entirely. Responses were weighted on a scale of 1-5 to assess the school leader’s preparation for technology use. This subscale score average ranged from 1 to 5 in the direction of minimum to maximum preparation for technology use.

Section Three, Confidence and Comfort Using Technology, included questions 17-24, used a Likert-type scale of Strongly agree, Agree, Neutral, Disagree, and Strongly disagree, and responses were weighted on a scale of 5-1 in that order to assess the school leader’s confidence and comfort in using technology. This subscale score average ranged from 1 to 5 in the direction of negative to positive confidence and comfort using technology.

Section Four, Attitude Towards Technology Use, questions 25-41 used a Likert-type scale of Strongly agree, Neutral, Disagree, and Strongly disagree, and weights of 5-1 were given in that order to assess the school leader’s attitude towards technology use. This subscale score average ranged from 1 to 5 in the direction of negative to positive attitude towards technology use. The final score for the school leader for Sections 2, 3, and 4 was the average of each subscale score.
Procedures

The researcher used the Mississippi Public School District (2011) to identify the school leaders for each school and their correct email addresses. The cover letter that explained the survey to the school leaders can be found in Appendix C. All school leaders received this cover letter and a list of definitions applicable to the survey instrument (Appendix C). The researcher introduced herself and gave a brief description of the research project in the cover letter via email and mail. The researcher emailed each school leader and asked if he or she would prefer to receive the survey instrument and cover letter via email or regular postal mail. After receiving five responses within two weeks from school leaders that indicated that he or she wanted to receive the survey instrument via email, the researcher emailed the survey instrument, cover letter, and definition list to applicable school leaders. The researcher also mailed one hundred and thirty five school leaders the cover letter, survey instrument, definition list, and a self-addressed stamped return envelope for each respondent. All Cisco school surveys were coded with the number one on the back of the survey; non-Cisco school surveys were coded with the number zero on the back of the survey. School leaders that participated in the survey received a $2.00 gift card redeemable at a local McDonald’s restaurant.

The researcher collected the questionnaires via regular postal mail and email. The questionnaire attempted to gain insight into school leaders’ attitude towards technology use, confidence and comfort using technology, and preparation for technology use.

Data Analysis

The problem formulated for this research was to assess the perception of technology for school leaders in Cisco and non-Cisco schools. This study was guided by the following research questions:
1. Is there a positive correlation between school leaders’ attitude toward technology use and their years of technology training?

2. Is there a positive correlation between school leaders’ confidence and comfort using technology and their school accreditation level?

3. Is there a negative correlation between school leaders’ preparation for technology use and their administrative experience?

4. Is there a negative correlation between school leaders’ confidence and comfort using technology and their age?

5. Is there a more positive correlation between school leaders’ attitude towards technology in Cisco school versus school leaders’ attitude towards technology in non-Cisco schools?

This study analyzed the following hypotheses:

H1: As the number of years of technology training of school leaders increases, the school leaders’ attitude towards technology will be more positive.

H2: As the school accreditation level increases, the school leaders’ confidence and comfort towards using technology will be more positive.

H3: As the number of years of administrative experience of school leaders increases, the number of years for preparation for technology use will decrease.

H4: As their age increases, the school leaders’ confidence and comfort using technology will be less positive.

H5: Cisco school leaders will have a more positive attitude towards technology than Non-Cisco school leaders.

Hypotheses 1 and 3 were analyzed using Pearson Correlation. Hypotheses 2 and 4 were analyzed
using the Spearman Rho Correlation Coefficient. The alpha .05 level of significance was used.

Hypothesis 5 was tested using an independent samples t test.
CHAPTER IV

RESULTS

Introduction

The primary purpose of this investigative study was to determine if a correlation existed among school leaders’ attitude toward technology use and years of technology training, confidence and comfort using technology and school accreditation level, school leaders’ preparation for technology use and administrative experience, and school leaders’ confidence and comfort using technology and age. This investigative study also examined whether there was a more positive attitude of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding. This chapter examines the processes through which the study was conducted and the analyses used to examine the research questions and related hypotheses. Descriptive statistics, inferential statistics, and a summary of results are provided.

Descriptive Statistics

Questionnaires were sent to one hundred and forty intercoastal Mississippi K-12 public school leaders, (principals, assistant principals, and technology coordinators) at 31 schools that received Cisco funding and 31 schools that did not receive Cisco funding. Originally, questionnaires were mailed to 76 school leaders from Cisco schools and 64 school leaders from non-Cisco schools.

Seventy-two questionnaires (51.43%), representing 24 Cisco schools (77.42%) and 21 non-Cisco schools (67.74%) were returned in a timely manner. All were included in the analysis. The researcher used a pencil to label the last page of each questionnaire prior to mailing to participants with a one for Cisco schools and a zero for non-Cisco schools. Thirty-five (48.6%)
non-Cisco schools and 37 (51.4%) Cisco schools returned questionnaires to the researcher. They represented 31 schools that received Cisco funding and 31 schools that did not receive Cisco funding. The researcher printed emailed questionnaires without the email addresses and added them to the completed questionnaires returned via U.S. postal mail to ensure participants’ anonymity.

Demographics

Twenty-eight school leaders (38.9%) were males, and 44 (61.1%) were female. Twenty-one of the school leaders (29.2%) were Black, 49 (68.1%) were White, one (1.4%) was American Indian, and one (1.4%) was Other. This Other school leader respondent did not specify race. None of the school leaders were reported as being Hispanic or Asian. Of the seventy-two school leaders, 14 (19.4%) had a Doctorate degree, 17 (23.6%) had a Specialist degree, 41 (56.9%) had a Master’s degree, and none of them had a Bachelor’s degree only.

Of the 72 school leaders, less than one-third (30.6%) of the school leaders were below the age of 39; one-half (50%) ranged in age from 40 to 50 years. Eleven (15.3%) ranged in age from 51 to 60 years, and three (4.2%) were over the age of 60. Of the 72 school leaders at the 45 Cisco and non-Cisco schools, there was an equal number (14) of the lowest (Academic Watch) and highest (Star School) performing school accreditation levels. There was almost an equal number of High Performing (21) and Successful (19) accreditation levels. Four schools did not report their accreditation level; two of those were Cisco schools, and two were non-Cisco schools. See Table 1 for complete demographic information.
Table 1

*Characteristics of Participants*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>38.9</td>
</tr>
<tr>
<td>Female</td>
<td>44</td>
<td>61.1</td>
</tr>
<tr>
<td>Race:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>21</td>
<td>29.2</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>49</td>
<td>68.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other, Specify</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Level of Education:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Masters</td>
<td>41</td>
<td>56.9</td>
</tr>
<tr>
<td>Specialist</td>
<td>17</td>
<td>23.6</td>
</tr>
<tr>
<td>Doctoral</td>
<td>14</td>
<td>19.5</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-39</td>
<td>22</td>
<td>30.6</td>
</tr>
<tr>
<td>40-50</td>
<td>36</td>
<td>50</td>
</tr>
</tbody>
</table>
Table 1 (continued).

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>11</td>
<td>15.3</td>
</tr>
<tr>
<td>61+</td>
<td>3</td>
<td>14.2</td>
</tr>
<tr>
<td>Accreditation Level 2008-2009:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Star School</td>
<td>14</td>
<td>19.4</td>
</tr>
<tr>
<td>High Performing</td>
<td>21</td>
<td>29.2</td>
</tr>
<tr>
<td>Successful</td>
<td>19</td>
<td>26.4</td>
</tr>
<tr>
<td>Academic Watch</td>
<td>14</td>
<td>19.4</td>
</tr>
<tr>
<td>Low Performing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>At-Risk of Failing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Failing</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Of the 72 school leaders, six did not indicate the number of years of administrative experience, two did not have any years of administrative experience, 10 had at least five years of administrative experience, and five had 20 or more years of administrative experience. School leaders’ surveys that did not indicate the number of years of administrative experience were included in this study. The mean of school leaders’ administrative experience was 7.60 years, with a standard deviation of 7.28 years (See Table 2).
School Leaders’ Administrative Experience

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>37</td>
<td>7.6</td>
<td>7.28</td>
</tr>
</tbody>
</table>

Of the 72 school leaders, five did not provide the number of years for technology training. Of the 67 school leaders who provided a response, the minimum number of years for technology training was zero and the maximum number of years for technology training was 25 (see Table 3).

Table 3
School Leaders’ Years of Technology Training

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
<td>7.9</td>
<td>6.15</td>
</tr>
</tbody>
</table>

Survey Scale Means and Standard Deviation

Section II, School Leader Preparation for Technology Use, survey questions 1-16 asked respondents to indicate their level of agreement to statements within the five subscales, which focused on the study variable, preparation for technology use. The subscales consisted of 5-point Likert questions wherein 1 indicated *not at all*, 2 indicated *to a small extent*, 3 indicated *to a moderate extent*, 4 indicated *to a great extent*, and 5 indicated *entirely* with the given statement. In service courses/workshops, independent learning (e.g., online tutorials or books), and interaction with other faculty/staff were the majority responses for school leader preparation for
technology use for current job. Each category for each question was used to determine how it prepared school leaders for his or her current role. Of the seventy-two returned questionnaires, three school leaders did not specify an answer to Question 7 in Section II, School Leader Preparation for Technology Use (See Table 4). Their questionnaire responses were included in this research study.

Table 4

*School Leaders’ Preparation for Technology Training*

<table>
<thead>
<tr>
<th>Type of Preparation</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Classes</td>
<td>4</td>
<td>1.72</td>
<td>0.93</td>
</tr>
<tr>
<td>Graduate Classes</td>
<td>5</td>
<td>2.58</td>
<td>1.06</td>
</tr>
<tr>
<td>In-Service Courses/ Workshops</td>
<td>5</td>
<td>3.49</td>
<td>0.99</td>
</tr>
<tr>
<td>Independent Learning (e.g., online Tutorials or books)</td>
<td>5</td>
<td>3.6</td>
<td>1.04</td>
</tr>
<tr>
<td>Interaction with other Faculty/Staff</td>
<td>5</td>
<td>3.63</td>
<td>0.9</td>
</tr>
<tr>
<td>Department of Education Training</td>
<td>5</td>
<td>2.28</td>
<td>1.00</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Section III, Confidence and Comfort Using Technology, survey questions 17-24 asked respondents to indicate their level of agreement to statements within the five subscales, which
focused on the study variable, confidence and comfort using technology for school leaders. The subscales consisted of 5-point Likert questions wherein 1 indicated *strongly disagree*, 3 indicated *neutral*, 5 indicated *strongly agree*, while answers of 2 and 4 indicated milder levels of agreement or disagreement with the given statement. School leaders strongly agreed that computer technology enhanced their current job. In addition, the majority of school leaders were confident using technology to monitor student performance and using technology applications such as word processing and spreadsheets to produce materials for use with their teachers. Also, the majority of school leaders were comfortable using technology in their office and comfortable with computer technology. Overall, school leaders were very confident and comfortable using technology. See Table 5 below for minimum, maximum, mean, and standard deviation of school leader confidence and comfort using technology.

Table 5

*School Leaders’ Confidence and Comfort Using Technology*

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>4.5</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Section IV, Attitude Towards Technology Use, survey questions 25-41 asked respondents to indicate their level of agreement to statements within the five subscales, which focused on the study variable, attitude towards technology use. The subscales consisted of 5-point Likert questions wherein 1 indicated *strongly disagree*, 3 indicated *neutral*, 5 indicated *strongly agree*, while answers of 2 and 4 indicated milder levels of agreement or disagreement with the given statement. All school leader means were 3.22 or higher in Section IV. The highest mean for
school leaders was for Question 31 
(N = 72) that averaged 4.83 (sd = .47), “Technology is just another fad.” The lowest mean for school leaders was for Question 37 (N = 72) that averaged 3.22 (sd = 1.21), “Reliance on technology in the school increases the gap between students along socioeconomic lines (digital divide).” Question 37 also showed the highest standard deviation in Section IV. The total mean of Question 40 (N = 72) averaged 4.58 (sd = .55), “Technology enhances my role as a school leader.” School leaders have a very positive attitude towards technology use. See Table 6 below for overall maximum, mean, and standard deviation of school leader attitude towards technology use.

Table 6

School Leaders’ Attitude toward Technology Use

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>5</td>
<td>4.36</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Analysis of Hypotheses

The first research question was stated as follows: Is there a positive correlation between school leaders’ attitude toward technology use and their years of technology training? The first hypothesis proposed that as the number of years of technology training increases, the school leaders’ attitude towards technology will be more positive. This question was tested by using a Pearson’s r Correlation. A Pearson correlation was calculated examining the relationship between school leaders’ attitude toward technology use and their years of technology training. School leaders’ attitude toward technology use was not related to years of technology training (r
The second research question asked if there was a positive correlation between school leaders’ confidence and comfort using technology and their school accreditation level. One hypothesis was used to test this research question, and it was stated as follows: As the school accreditation level increases, the school leaders’ confidence and comfort toward using technology will be more positive. This question was tested using a Spearman rho correlation. A Spearman rho correlation coefficient was calculated for a positive relationship between school leaders’ confidence and comfort using technology and their school accreditation level. School leaders’ confidence and comfort using technology was not related to their school accreditation level ($r(68) = -0.012, p = .921$).

The third research question asked if there was a negative correlation between school leaders’ preparation for technology use and their administrative experience. One hypothesis was used to test this research question, and it was stated as follows: As the number of years of administrative experience of school leaders increases, the number of years for preparation for technology use will decrease. This question was tested using a Spearman rho correlation. A Spearman rho correlation coefficient was calculated for a negative relationship between school leaders’ preparation for technology use and their administrative experience. School leaders’ preparation for technology use was not related to their administrative experience ($r(66) = -0.081, p = .520$).

The fourth research question asked if there was a negative correlation between school leaders’ confidence and comfort using technology and their age. One hypothesis was used to test this research question, and it was stated as follows: As their ages increases, the school leaders’ confidence and comfort using technology will be less positive. This question was tested using a
Spearman \( \rho \) correlation. A Spearman \( \rho \) correlation coefficient was calculated for the relationship between school leaders’ confidence and comfort using technology and their age increase. A negative correlation was found (\( \rho(70) = -0.277, p = 0.019 \)), that indicated a significant relationship between the two variables. School leaders’ confidence and comfort using technology was less positive as age increased.

The fifth research question asked if there was a more positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude towards technology in non-Cisco schools. One hypothesis was used to test this research question, and it was stated as follows: Cisco leaders will have a more positive attitude towards technology than non-Cisco school leaders. This question was tested using an independent samples \( t \) test. An independent samples \( t \) test was calculated comparing the mean score of school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude toward technology in non-Cisco schools. No significant difference was found (\( t(70) = -0.859, p = .393 \)). The mean of the Cisco school leaders’ attitude towards technology (\( m = 4.31, sd = .42 \)) was not significantly different from the mean of the non-Cisco school leaders’ attitude towards technology (\( m = 4.39, sd = .35 \)). There was not a more positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude towards technology in non-Cisco schools.

Summary

Chapter IV provided a brief description of results of this study of school leaders that consisted of principals, assistant principals, and technology coordinators in K-12 intercoastal Mississippi schools. School leaders’ attitude toward technology use and their years of technology training, confidence and comfort using technology and their school accreditation level,
preparation for technology use and their administrative experience, and confidence and comfort using technology and their age were analyzed. This study also analyzed the attitude of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding. Results of the analysis of the data were provided for five research questions and five hypotheses using statistical procedures, such as descriptive analyses, Pearson Correlation Coefficient, Spearman’s $\rho$ Correlation Coefficient, and the independent samples $t$-Test using SPSS 15.0.
CHAPTER V
FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The No Child Left Behind (NCLB) Act of 2001, established Title II Part D known as Enhancing Education Through Technology (“The Facts About 21st-Century Technology,” 2001; NCLB, 2002). This legislation lists as a primary goal, “to improve student academic achievement through the use of technology in elementary schools and secondary schools” (NCLB, 2002, p. 17). Other goals include having students exit eighth grade technologically literate and integrating technology effectively into teacher preparation and curriculum development. In a 2004 interview, then President George Bush said that we cannot assume that our schools will naturally drift toward using technology effectively. “Together, we can use technology to ensure that no child is left behind” (U.S. Department of Education, 2004, p. 1).

Government analysts, educational leadership, and theorists are in accord that improved principal and teacher training, program evaluation, assessment, curriculum and funding must happen to meet state standards, close the achievement gap and sustain school improvement (A Nation at Risk, 1983; Coleman et al., 1967; GOALS 2000, 1994; Langley & Jacobs, 2006; Marzano et al., 2005; NCLB, 2001). The effect of principals is considered second only to that of teachers in facilitating student learning (Leithwood, Seashore Louis, Anderson, & Wahlstrom, 2004; Marzano, Waters, & McNulty, 2005).

The Clinton administration in the early 1990s appealed to the nation to close digital divides. Furthermore, in 2005 Cisco Systems, Inc., committed $20 million specifically for the Mississippi Education Initiative (MEI) to rebuild, improve, and expand the learning opportunities for students in 36 schools in Mississippi. School leaders have varying ages,
administrative experience, years of technology training, and school accreditation levels. This study was initially implemented because of the researcher’s concern for many years with school leaders’ perceptions of technology that utilized technology in various ways with various results.

This chapter summarizes the data provided in Chapter IV and links the findings to the relevant current literature discussed in Chapter II. Additional sections summarize the limitations of the study and discuss the implications of the findings for future studies.

Purpose

This study set out to determine if there was a correlation between school leaders’ attitude toward technology use and their years of technology training, confidence and comfort using technology and their school accreditation level, preparation for technology use and their administrative experience, and confidence and comfort using technology and their age. Finally, this study set out to determine if there was a more positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude toward technology in non-Cisco schools. In order to explore these issues, this study centered around five main research questions and five hypotheses.

Research Questions

The specific questions examined by this research were as follows:

1. Is there a positive correlation between school leaders’ attitude toward technology use and their years of technology training?

2. Is there a positive correlation between school leaders’ confidence and comfort using technology and their school accreditation level?

3. Is there a negative correlation between school leaders’ preparation for technology use and their administrative experience?
4. Is there a negative correlation between school leaders’ confidence and comfort using technology and their age?

5. Is there a more positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude towards technology in Non-Cisco schools?

Hypotheses

H1: As the number of years of technology training of school leaders increases, the school leaders’ attitude towards technology will be more positive.

H2: As the school accreditation level increases, the school leaders’ confidence and comfort towards using technology will be more positive.

H3: As the number of years of administrative experience of school leaders increases, the number of years for preparation for technology use will decrease.

H4: As their age increases, the school leaders’ confidence and comfort using technology will be less positive.

H5: Cisco school leaders will have a more positive attitude towards technology than non-Cisco school leaders.

A causal comparative approach was used to answer these questions and hypotheses. A survey instrument, the School Leaders’ Survey of Technology (Appendix B), was used to gather quantitative data regarding school leaders’ use of technology.

Participants

The participants in this research study consisted of principals, assistant principals, and
technology coordinators for 31 Cisco elementary, middle, and high schools throughout the state of Mississippi; 31 additional schools were systematically chosen from an alphabetical list of intercoastal Mississippi K-12 schools that did not receive Cisco funding for technology (non-Cisco). Initially, there were 76 school leaders from Cisco schools and 64 school leaders from non-Cisco schools. Out of the 72 returned surveys, individual responses came from 24 Cisco schools and 21 non-Cisco schools.

Limitations

The researcher acknowledges the following limitations to this study:

1. The sample size was small and limited the researcher’s ability to generalize findings beyond this study’s sample population. These results could be sample-specific and school leaders who responded could be quantitatively different from those of a larger sample.

2. Cisco Systems, Inc. assisted schools impacted by Hurricane Katrina. This made it impossible to draw statistical comparisons between K-12 schools within Mississippi and other states. Although Louisiana was impacted by Hurricane Katrina and received Cisco Systems, Inc. funding for technology use, it was not included in this study. All school leaders worked in Cisco K-12 schools or districts in Mississippi and intercoastal K-12 non-Cisco schools.

3. A third limitation of this study was time. The accreditation levels were applicable for years 2008-2009 only. NCLB allowed each state to determine its own statewide accountability system.

4. This study was limited by a lack of comparable technology programs across states. The Cisco Systems, Inc. funding for technology use was limited to an initial investment of $20 million in a multi-phase three year initiative beginning in 2005. In the second phase that began
in 2008, Cisco Systems, Inc. committed an additional $20 million to expand this education initiative within the area devastated by Katrina over the next two to three years.

"The 21S initiative is about empowering our children to participate and thrive in the 21st century economy. It's time for America to lead again, and its time for local schools to lead—with the Gulf Coast schools as our catalyst," said John Chambers, president and CEO, Cisco Systems. "Starting with Mississippi via MEI, our hope is that this program will serve as a blueprint for schools around the country and around the world” (Carless, 2005, p. 1). This factor limited the ability of the researcher to track changes across states or even within states from year to year.

5. Participants may not have clearly understood questionnaire items; this may have resulted in a large number of missing items. For instance, the instrument prompted school leaders to specify how well they were prepared for technology use. Some school leaders indicated they had received Other but did not specify the type of preparation for technology use.

Findings

One of the major purposes of this study was to determine whether or not a correlation existed among school leaders’ perceptions of technology and years of technology training, confidence and comfort using technology, administrative experience, school accreditation level, and age. Also, this study focused on whether there was a more positive perception of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding. All statistical analysis revealed no significant correlation between school leaders’ perceptions of technology and years of technology training, administrative experience, and school accreditation level. School leaders’ confidence and comfort using technology was less positive as age increases. A negative correlation was found
(\rho(70) = -0.277, p = 0.019), that indicated a significant relationship between the two variables.

Lastly, Tables 1-5 indicated that the school leaders in this study had positive attitudes and were confident and comfortable using technology regardless of technology training, administrative experience, school accreditation level, and age. Finally, there was no positive correlation between school leaders’ attitude towards technology in Cisco schools versus school leaders’ attitude towards technology in non-Cisco schools.

The response of most school leaders that interaction with other faculty/staff prepared them to a great extent for technology use in their current role confirms the literature.

Effective principals don't just arrange for professional development; rather, they participate in staff training provided to their staffs. Additionally, good principals foster the idea of working together as a valuable enterprise because they understand that this kind of collaborative learning community ultimately will build trust, collective responsibility, and a school-wide focus on improved student learning. (Prestine & Nelson, 2003, p. 15)

According to the Education Commission of the States (2008), “At the building level it is vital that principals employ data-gathering processes to determine staff and student needs. Additionally, continuous improvement requires principals to examine data and find means to address inconsistencies with expected results” (p. 21). This was evident in this study with school leaders’ favorable response to being confident using technology to monitor student performance and using online resources to find data relevant for use with school curriculum.

Furthermore, a growing body of research argued that expenditure patterns—particularly how schools spend their funds—did have consequences for teaching and learning (Hedges & Greenwald, 1996; Ladd, 1996; National Research Council, 1999). Research on such questions is
difficult, and has yet to be applied to particular areas of expenditure such as how schools spend information and communication technologies.

Finally, the President’s Committee of Advisors on Science and Technology & Panel on Educational Technology (1997) recommended a three-fold increase in public spending on technology-related resources and services. Despite Cisco Systems, Inc.’s $40 million investment in Mississippi K-12 schools, there were no significant differences for teaching and learning in Cisco versus non-Cisco schools which confirmed the growing body of research patterns for technology expenditures.

However, Cisco Systems, Inc.’s decision to place 10 Cisco employees during 2005-2008 to serve as “21S Fellows” for each year of the program, providing consulting and expertise in educational governance, curriculum development, teacher training, e-learning, and the use of technology in Cisco schools is consistent with the widespread consensus among those in government and research that effective use of educational technology depends most strongly on the human element (Leithwood & Riehl, 2003). Likewise, the Department of Education’s (2000) National Technology Plan made improving “the instructional support available to teachers who use technology” a national goal (p. 10).

Within this study school leaders’ response to undergraduate and graduate classes not preparing them at all for technology use in current role is consistent with Lou Gerstner’s (1994), CEO of IBM, belief that the role of principal as technology leader is only mentioned in passing at principal preparation programs at our universities. According to Creighton (2003), many school technology programs are led by technology directors or specialists, rather than the principal. This could not be analyzed in the present study due to the small number of technology directors or specialist participants. Even so, colleges and schools of education have not been
responding fast enough to meet the overwhelming need of including technology in their educational leadership programs (Becker et al., 2005).

Recommendations for Policy or Practice

Recommendations for policy and practice revealed by this study include but are not limited to the following:

1. Colleges and schools of education should develop technology leadership as an integral component of administrator preparation and licensure since most school leader preparation for technology use in this study was acquired through interaction with other faculty/staff, independent learning, and in-service courses/workshops.

2. Conduct large qualitative and quantitative research on the effectiveness of technology use throughout the United States that meets the requirements for reliability and validity.

Recommendations for Future Research

This study concentrated on examining school leader’s use of technology. This particular group of school leaders was highly comfortable using technology. Further examination of school leaders’ use of technology is justified.

A possible avenue for future study in this area would be to probe the following two questions:

1. Is there a positive correlation between school leaders’ confidence and comfort using technology and their age throughout the state of Mississippi K-12 public schools? The majority of the school leaders in this study were very confident and comfortable using technology regardless of age, experience, technology training,
etc., so larger qualitative and quantitative research studies could be done throughout the state of Mississippi to ensure effective and efficient use of technology. Mississippi’s ranking of 49 out of 50 states in education today justifies further study of school leaders’ use of technology to provide additional information to educators and/or politicians involved in policy decisions that may impact funding related to school accountability.

2. Would older school leaders feel more confident and comfortable using technology if they received more technology preparation and training during undergraduate classes? Additional qualitative and quantitative research throughout the state of Mississippi might identify different predictors that would help narrow the target to more efficient ways of using technology to facilitate higher test scores and better student outcomes.

Summary

A summary of the research study and conclusions drawn were presented in this chapter. This study investigated whether a correlation existed among school leaders’ perception of technology and years of technology training, administrative experience, school accreditation level, and age. This study also focused on whether there was a more positive perception of technology among school leaders in schools that received Cisco funding versus those school leaders in schools that did not receive Cisco funding. This chapter also discussed and explained the results of the conclusions of this study including limitations of this study. The final section of this chapter focused on recommendations for policy and practice, implications for school leaders, and recommendations for future research.
APPENDIX A
HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE APPROVAL
THE UNIVERSITY OF SOUTHERN MISSISSIPPI
Institutional Review Board
118 College Drive #5147
Hattiesburg, MS 39406-0001
Tel: 601.266.6820
Fax: 601.266.5509
www.usm.edu/irb

HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 10072607
PROJECT TITLE: Administrator Perceptions of Technology
PROPOSED PROJECT DATES: 08/01/2010 to 08/01/2011
PROJECT TYPE: Dissertation
PRINCIPAL INVESTIGATORS: Irene Amos Causey
COLLEGE/DIVISION: College of Education & Psychology
DEPARTMENT: Educational Leadership & School Counseling
FUNDING AGENCY: N/A
HSPRC COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 08/02/2010 to 08/01/2011

Lawrence A. Hosman, Ph.D.
HSPRC Chair

8-03-2010
Date
APPENDIX B
SURVEY INSTRUMENT

School Leader Survey of Technology Use

I. Demographics

Directions: For each item please use a No. 2 pencil and select the choice that best represents your response or write down your response.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Race</th>
<th>Level of Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) Male</td>
<td>( ) Black</td>
<td>( ) Bachelor</td>
</tr>
<tr>
<td>( ) Female</td>
<td>( ) Asian</td>
<td>( ) Master</td>
</tr>
<tr>
<td></td>
<td>( ) White</td>
<td>( ) Specialist</td>
</tr>
<tr>
<td></td>
<td>( ) American Indian</td>
<td>( ) Doctorate</td>
</tr>
<tr>
<td></td>
<td>( ) Hispanic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( ) Other, Specify</td>
<td></td>
</tr>
</tbody>
</table>

Administrative Experience Age Accreditation Level for 2008-2009

Write number of years.

( ) 21-39
( ) 40-50
( ) 51-60
( ) 61+

( ) Star school
( ) High performing
( ) Successful
( ) Academic watch
( ) Low performing
( ) At-risk of failing
( ) Failing

Years of Technology Training
Write number.

II. School Leader Preparation for Technology Use
Directions: Circle the one answer that best reflects your level of agreement.

1 = not at all
2 = to a small extent
3 = to a moderate extent
4 = to a great extent
5 = entirely

How well did each of the following prepare you to use technology in your current role?

1. Undergraduate classes
2. Graduate classes
3. In-service courses/workshops
4. Independent learning (e.g., online tutorials or books)
5. Interaction with other faculty/staff
6. Department of Education training
7. Other

Specify ____________________
1 = not at all
2 = to a small extent
3 = to a moderate extent
4 = to a great extent
5 = entirely

How much training have you received in the following areas?

8. Introductory computer skills
   1  2  3  4  5
9. Word processing
   1  2  3  4  5
10. Spreadsheets
    1  2  3  4  5
11. Databases
    1  2  3  4  5
12. Desktop Publishing
    1  2  3  4  5
13. Presentation (PowerPoint, etc.)
    1  2  3  4  5
14. Interactive Boards (Smart and Promethean)
    1  2  3  4  5
15. Internet
    1  2  3  4  5
16. Specialized training on integrating the computer into
    the classroom and school
    1  2  3  4  5

III. Confidence and Comfort Using Technology

Directions: Circle the one answer that best reflects your level of agreement.

strongly disagree (SD)

disagree (D)
negative (N)
agree (A)
strongly agree (SA)

17. I am comfortable using technology in my office.
   SD  D  N  A  SA
18. Use of computer technology enhances my current job.
   SD  D  N  A  SA
19. I am confident using technology to monitor student
    performance.
   SD  D  N  A  SA
20. I am comfortable with computer technology.
    SD  D  N  A  SA
21. I am developing expertise in the uses of technology
    for the classroom.
    SD  D  N  A  SA
22. I am confident using technology applications such as
    word processing and spreadsheets to produce materials
    for use with my teachers.
    SD  D  N  A  SA
23. I am confident using online resources to find data
    relevant for use with my school curriculum.
    SD  D  N  A  SA
24. I am comfortable using email to contact peers and
    experts both inside and outside of my school district.
    SD  D  N  A  SA
IV. Attitude Towards Technology Use

Directions: Circle the one answer that best reflects your level of agreement.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SD)</td>
<td>(D)</td>
<td>(N)</td>
<td>(A)</td>
<td>(SA)</td>
</tr>
</tbody>
</table>

25. I think every student in my school should have access to a computer.   SD  D  N  A  SA
26. Technology skills are essential to my students.                     SD  D  N  A  SA
27. I feel tense when people ask me about technology.                   SD  D  N  A  SA
28. I feel pressure from others to integrate technology into my school. SD  D  N  A  SA
29. Technology is dehumanizing.                                         SD  D  N  A  SA
30. I avoid technology whenever possible.                                SD  D  N  A  SA
31. Technology is just another fad.                                      SD  D  N  A  SA
32. The use of technology should be confined to computer courses.        SD  D  N  A  SA
33. I like using technology to solve complex problems.                   SD  D  N  A  SA
34. Technology diminishes my role as a school leader.                    SD  D  N  A  SA
35. Technology should be incorporated into the classroom curriculum.     SD  D  N  A  SA
36. Technology makes my job easier.                                      SD  D  N  A  SA
37. Reliance on technology in the school increases the gap between       SD  D  N  A  SA
   students along socioeconomic lines (digital divide).                  SD  D  N  A  SA
38. Technology skills help me as a professional.                          SD  D  N  A  SA
39. Learning technology makes high demands on my professional time.      SD  D  N  A  SA
40. Technology enhances my role as a school leader.                      SD  D  N  A  SA
41. Technology enhances classroom instruction.                           SD  D  N  A  SA
APPENDIX C

COVER LETTER

To Whom It May Concern:

Thank you for agreeing to participate in this research study. I am conducting this research for my dissertation in Educational Administration. All personal information is strictly confidential, and no names will be disclosed. This survey was developed to assess the self-reported use of technology for school leaders. This survey requires you to answer (41) questions about technology. The survey will take approximately 10-15 minutes to complete and requires you to use a pencil or pen. Your participation is strictly voluntary and you can at any time during the survey terminate participation. If you decide to continue, complete the survey and follow the directions for returning the survey. Participants in the study will receive a $2.00 gift card from McDonald’s. If you complete the survey and would like to know the results, please contact me at Irene Amos Causey, 1006 Michelle Drive, Gulfport, MS 39503 or by email at iamos@earthlink.net. Questions concerning the research, at any time during or after the research, should be directed to Irene Amos Causey at (601) 307-9383.

This study has been approved by the Human Subjects Protection Review Committee at the University of Southern Mississippi and I have permission to use the following statement: “This project and this consent form have been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.”

Thanks again for your participation. This study could not be done without you.

Sincerely,

Irene Amos Causey
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