TECHNOLOGY LEADERSHIP IN SECONDARY SCHOOLS: TEACHERS' RESPONSES TO ADMINISTRATORS' PERSPECTIVES REGARDING VISION, ROLES, ACTIONS AND BARRIERS

by

Steven E. Hall

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DEDICATION

This is dedicated to my loving wife Ginger, and in memory of my mother Pauline Sites Hall.

ACKNOWLEDGEMENTS

For me, this has been an extremely long journey. There have been so many people who have helped me along the way that I am certain I will forget someone. The next few paragraphs represent my attempt to say thank you to everyone. If I neglect to list anyone individually, please know that any help you provided was appreciated. There are just so many who deserve my thanks.

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LIST OF ABBREVIATIONS

Instructional Technology Resource Teacher .....ITRT
Instructional Education Plan.....IEP
Springfield County Online Resource for Education .....SCORE

ABSTRACT

TECHNOLOGY LEADERSHIP IN SECONDARY SCHOOLS: TEACHERS' RESPONSES TO ADMINISTRATORS' PERSPECTIVES REGARDING VISION, ROLES, ACTIONS AND BARRIERS

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Information technology as an innovation has been readily adopted by students and society in general and is changing the way students think, play, and learn. Schools must prepare students for a world where technology is ubiquitous. While policy makers have made progress in providing teachers access to technology, this has not resulted in large changes in schools or teaching pedagogy. Instead, teachers adopt technology most often in ways that sustain direct instruction or automate administrative tasks. A number of barriers exist that negatively impact technology integration. Research demonstrates that administrators, as school leaders, can have a positive impact on the implementation of initiatives like technology integration but may lack the skills needed to lead where technology is concerned. While administrators are a key part of school culture and change, more research is needed with regard to how administrators impact teachers and technology integration.

This study used a mixed-methods approach to examine teachers' endorsement or lack of endorsement of high school administrators' perspectives regarding those administrators' technology vision, role in promoting technology integration, actions to promote technology integration, and perspectives regarding barriers to technology integration. Teachers and administrators both expressed concerns regarding administrators' instructional technology skills. Both teachers and administrators indicated that administrators create an expectation that teachers use technology tools that have an administrative focus, but this expectation is not clearly communicated to teachers as an expectation to use technology during instruction.

CHAPTER ONE

Technology has impacted modern culture. The Internet, social networking, and digital communications have created a generation of digital natives who communicate and think differently (Gasser & Palfrey, 2008; Prensky, 2001, 2006; Tapscott, 1998). Yet, despite many efforts to reform education, relatively little has changed (Christensen, Horn, & Johnson, 2008; Cuban, 1986, 2001). Education is or should be a reflection of the culture that it serves. Often, practices and structures that once had a clear purpose continue to exist because they are deeply ingrained in the culture of schools. For this reason, and to a substantial degree, educational culture and pedagogy are resistant to change (Christensen et al., 2008; Cuban, 1986, 2001). Rogers (2003) indicated that unless key factors are in place the diffusion of an innovation can be hindered. Schools are organizations and are likely to resist the adoption of technology as an innovation.

Despite efforts to promote technology integration through professional development and increased access, technology integration—more often than not—does not go beyond sustaining current educational practice (Christensen et al., 2008; Cuban, 2001). Leadership that is capable of integrating change is essential to creating an environment where new practices, consistent with the needs of today's learners, can be developed and adopted. Educational leaders are critical to promoting the kinds of cultural change necessary to integrate technology into classrooms successfully.

Guiding schools through the kinds changes needed to support technology integration presents a number of challenges for schools. Johnson, Levine, Smith, and Stone (2010) outlined five critical challenges regarding technology integration in education. These challenges involve developing teachers' digital media literacy skills, changing school practice to match the students' rapidly changing world, having leaders develop a clear vision to shape reform, changing the focus in education from sustaining current pedagogy and practice, and improving the perceived value of real world learning.

A common thread running through each of the challenges is their relationship to leaders, leadership, and school culture. Leaders are central to developing a school's cultural norms and practices. As attempts to integrate technology continue, there appears to be a lack of vision for technology integration among educational leaders. According to McLeod (2007), "Technology is marginalized and viewed as a non-essential, optional component in most school systems. This occurs because the vast majority of our technology leaders lack the background, training, and understanding to effectively facilitate deep-rooted change" (p. 17, see also McLeod & Richardson, 2011). These challenges clearly indicate that while leaders may have worked to place technology in the hands of teachers and may have provided professional development to build technology skills, these leaders have often failed to provide an adequate vision to guide technology integration.

Statement of the Problem

Despite efforts to promote technology integration, the literature indicates that teachers have not widely adopted technology for instructional use. While the literature is

rife with research examining teachers and technology integration, relatively little is known of the principals' knowledge of and support for integrating instructional technology in the classroom, particularly with regard to overcoming barriers to technology integration. There is a dearth of literature addressing school leaders and instructional uses of technology. School leaders are critical to implementing change in schools and the adoption of innovations, but little is known about administrators' perspectives with regard to critical leadership aspects related to technology integration and how teachers would respond to the administrators' perspectives. This study examined whether or not teachers endorse high school administrators' perspectives on technology vision, role in promoting technology integration, administrative activities to promote technology integration, and perceived barriers to technology integration.

Background

Diffusion of Innovation

In examining technology integration in schools, it is important to consider research related to the diffusion of innovation. It would appear that any useful innovation would quickly be adopted and used. Rogers (2003) addressed several factors that can either speed or hinder adoption. The first factor is related to the innovation itself. The innovation's relative advantages, compatibility, complexity, trialability and observability all impact the general perception of any innovation (Rogers, 2003). Rogers indicated that relative advantage refers to the degree to which a new innovation is better than what is currently in use. Compatibility refers to the degree to which a new innovation aligns with the potential adopters' current beliefs and practices. Complexity refers to the degree to

which an innovation is perceived as difficult to use. Trialability refers to the ability of potential adopters to experiment with the innovation. Observability refers to the degree to which potential adopters can observe an innovation.

A second factor discussed by Rogers (2003) is related to communication channels or the means by which one learns about the innovation and the innovation's uses. The third factor is time. How much time is needed for individuals to learn about, test, and subsequently master a given innovation (Rogers, 2003)? The fourth factor is the social system in which the innovation is introduced (p. 37). In Rogers' model, innovation, communication channels, time, and social systems combine to either promote or inhibit adoption of a new technology. With regard to technology and education, it is important to consider all of these factors when examining technology integration in the classroom as an educational innovation.

Investment in Technology

Over the past 20 years, access to and use of communications technology in the workplace and schools have increased. The National Center for Educational Statistics (NCES) publishes an annual digest of educational statistical data. Statistical data from these reports are based on periodic surveys conducted by NCES, which reported as of 1990 that 96% of public schools had microcomputers. Forty-two percent of students used computers at school, and 38% of adults used computers in the workplace (Snyder & Hoffman, 1991). By 1995, NCES indicated that 59% of students reported using computers, and use of computers in the workplace was "widespread" (Snyder & Hoffman, 1996, p. 443) with more frequent use associated with higher levels of learning.

The 1995 NCES report also indicated that teachers were less likely to use computers than those with a similar education level employed in other fields (as cited in Snyder & Hoffman, 1996).

Findings from the 2009 NCES report indicated that 97% of teachers responded that they had a computer available in the classroom. The ratio of students to computers was reported as 5.3:1. Still, only 40% of teachers reported using technology on a frequent basis during instruction (Gray, Thomas, & Lewis, 2010). The 2009 NCES also indicated that 97% of responding school districts had computer network access in all schools. Eighty-three percent employed a technology leader in either a full- or part-time capacity. One hundred percent of the districts indicated that some student data was stored electronically, and 95% of the districts provided some type of professional development geared toward technology integration (Gray & Lewis, 2009). The data clearly indicated that the availability and use of technology has increased. Teachers are receiving professional development; technology is available; and some teachers are using technology regularly.

Unrealized Hopes

Despite improved access to technology in schools, most teachers have not adopted technology use in the classroom. Promotion of information technology by business leaders, policy makers, and parents has led to increased access to computers and software for teachers and students at both school and home. However, most teachers and students are only occasional users or nonusers of technology for classroom instruction. While technology has become more ubiquitous in schools, this has not been accompanied by

greater use in the classroom. In many situations where technology has been adopted, it is used to facilitate existing practices rather than to promote new instructional activities (Cuban, 2000, 2013).

Educators have chosen to adopt some technologies at a greater rate than others. For instance, while grading software is available to 94% of teachers and used often by 92%, digital cameras are available in 36% of the reporting classrooms and used sometimes or often in 49% of those classrooms (Gray et al., 2010). In general, technologies that relate to administrative tasks or presentation are more likely to be available and used than technology designed to be used directly by students (Gray et al., 2010). Educators recognize some benefits of technology use but have widely adopted its use in areas not related to instruction.

Futurist Alvin Toffler stated in 2006 that business is moving at 100 miles per hour while schools are moving at 10 miles per hour (Daly, 2007). Outside of schools, the culture of the rest of the world is changing and accelerating quickly. Schools, however, are not changing quickly enough to provide an adequate education for the students they serve. Toffler suggested that the best solution to current problems with education is to shut down the entire system (Daly, 2007). Toffler stated, "Teachers are wonderful, and there are hundreds of thousands of them who are creative and terrific, but they are operating in a system that is completely out of time. It is a system designed to produce industrial workers" (Daly, 2007, p. 52). Educational leaders need to find ways to support teachers and promote changes to the culture of education. This will not be accomplished

overnight, and it will require designing professional development that changes teachers' belief systems as they relate to teaching and learning.

Schools Have Not Adopted Technology

Despite improvements in teachers' access to technology, many teachers have not readily adopted these potential tools. As Cuban pointed out, "The tools that teachers have added to their repertoire over time (e.g., chalkboard and textbooks) have been simple, durable, flexible, and responsive to teacher-defined problems in meeting the needs of daily instruction" (1986, p. 58). While cell phones and other new technologies do meet several of these characteristics, these technologies are completely in students' hands and beyond the teachers' sphere of control. As a result, in the minds of many educators, concerns with cheating and class disruption outweigh the potential advantage that cell phones might carry. As schools adopt technology, more often than not, changes are related to the use of technology to assist with administrative rather than instructional activities (November, 2001). When technology is adopted and used to perform instructional tasks, teachers often deploy technology to automate an existing task (Cuban, 2001; November, 2001).

Strategies to Resolve the Problem

The NECS reported that in 2009, 61% of teachers took part in professional development related to technology (Gray et al., 2010). Eighty-seven percent of those teachers felt that the professional development met their needs in the classroom. While it may be encouraging that teachers found the professional development useful, 39% of teachers potentially did not receive technology-related professional development (Gray et

al., 2010). It is also not clear why those teachers did not receive professional development or if technology-related professional development was even an option.

When examining research and professional development as it relates to administrators, the information is less clear. Davies (2010) and McLeod and Richardson (2011) both indicated gaps in the research related to technology and school leaders, stating that research examining school leaders and technology integration is needed. Given the relative importance of leaders with regard to changing school cultures and leading school change, this lack of research is disconcerting.

Shift in Cultural Norms and Leadership

Schools, by their nature, are resistant to change. This resistance has frustrated many efforts to reform education. In addressing schools' resistance to reform, Elmore stated that "public schools have had little difficulty deflecting or co-opting the best efforts of school reformers" (1990, p. 4). Bruner (1990) pointed to three key concepts related to the importance of culture: (a) human expression, in general, is based on cultural interaction (p. 12); (b) because humans participate in culture, meaning is necessarily "shared and public" (p. 12); and (c) culture reflects what "makes human beings tick" (p. 13).

These concepts are indicative of the strength of any culture and can be applied to the pedagogy of teaching. Teachers' beliefs about pedagogy are entrenched in the culture of teaching. There are principles, maxims, and norms that teachers use to guide instruction (Shulman, 1986, p. 86). Teachers believe practices supported by pedagogical knowledge will provide students with appropriate instruction. Many instructional

activities have been the subject of research and are accepted as effective instructional practices, but the practices are tied to the current structure and culture of teaching and education, not the emerging, technology-driven culture.

Strong Leadership is Needed

Leadership focused on implementing change is essential to creating an environment where new practices, more consistent with the needs of today's learners, can be adopted. A study conducted by Anderson and Dexter (2005) "confirmed that technology leadership played a very central, pivotal role in technology-related outcomes, and the findings also revealed considerable diversity in technology leadership and organizational support systems" (p. 73). Educational leaders are critical to promoting the kinds of cultural change needed for the successful integration of technology in classrooms. Anderson and Dexter's "results suggest that a school's technology efforts are seriously threatened unless key administrators become active technology leaders in a school" (p. 74). Technology integration might not progress adequately without administrative support.

Administrators should recognize the importance of instructional technology (Hope, 1997), but they tend to stress more traditional approaches more familiar to teachers. Administrators appear to focus on a single objective approach to instruction. In this type of instruction, a lesson is focused on a specific learning objective. When administrators do focus on technology, they often focus on administrative uses of technology rather than the application of technology in the classroom (McLeod, 2007,

2008). Administrators tend to stress technology that is focused on school management rather than technology that focuses on instruction:

> Principals should be role models for technology implementation. Teachers need to see the principal exhibiting positive emotions toward technology and modeling its use. Teachers cannot be expected to acquire the motivation and get support to use technology in their practice if the leadership shows little interest. (Hope, 1997, p. 3)

Research also seems to follow this pattern where administrators are concerned. Most research conducted connecting administrators and technology focuses on school management rather than instruction. As McLeod (2008) pointed out, instead of focusing on instruction, research concerning leaders and administrators often examines the ways administrators use technology for administrative purposes. The result of this approach is that instructional technology is overlooked by both administrators and most researchers.

Teachers are adopting technology in patterns similar to administrators in that the focus is on using technology for administrative purposes or to sustain long-standing pedagogical practices. Christensen et al. wrote, "Classrooms look largely the same as they did before the personal computer revolution, and the teaching and learning processes are similar to what they were in the days before computers" (2008, p. 72). They also stated that with regard to computers that "schools have crammed them into classrooms to sustain and marginally improve the way they already teach and run their schools, just as most organizations do when they attempt to implement innovations, including computers" (p. 73). Yet, technology integration goes well beyond providing computers

and Internet access. The real challenge for educational leaders is to help teachers integrate technology so that students are able to gain the information literacy they will need in modern culture. Technology integration can only be accomplished by helping educators and students overcome barriers so they can develop new attitudes and beliefs about learning, technology, and how both relate to the world outside of the classroom.

Research Questions

The literature indicates that teachers have not widely adopted technology for instructional use and relatively little is known of the principals' knowledge of and support for integrating instructional technology in the classroom, particularly with regard to overcoming barriers to technology integration. The literature would benefit from research examining school administrators' leadership qualities related to technology integration. School leaders are important to implementing change in schools and adopting innovations. This study examined whether or not teachers endorse high school administrators' perspectives on technology vision, role in promoting technology integration, administrative activities to promote technology integration, and perceived barriers to technology integration.

The following research questions were used to gather data related to this research.

1. What do high school administrators indicate is an appropriate vision for technology integration?
2. How do high school administrators identify their role with regard to technology integration?
3. What do high school administrators do to promote technology integration?

4. What do high school administrators perceive as barriers to technology integration?
5. What are high school teachers' responses to high school administrators' perspectives regarding technology integration?

Significance of the Study

The National Education Technology Plan (U.S. Department of Education, Office of Educational Technology, 2010) contended that a key to improving education is the use of instructional technology. The plan identified two primary goals driving educational reform:

1. Raising the proportion of college graduates from where it now stands [41%] so that 60% of our population holds a 2-year or 4-year degree, and
2. Closing the achievement gap so that all students—regardless of race, income, or neighborhood—graduate from high school ready to succeed in college and careers. (p. ix)

Viewing technology as a central component of education reform, the plan also stated that technology integration is central to achieving these critical goals:

> Just as technology is at the core of virtually every aspect of our daily lives and work, we must leverage it to provide engaging and powerful learning experiences, content, and resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. (p. ix)

The concept of technology as a catalyst for reform is not unique to the current Technology Plan. This view has been echoed repeatedly by policy makers and those promoting technology, who believe that instructional technology has the potential to alter teaching, learning, and school organization in general. Despite the appearance of technology in schools, most teachers have not adopted its use in the classroom, and technology's impact on instructional practices has been minimal at best.

Teachers must learn to design instruction that provides authentic, meaningful learning that is relevant. The question now facing schools is this: "Can the system of schooling designed to process groups of students in standardized ways in a monolithic instructional mode be adapted to handle differences in the way individual brains are wired for learning?" (Christensen et al., 2008, p. 34). While technology alone will not create this kind of change, instructional technology provides teachers with some of the tools needed to change instruction. Sound leadership is important to promoting change, and adopting innovations like instructional technology.

Despite the importance of school technology leadership, this topic has received relatively little attention from researchers (McLeod & Richardson, 2011). Due to the lack of research in this field, it is difficult to identify effective technology leadership (McLeod & Richardson, 2011). One approach to provide additional information regarding effective technology leadership is to examine the perspectives of school leaders as the perspectives relate to important leadership concepts like vision for technology integration, roles with regard to technology integration, promoting technology integration, and barriers to technology integration. By examining teachers' endorsement of administrators'

perspectives as they relate to technology integration, valuable information can be acquired regarding how well administrators are able to communicate change concepts like vision, administrators' roles, administrators' activities to promote technology integration, and potential barriers to technology integration. Examining similarities and differences in teachers' and principals' perspectives will help educational policy makers provide adequate professional development to both teachers and administrators. The information will also inform administrators regarding technology leadership and assist both teachers and administrators with developing common perspectives that will assist with bridging gaps in both teachers' and administrators' ability to lead technology integration.

Conceptual Framework

Information technology as an innovation has been readily adopted by students and society in general. Technologies are altering the way students think, play, and learn (McLeod & Richardson, 2011; Pink, 2005). Changes in knowledge and information processing are providing new opportunities for students (Norton & Wiburg, 2003). With such developments, schools must prepare students for a world where technology is making revolutionary changes in most aspects of life (Boone, 2009). This requires that educators change the pedagogy of teaching so that students are prepared to function in an information-rich environment (Boone, 2009; Holland & Moore-Steward, 2000).

Policy makers have made progress in providing teachers access to technology. In addition, professional development has improved teachers' technology skills (Cuban, 2001; Gray et al., 2010; Snyder & Hoffman, 1991). Yet, a disconnect exists with regard

to the integration of technology during instruction (Coffey & Obringer, 2007; Kolb, 2008; Project Tomorrow, 2010). While students use technology regularly, teachers continue to conduct their classes the same way (Cuban, 2001). Classrooms look the same because schools have limited adoption of technology to using it as a sustaining innovation and to automate administrative practices (Christensen et al., 2008; November, 2001).

Schools have been slow to adopt technology for instructional purposes. While access to technology in the classroom has improved and professional development has improved teachers' technology skills, this has not led to a culture of technology integration. A large number of barriers exist that negatively impact technology integration (Ertmer, 1999; Hew & Brush, 2007; Hughes, 2005; Newhouse, 2001; Norton & Hathaway, 2011; Teo & Wei, 2001). While most of these barriers are not identified as strongly influential, the combined impact of these barriers is inhibiting technology integration (Norton & Hathaway, 2011).

Research demonstrates that the principal as school leader is a key part of a successful school (Anderson & Dexter, 2005; Fullan, 2002; Hallinger & Heck, 1996). Administrators can have a positive impact on the implementation of initiatives like technology integration (Anderson & Dexter, 2005; Ertmer et al., 2002; Fullan, 2002; McLeod, 2007). However, research indicates that principals may not have adequate instructional technology skills (Creighton, 2003; Ertmer et al., 2002). As a result, principals may not be prepared to lead where technology is concerned (Anderson & Dexter, 2005; Greer, 2002; McLeod & Richardson, 2011). Research indicates that

leadership in the form of vision, planning, modeling, and skill development can help teachers overcome barriers to technology integration (Baylor & Ritchie, 2002; Cosner & Peterson, 2003; Ertmer et al., 2002). More research is needed with regard to school leaders and leadership as they impact technology integration (McLeod & Richardson, 2011). Figure 1 provides a visual representation of this study's conceptual framework.

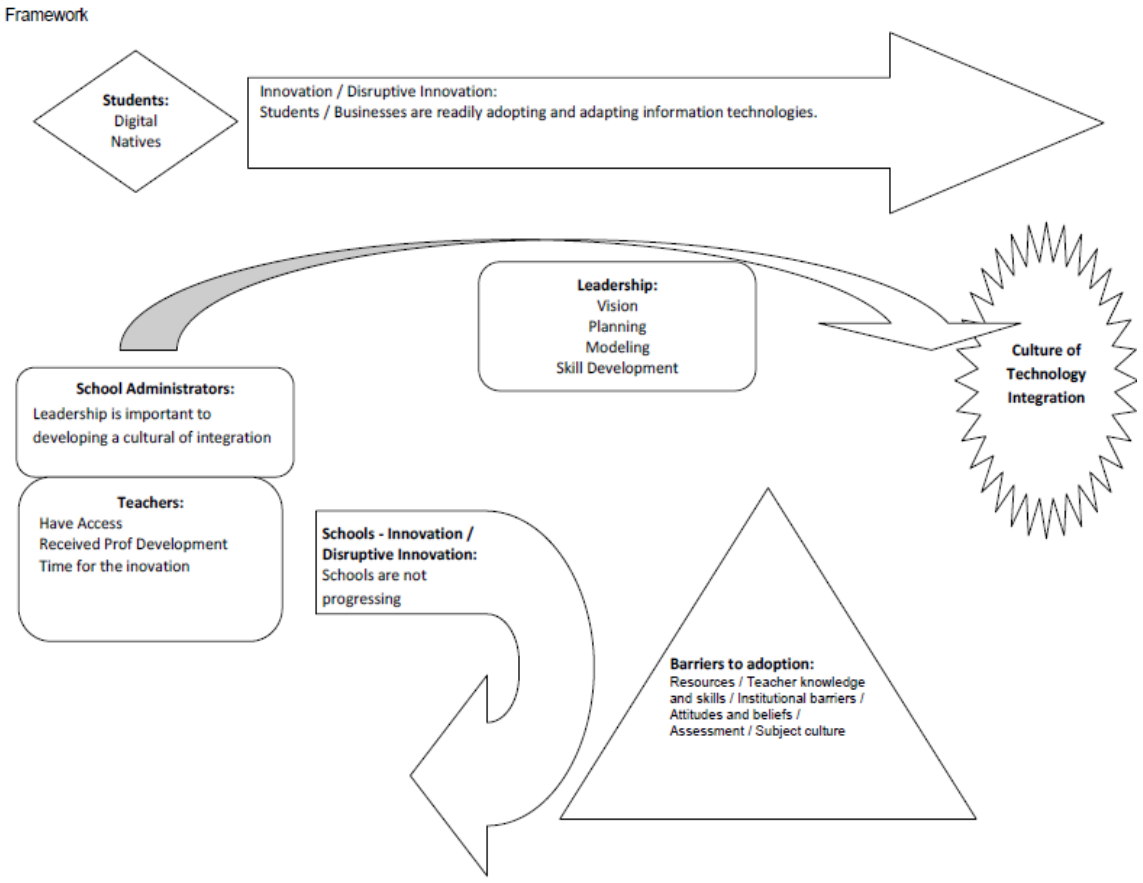

Figure 1. Conceptual framework.

Scope of the Study

This study used a mixed-methods approach to identify high school administrators' and high school teachers' perceptions of administrators' technology vision, their role in promoting technology integration, their administrative activities to promote technology integration, and perceived barriers to technology integration, and to determine the extent to which teachers endorsed administrators' perspectives. The study was conducted in two phases, a qualitative phase and a quantitative phase. The first phase of the study used qualitative methods to collect data from high school administrators in a single school division. In this phase, administrators were asked to participate in interviews. Data were coded, and a general operating theory was developed.

Phase 2 of the study used quantitative methods. A survey instrument was developed using qualitative data obtained from administrators during Phase 1. The survey asked teachers to respond to administrators' statements and identify the extent to which they agreed or disagreed. Teachers were asked to complete this survey in an online format using SurveyMonkey.com software. The teacher survey data were analyzed to identify the percentage of respondents who strongly agreed, agreed, disagreed, and strongly disagreed. Qualitative data collected from administrators interviews during Phase 1 were then examined along with quantitative data collected from teacher surveys in Phase 2 to determine how strongly teachers endorsed the perspectives of administrators and teachers in relation to administrators' technology vision, administrators' role in promoting technology integration, administrators' activities to promote technology integration, and administrators' perceived barriers to technology integration.

Definition of Terms

The following terms are used in specific ways in this study.

Technology Integration: This means using technology during instruction either to deliver content or engage students in activities related to course content, so that different forms of interactions among and between students as well as teachers are encouraged so that students engage in higher order thinking. Instructional practices include technology and cause teachers to question assumptions regarding instruction and learning, and teachers use technology to design lessons for students. Administrators develop their abilities to promote and evaluate teachers' use of technology during instruction (Barron, Kemker, Harmes, & Kalaydjian, 2003; Dwyer, 1994).

School Administrators: For the purpose of this study, school administrators are defined as assistant principals or principals currently serving in a school.

School Culture: The means patterns of meaning or activity (norms, values, beliefs, relationships, rituals, traditions, myths, etc.) shared in varying degrees by members of a school community ("School Culture," n.d.).

Barriers: Barriers to technology integration are items identified in the literature that block or inhibit a teacher with integrating technology in the classroom. Barriers can be subdivided into specific categories.

Promoters: Promoters of technology integration for the purpose of this study are administrative behaviors that have a positive impact on teachers' use of technology during instruction.

Leadership: For the purpose of this study, leadership is administrators using vision, modeling, and communication skills to positively influence teachers and assist them with performing a task or reaching goals within a school.

Technology Leadership: Technology leadership as it applies to this study is the practice of using leadership skills to assist teachers with the integration of technology into the classroom so that the use of technology will help students gain the information and technology literacy that they will need in modern culture.

Vision: In relation to leadership, vision is the concept of communicating an idea or direction to others in an organization so that all members develop common goals.

Modeling: The practice of demonstrating specific skills by using these skills in the presence of others is defined as modeling. For this study, administrators would model technology skills by using them when interacting with teachers.

CHAPTER TWO

This chapter reviews the literature related to technology adoption as an innovation in education. The review begins by examining the literature regarding the adoption of innovation and discusses the literature related to the theory of disruptive innovation. Then, the review examines the literature with regard to the investments made at local, state, and federal levels in technology infrastructure for schools. The review moves to a discussion of technology use in education, progressing into a discussion of the literature related to social changes associated with technology and how these changes may relate to schools. The review then examines the literature regarding barriers to technology integration in schools. The final area discussed is the literature related to leadership and change in schools.

Innovation

The adoption of any innovation is part of a process that brings together several elements (Brennan & Surry, 1998). While it would appear that any useful innovation would quickly be adopted and used, in Rogers' (1995) model of the diffusion of innovation, it becomes clear that the impact of several factors can either speed or hinder the adoption of an innovation. Brennan and Surry (1998) pointed out:

> Diffusion literature has taught us that innovations can also be holistic and systemic. In many ways, this emerging idea of the macro-level innovation has

> paralleled instructional technologies' gradual shift away from a product creation focus toward a focus on systemic change. (p. 6)

It is this systemic approach to the adoption of innovation that will be the focus of this literature review.

Several key concepts impact the adoption of an innovation. The first factor is the innovation itself. The innovation's relative advantages, compatibility, complexity, "trialability," and "observability" all affect the general perception of any innovation (Rogers, 2003, p. 36). Relative advantage refers to the perceived advantage that a given innovation holds with regard to the item it supersedes. The actual advantage is less important than the perceived advantage (p. 15). Compatibility refers to the consistency of the innovation with existing values, experiences, and the needs of adopters (p. 15). Complexity refers to the perceived difficulty of an innovation to be understood and used. New ideas that are simple to understand are more likely to be adopted more rapidly than those that require additional skills (p. 16). Trialability is the ability potential users may have to experiment with or try the innovation; when individuals are able to try an innovation, it can impact the adoption of that innovation (p. 16). Observability refers to the degree to which potential adopters can see the results of an innovation, and this visibility promotes discussion and can enhance adoption (p. 16). It is important to remember that, in each instance, the critical factor is the perception of the primary adopter with regard to the innovation. While the innovation should have an impact or perception, ultimately, perception is a human factor that may or may not have a basis in fact.

The second critical factor regarding diffusion of innovation is communications channels, or the means by which one learns about the innovation and the innovation's uses (Rogers, 2003, p. 36). Communications channels have the potential to take several forms. Diffusion investigations indicate that potential adopters do not usually rely on scientific studies; rather, they gather information from other individuals like themselves who have already adopted the innovation (p. 18). These various routes of communication often serve different purposes in the process of diffusion. We know that individuals pass from (a) knowledge of an innovation to (b) persuasion to (c) a decision to adopt or reject to (d) implementation, and then to (e) confirmation of this decision. Mass communications channels are primary knowledge creators whereas interpersonal networks are more important to persuading individuals to adopt or reject a concept (p. 305).

It is through communication that one learns about and is persuaded to adopt a particular innovation. The transfer of ideas also depends on the degree to which those communicating are both similar and different. The similarity or homophily, communication between those with similar backgrounds, is important to diffusion because it promotes communication. A degree of heterophily, differences among those who communicate, is also important in that it provides an opening for new ideas (Rogers, 2003, p. 19).

The third critical factor is time. With regard to diffusion of innovation, this indicates the amount of time needed for individuals to learn about, try, and subsequently master a given innovation (Rogers, 2003, p. 37). According to Rogers, "Much other

behavioral science research is timeless in the sense that the time dimension is simply ignored or does not matter. The inclusion of time as a variable in diffusion research is one of its strengths" (p. 20). Time is involved in the diffusion process in that time is required for individuals to learn about and subsequently adopt or reject an innovation (p. 20).

The fourth factor, the social system in which the innovation will be introduced, is defined as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 2003, p. 23). In any social system, there are norms, opinion leaders, and change agents. All of these influence the diffusion process (Minishi-Majanja, 2005, p. 213). Social systems are very complex in general with a normative structure. Schools as social systems tend to resist innovation and change in part because the social structure has strong values, norms, and role identities. Values help establish the focus of behavior, norms are rules that govern behavior and establish the appropriate means for pursuing goals, and roles are expectations a society or culture holds for specific social positions (Scott, 1992, p. 16). Values, norms, and roles are the established patterns of behavior that provide clear guidelines as to what is accepted practice and what is taboo; however, norms can be a barrier to change (Rogers, 2003, p. 26). Educational norms are particularly strong—in part due to the overall culture in a school.

Teachers have a general idea of how classrooms should operate, which is largely based on their own educational experiences. Cuban (1984) examined the strength of social structures related to teaching through a meta-analysis of existing data, collected between 1890 and 1980. In this study, Cuban examined descriptions of over 1,200 classrooms and survey responses of over 6,000 teachers to develop a map of instructional

practices used by teachers between 1890 and 1980. Cuban's findings indicate that teaching practices have remained relatively unchanged since the turn on the 20th century in both elementary and high school classrooms. Whole group instruction, heavy use of textbooks, straight rows of desks, and teacher-directed questioning all persist over time. Changes in school setting, teacher education, students, and social and cultural norms have had very little impact on instructional practice (Cuban, 2001). Schools have demonstrated repeatedly that they resist change. This is to a large extent related to their strong normative structure. In addition, teachers often tend to teach in ways compatible with their strengths (Christensen et al., 2008). Parents also experienced schools. As a result, parents also have a general idea as to how a classroom "should" operate. While these views may differ in favorability based on the parents' experiences, in general, parents have an idea as to what is expected in a classroom. Students also learn what is expected in order to master a particular subject and move through classes with an understanding of what teachers should do in a classroom (Applebee, 1996). These educational norms are well established, and when teachers deviate from what is socially expected, critical judgments from other teachers, administrators, parents, and students are to be expected. In turn, social pressure has the ability to impact innovation.

Christensen et al. (2008) expanded on Rogers' ideas through an analysis of the adoption of innovation. The researchers developed his theory of disruptive innovation through an examination of the failure and success of companies in the disk drive industry. They indicated that in instances where an innovation is adopted by dominant companies, it is usually adopted as a sustaining innovation: Industry leaders usually win battles

related to sustaining innovations, specifically because these types of innovations improve the product they sell. In some instances, an innovation does not meet the needs of the primary market but develops more slowly as a disruptive innovation. Instead of sustaining the leading companies' place in the original market, a disruptive innovation is actually not as good as the existing product or service, and it benefits people who are not primary consumers of the original product (p. 14). Through a process of successive minor improvements, a disruptive innovation eventually overtakes and disrupts existing markets and has the potential to completely alter the status quo (Christensen, 1997; Christensen et al., 2008).

A disruptive innovation is able to develop and thrive because it competes against nonconsumption. In this aspect, it serves a segment of the population that was not previously reached (Christensen, 1997; Christensen et al., 2008). In addition, a disruptive innovation establishes an entirely different way to measure quality and improvement that is not subject to the constraints of the existing market (Christensen et al., 2008, p. 47). An example of disruptive innovation at work is provided by Christensen et al.'s discussion of the development of the personal computer. Minicomputers were the mainstay of the computer market. While smaller than mainframe computers, minicomputers were still difficult to operate and very expensive. Digital Equipment Corporation (DEC) was one of the leading manufacturers of computers, and its primary goal was to make computers fast and more powerful; ease of use was not an issue because the computer would be operated by a trained programmer. In contrast, Apple's IIe was originally sold to children as a game platform; thus, Apple's focus was to make their product cheaper and easier to use

for this market. Since Apple's market was made up of those who previously were nonconsumers of computers, the fact that Apple's product was inferior to DEC's minicomputer was not a concern. DEC continued to listen to its best customers while personal computers (PC)—championed by Apple—continued to develop and, eventually, disrupt and take over DEC's primary market (Christensen et al., 2008, p. 48). As the overall quality of Apple's products improved, it displaced DEC, and the PC became a disruptive innovation that changed the computer market (Christensen et al., 2008).

The theory of disruptive innovation provides a unique lens to examine technology integration in education, particularly in light of current educational goals. Each of these goals represents a separate plane on which school success is measured. Christensen et al (2008) identified four goals currently held by educational institutions. The first goal is to preserve democracy and inculcate democratic values. In this respect, schools provide the education needed to preserve democratic values (p. 52). The second goal is to provide something for every student. Schools perform this function by offering both career-based courses and academic courses. The result is a very diverse curriculum with a wide range of activities (p. 53). The third goal, keeping America competitive, is a response to industrial competition from the '70s and '80s. Policy makers were concerned that other countries outscored the U.S. on selected standardized tests, so schools were asked to focus on helping students prepare for these tests (p. 58). The fourth goal is to eliminate poverty. This goal is a product of the No Child Left Behind Act of 2001 (NCLB) with the intent to ensure that every student learns at high levels (p. 62).

The fourth goal identified by Christensen et al. (2008) is found in Title 1 of the No Child Left Behind Act, which 1 states, "[the intent is] to ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments" (NCLB, 2001). For schools in Virginia, meeting Title 1 means a strong focus on end of course (EOC) standards of learning (SOL) tests that are given to all students. Test results are measured and reported with a separate emphasis on traditionally disadvantaged groups, economically disadvantaged students (ECD), Black students, and students with disabilities (SWD). An individual school's success is measured in terms of meeting annual measurable objectives (AMO) that reflect, among other things, the SOL pass rate. As a result, it would be reasonable to assume that most schools in Virginia have placed a strong emphasis on SOL tests and meeting AMOs. All of these factors place a strong emphasis on standardizing educational outputs. In recent years, meeting this goal has become a central focus for schools. School leaders often must choose areas of focus for professional development and school improvement. It is possible, then, that a central focus on testing might impact the adoption of instructional technology.

The integration of technology can have unintended consequences (Rogers, 1995, p. 448). Regardless of the technology employed, the reality is that people will ultimately decide how it will and will not be used. So while the innovation is important, the perceptions of the people who use it are critically important. Rogers provided the example of an aboriginal tribe that was provided steel axes. The axe was a symbol of

power in aboriginal society. Through an outside program, steel axes were distributed to young men and women. While the intent was to make the aborigines more productive, the result was that the social order was disrupted (p. 450). The potential for unintended consequences is always present where technology is concerned.

Technology integration in schools involves several different groups of critical stakeholders: Teachers, administrators, students, parents, and businesses. While administrators may have specific intentions for an innovation, other policies and/or stakeholders may intentional or unintentionally subvert the goals and essentially hijack an innovation and take it in an entirely new direction. Horn, during an interview with McCrea (2010), provided online learning as an example of a disruptive innovation in education in that it has developed better and more extensive content and it has grown from serving primarily in a credit recovery capacity to offering more mainstream courses.

Infrastructure Investment in Technology

Access to instructional technology is important to promoting technology integration in schools. Cuban provided three measures of access to computer technology: the number of computers per student, the number of schools wired for the Internet, and the placement of computers (2001, p. 82). Each of these concepts provides a unique way to characterize access. The number of computers per student provides an indication of the actual ratio of computers to student. The lower the ratio, the more available computers are for student use. The number of schools wired for the Internet is an indication of the availability of access to the World Wide Web and all of the information that this would make available. The placement of computers would indicate the relative ease of access.

For example, are the computers located in labs or the classroom? A lab would require the teacher to move a class into the lab. An examination of each of these factors provides a clear indication that access to computer technology has increased.

Statistical data reported by the United States Department of Education's National Center for Education Statistics (NECS) indicates that the availability of technology in schools has changed radically over the past 30 years. In 1981, only 18.2% of all schools used computers at all. By 1986, school use of computers had increased to 95.6% (Snyder & Hoffman, 1991, p. 396). By 1999, 99% of schools reported Internet access, 63% of classrooms had Internet access, and the rate of computer use for students increased from 59% in 1993 to 69% in 1997 (Gray et al., 2010, p. 472). The NECS reports that in 2009, teachers indicated that the ratio of students to computers in the classroom everyday was 5.3:1 (Gray et al., 2010, p. 3). Over the past 20 years, the availability of computer technology for student use has increased. It is clear that opportunities for students to use computers have been present for some time.

According to the NECS, from 1994 to 1999, the number of schools with Internet access increased from 34% to 95%. During the same period, the number of classrooms with Internet access increased from 3% to 64% (Gray et al., 2010, p. 472). By 2003 virtually all schools (100%) had some type of Internet access, and 95% of instructional classrooms had Internet access (Gray et al., 2010, p. 641). While Internet access in schools was ubiquitous by 2003, only 66.1% of all students reported using the Internet anywhere (p. 615). Students ages 10 to 19 led all other groups with regard to using the Internet any place. The primary uses of the Internet for these groups were playing games

and sending email (p. 615). While Internet access was available in virtually all schools by 2003, this availability did not translate directly into availability in classrooms since only 64% had access, but it is clear that access continually improved.

The location of computers in schools is a bit more difficult to track. According to NECS, in 1995, 67.5% of schools reported the availability of computers in administrative offices, 16.6% of schools reported that computers were available in teacher workrooms, 38.1% of schools had computers in classrooms, 59.3% had computers in labs, and 60.1% had computers available in library media centers (Snyder & Hoffman, 1996, p. 448). After 1995, NCES no longer tracked statistical data on the location of computers. The National Trends in Education national survey (NTES) of teachers in 2005 indicated that by 2005, 95% of classroom teachers had access to a computer in the classroom (Gray et al., 2010, p. 14). Sixty-four percent of teachers reported access to one computer for every five students (p. 15), 71% of teachers reported that they had access to computers through a computer lab (p. 16), 97% of teachers had at least one computer available in the classroom, and 97% of schools had access the Internet (p. 18). It is clear that, since the early 1990s, most teachers have been provided access to computers for student use. This represents a large investment in technology.

The increases in Internet access would seem to provide teachers greater ability to extend this technology for classroom use, but data indicate that not everyone feels technology access is adequate. Sixty-one percent of teachers involved in the 2005 NTES study reported inadequate levels of technology (Gray et al., 2010, p. 16). Only 31% of the teachers that responded indicated that they used technology weekly to develop lessons or

assessments (p. 17). During this period, 70% of students were reported by NTES as using computers at home while 48.8% were reported as using the Internet at school (Gray et al., 2010, p. 615). The data are even more alarming when examining critical thinking skills. Five percent of students were reported to use technology to communicate with experts; 4% were reported to use technology to visually represent or investigate concepts; 3% were reported to use technology to use inquiry-based strategies, solve real-world problems, or work with content in multiple disciplines (Gray et al., 2010, p. 14). While more technology was present by 2010, it did not result in higher levels of technology integration. In addition, skills related to information processing, problem solving, communication, and collaboration—all important for a globally competitive job market—were not present in most classrooms. This issue becomes critical with regard to technology integration. As Cuban stated, "Although we need to know how often students turn *on* computers in school, we also need to determine how they are being used" (2001, p. 817).

Technology Use in Schools

With the financial investment made to provide technology for classrooms in mind, Kolb (2008) stated, "There is a 'digital disconnect' between how students use technology for their everyday communication and how they use technology in the classroom" (p. 1). In a study that surveyed educational stakeholders from urban, suburban, and rural public and private schools where school districts participated voluntarily in an online survey conducted over a 3-month period in late 2009, Project Tomorrow (2010) found that 78% of parents, 85% of administrators, and 70% of teachers feel that technology is an

important part of a student's education (p. 4); however, the report also indicated that parents and students are not satisfied with the way technology is implemented in schools. Only 35% of the parents who responded felt the amount of technology was adequate, 33% felt the use of technology was appropriate, and 25% felt the school emphasized technology enough (p. 5). The same report indicated that 39% of students want to use mobile devices, 38% want unlimited Internet access, 51% want schools to include games, and 52% want access to laptops (p. 5).

Teacher-reported data provides a picture of how technology is being used in schools. Gray et al. (2010) found that teachers indicated a very high level of technology available for administrative tasks, with 94% using technology for grading, 93% using technology to record attendance, 90% using technology to administer or review state assessment data, and 71% using technology in relation to Individual Education Plans (p. 9). These technology uses are all primarily administrative and not directly related to instruction. The same report found lower levels of technology available for and used in the classroom: 72% of classrooms used LCD or DLP projectors sometimes or often, 57% used interactive white boards, and 35% used classroom response systems (p. 7). These three technologies are primarily geared toward large-group lesson presentation.

With regard to specific ways students use technology in schools, Gray et al. (2010) indicate that students' technology use typically involves written text (61%), graphic display (53%), basic skills (69%), and research (66%) (p. 13). Students were much less likely to engage in social activities such as corresponding with others (31%), contributing to blogs or wikis (9%), and contributing to social networking (7%) (p. 13).

Only 45% of teachers indicated that students used technology to engage in problem solving or calculations, 25% to measure data or conduct experiments, and 17% to develop or use simulations or models (p. 14). The data indicates that most teachers are not using technology to support higher order thinking activities.

Mobile technologies like cell phones and smart phones provide an even sharper contrast when the views of educators and students are considered. A 2012 survey using a nationally representative sample of 802 teens aged 12 to 17 indicated that mobile technology use among teens has increased substantially: 78% of teens have a cell phone, 34% of these phones are smart phones. Seventy-four percent of teens access the Internet using some type of mobile device at least occasionally, and 24% use mobile devices as their primary way to access the Internet (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Mobile technology is an important tool for the average teen.

Students typically do not use their personal technology after they arrive at school because many schools prohibit the use of mobile technology. Limiting students' access to technology means taking away an important part of the toolkit they use to participate in the world around them. When students power down, they are working without the tools that help them organize their thinking, conduct research, collaborate, and create content. It is like to asking them to write without a pencil (Project Tomorrow, 2010, p. 7). Even though 75% of administrators and 46% of teachers feel that mobile devices can increase student engagement (p. 7), this belief has not translated into classroom use or even widespread acceptance of these devices by educators. Common Sense Media and The Joan Ganz Cooney Center (2008) conducted an online survey of 695 parents and 264

elementary and middle school teachers. The survey indicated that while teachers see potential for some types of digital media, 69% of the teachers surveyed felt that MP3 players had no place in schools. Eighty-five percent of teachers see cell phones as a distraction with 64% indicating that cell phones had no place in schools (Common Sense Media & the Joan Ganz Cooney Center, 2008, slide 15).

School administrators believe there are potential uses for mobile technologies (Project Tomorrow, 2010, p. 7); yet, in practice, schools restrict the use of mobile technologies. According to Kolb (2008), "School officials spend much time and energy developing policies and procedures to keep cell phones out of the classroom" (p. 1). Coffey and Obringer (2007) conducted a survey of 200 principals from schools and school districts from all 50 states. They found that 84% of the principals responding had written cell phone policies in place; 78% of these polices restricted the use of cell phones (p. 42). In response to this finding, Coffey and Obringer noted, "Perhaps the most common feature of school cell phone policies is that students are prohibited from using the devices at school, and in some cases even bringing cell phones to schools is strictly disallowed" (p. 44). It is apparent that where mobile technologies are concerned, students, teachers, and administrators are far from agreement on the subject.

Teachers also have clear beliefs with regard to what they believe should be accomplished in classrooms. Cuban (1986) indicated that "teachers have altered their practice when *technological* innovation helped them do a better job of what they already decided had to be done and matched their view of daily classroom realities" (p. 66). In addition, "Teachers at all levels of schooling have used the new technology basically to

continue what they have always done: communicate with parents and administrators, prepare syllabi and lectures, record grades, and assign research papers" (Cuban, 2001, p. 178). Christensen et al. added that classrooms look largely the same with the addition of technology, in part because schools have added technology as a sustaining tool to enhance existing practice rather than deploying it in a disruptive manner (2008, p. 72). Christensen et al. indicated that this is similar to the practice often used by organizations attempting to implement technology (p. 73). Cuban (2001) stated that "school structures and historical legacies carry so much weight that, unless changed, they will retard widespread use of technology and hinder substantial changes in classroom practice" (p. 180).

While society is adopting technology at a rapid rate, schools are lagging behind. Lim, Zhao, Tondeur, Chai, and Tsai discussed the gap between technology trends in society and those taking place in schools: "We learn, work, entertain, and stay connected with family, colleagues and friends in a world mediated by technology that has become an essential part of our daily lives" (2013, p. 61). Schools have not seen the same impacts. Lim et al. (2013) indicated that one reason for the gap is that schools are extremely complex systems that make the adoption of technology more difficult. Schools are accountable to stakeholders and must demonstrate that funds allocated maximize student achievement. In addition, schools must navigate potential concerns related to student misuse of technology (Lim et al., 2013).

Social Shift

The social changes brought on by technology are radically altering the skills and knowledge needed by students today. Pink stated, "We've progressed from a society of farmers to a society of factory workers to a society of knowledge workers. And now we're progressing yet again to a society of creators and empathizers, of pattern recognitions and meaning makers" (2005, p. 50). Technology is changing the work environment and the kinds of workers employers need. Schools and school leaders are important to prepare students for this changing work environment. McLeod and Richardson stated:

> Digital technologies are important. They are fostering complete upheavals in how we think, play, and work. They are revolutionizing the world around us. This is a societal shift on the scale of the Industrial Revolution—only quicker. It is vital that school leaders make this shift effectively, efficiently, and more importantly, do it now. (2011, p. 25)

School leaders must be prepared to change schools so that students are adequately prepared for the world they will face after they leave school. Norton and Wiburg stated, "The reinvention of knowledge as a result of our interactions with computers is already occurring and is changing our life options and the kinds of educational opportunities required for students to succeed in this new knowledge environment" (2003, p. 2). In order for school leaders to prepare students, school leaders must embrace technology and use it to change instruction.

Barriers to Technology Integration

While progress has been made with regard to incorporating technology in the classroom, barriers still exist that are inhibiting integration. Hew and Brush (2007) conducted an analysis of research examining barriers to technology integration and found 123 barriers identified in the literature. The researchers separated the barriers into six primary classifications. The classifications in order of the frequency they appear in the literature are (a) resources, (b) knowledge and skills, (c) the institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture (p. 226). Resources include availability of technology, access to technology, time, and technical support (Hew & Brush, 2007). Knowledge and skills include "specific technology knowledge and skills, technology-supported pedagogical knowledge and skills and technology-related-classroom management knowledge and skills" (p. 227). The institution refers to leadership, the school's time table related to technology, and school technology planning (Hew & Brush, 2007). Attitudes and beliefs are defined by Hew and Brush in the context of technology as attitudes, "teachers liking or disliking the use of technology" (p. 229) and beliefs "as premises or suppositions about something felt to be true" (p. 229). Assessments refer to any activity designed to measure student learning (Hew & Brush, 2007). Subject culture refers to the set of practices and expectations that are consistent with a school subject (Hew & Brush, 2007). In many instances, the barriers overlap or are related. For instance, the level of a teacher's knowledge and skills with regard to technology use impacts the teacher's attitudes and beliefs about the use of technology in the classroom (Hew & Brush, 2007; Hughes, 2005; Teo & Wei, 2001).

A study by Norton and Hathaway (2011) examined barriers identified by high technology-using teachers. The study surveyed teachers who had participated in an advanced graduate program focused on instructional technology and were currently practicing in schools. Teachers were asked to take part in an Internet-based survey. Based on participants' responses, the researchers identified 21 potential barriers separated into three specific classifications: (a) individual factors, (b) school-based factors, and (c) systemwide policies or practices (Norton & Hathaway, 2011). In addition, this study asked teachers to rate the overall effect each barrier had on their decisions regarding technology.

In addition to the identification of 21 barriers, the researchers reported a significant difference between the groups of barriers studied, with systemwide impediments as the largest barrier. Teachers indicated that they were being sent mixed messages through a variety of "decisions or policies at the school or system level" (p. 196) which took some instructional decisions out of the teachers' hands. Norton and Hathaway concluded,

> Teachers in schools who are attempting to be high technology-using teachers, to push the potentials of technology to reshape teaching and learning, and to respond to the digital attributes of today's learners report experiencing multiple irritants. No single or cluster of irritants reach the level of an obstacle to which teachers might turn their attention but collectively serve to create a culture of work that is fraught with small aggravations. (2011, p. 196)

For the purpose of this review, the structure presented by Hew and Brush (2007) of six primary classifications of barriers will be followed. Barriers and categories from other studies will also be included while using this framework as a central structure to guide research.

Resources

Lack of resources is one of the more frequently identified barriers to classroom technology integration in the research (Hew & Brush, 2007, p. 226). Resources are identified in the research as of any of the following: the technology itself (i.e., computers, peripherals, and software), and/or access to technology, time, and technical support (Cuban, Kirkpatrick & Peck, 2001; Dwyer, Ringstaff & Sandholtz, 1997; Hew & Brush, 2007; Karagiorgi, 2005; Lu & Overbaugh, 2008; O'Mahony, 2003; Pelgrum, 2001). Without adequate technology resources, it is difficult for teachers to integrate technology. While physical access to computer hardware and the Internet has improved in recent years (Gray et al., 2010), other aspects of technology access may still inhibit technology integration. Differences in the perceptions of stakeholders' views regarding access based on their role in the school indicate some variation in the perception of some school-based barriers. Specifically, classroom teachers rated the placement of computers as a more important barrier to technology integration, while Instructional Resource and support personnel saw location as less of a barrier (Norton & Hathaway, 2011).

Several researchers have identified time as a resource barrier. This primarily refers to the time required to develop and implement technology-based lessons (Butzin, 2001; Cuban et al., 2001; Hew & Brush, 2007; Karagiorgi, 2005; Norton & Hathaway,

2011; O'Mahony, 2003). Fordham and Vannatta (2004) found that one attribute common to high technology-using teachers in their study was a willingness to commit time outside of the classroom to learning technology and to developing lesson plans that incorporate technology. This finding is consistent with other researchers who found that teachers reported that preparing lessons integrating technology requires additional time to preview websites, find materials for multimedia presentations, and develop lessons. High-end technology users who spend the extra time to incorporate technology were reported to suffer higher levels of teacher burnout (Cuban et al., 2001; Hew & Brush, 2007).

Teacher Knowledge and Skills

Teacher knowledge and skills with instructional technology are also often identified as a barrier to technology integration (Allensworth, Gladden, Hart, & Lauen, 2002; Becker, 1999; Hew & Brush, 2007; Lawless & Pellegrino, 2007; Norton & Hathaway, 2011). This barrier includes factors such as a lack of knowledge about technology tools, a lack of professional development, a general lack of adequate teacher preparation, a lack of understanding on the part of the teacher as to what good technology integration is, and a lack of understanding how to connect content with technology (Hew & Brush, 2007; Norton & Hathaway, 2011). Brinkerhoff (2006) examined teacher professional development through a 3-year technology professional development academy. While the teachers reported changes in their teaching and increased efficacy with technology, the research also found that in many instances, little had actually occurred in the delivery of instruction. The researcher attributes this discrepancy to a lack of clear understanding as to what constitutes technology integration (p. 39).

Research has demonstrated that professional development can impact teachers' perceptions of barriers to change. Michael (2007) examined the accuracy of faculty perceptions about barriers to active learning at the university level. While many of the barriers identified existed and were demonstrated by research, the barriers could also be overcome. Faculty members spent more time planning at first, thus they would have more time later. They also were often able to find ways to accommodate for pedagogical issues. Students, if given the opportunity, could learn the process and overcome technological barriers. Furthermore, control issues posed a matter of perception and methods used to exert control rather than true barriers. With this in mind, developing teachers' knowledge and skills could help reduce or eliminate perceptions regarding other barriers. Norton and Hathaway (2011) found that teachers with more extensive instruction in the use of technology found individual factors like knowledge and skills, attitudes and beliefs, and perceptions of technology innovators to be less important barriers than other factors.

In general, effective professional development designed to increase teachers' knowledge and skills would be an essential part of any program related to school change. Nir and Bogler (2008) found the following with regard to professional development: (a) professional development is a key component of school improvement, (b) professional development is most beneficial when it is long term, (c) school-based programs tend to have better results, (d) school-based programs tend to have a greater impact on overall school culture, (e) teacher participation in planning professional development is considered more productive, and (f) school-based professional development provided the

opportunity for the principal to be more involved. While there are indications that many teachers are engaging in technology-related professional development (Gray et al., 2010), the professional development instruction provided to teachers is not sufficient to create sustained technology integration. For many teachers, professional development has generally taken a "training" approach that focuses on a single technology skill (Norton & Hathaway, 2011); however, focusing on technology skills is not enough. Teachers need to be given opportunities to use technology in everyday practice and then adapt approaches to their own practice. Focusing on instructional practices that incorporate and use technology to support them may be a more appropriate way to build teachers' technology skills (Glass & Vrasidas, 2005).

Institutional Barriers

Institutional barriers include leadership, the schools' time-tabling structure or scheduling, and school planning (Hew & Brush, 2007). One factor constant in schools considered successful with technology integration is a leader who has a clear vision and directs change. In addition, these leaders model technology use, and reward teachers who incorporate technology, demonstrate planning, and are able to articulate a technology vision (Baylor & Ritchie, 2002; Ertmer et al., 2002). In many instances, principals lack the technology skills necessary to provide direct leadership. As a result, they rely more on a shared leadership structure where they take on the role of cheerleader (Ertmer, 2002, p. 10). Research also indicates schools that are successful with technology integration have a technology plan that outlines the goals and philosophy of the school (Baylor & Ritchie, 2002). While Norton and Hathaway (2011) found that teachers found scheduling of

access to computers as a barrier, the teachers in the study did not see the school principal as a major barrier. The Technology Resource Teachers in the study, who often work more directly with the principal, were more likely to indicate that the principal may be a barrier.

Attitudes and Beliefs

Teachers' beliefs about teaching and learning are entrenched in the culture of teaching. There are principles, maxims, and norms that teachers use to guide instruction (Shulman, 1986, p. 86). Ultimately, the decision to use or not to use technology in the classroom rests with the teacher (Ertmer, 2005; Hew & Brush, 2007). Attitudinal barriers that interfere with fundamental change are referred to as second-order barriers. These are generally harder to identify and overcome, in part because they are deeply engrained in the pedagogy of teaching (Brickner, 1995; Ertmer, 1999; Schulman, 1986). Attitudes and beliefs about teachers' and students' roles as well as traditional classroom practices form the pedagogy of teaching and learning (Ertmer, 1999; Kerr, 1996).

Ertmer (1999) examined the reasons for teachers' instructional decisions regarding technology. For teachers who felt more effective with technology, many barriers were not seen as a major concern. Teachers in their study who described technology as supplemental appeared to be more hampered by attitudinal barriers. The teachers' attitudes and beliefs play a critical role in decisions that they make regarding instruction in general and technology in particular (Ertmer, 1999; Hew & Brush, 2007; Newhouse, 2001). An attitude that demonstrates an openness to change and a willingness

to take risk has been connected to positive technology integration (Fordham & Vannatta, 2004).

Assessment

High stakes testing as a barrier to integration has been identified by several researchers (Butzin, 2004; Fox & Henri, 2005; Hew & Brush, 2007). Standards-based education holds students accountable for learning a particular canon of knowledge. Schools and teachers are held accountable for providing instruction, while standardized tests measure the success of stakeholders at acquiring the knowledge (Bichelmeyer & Keller, 2004). Several researchers indicate that the high stakes testing and annual yearly progress requirements place burdens on schools and teachers that inhibit technology integration (Bichelmeyer & Molenda, 2006; Brindley, Hennessy, & Ruthven, 2005). It is difficult to meet traditional mandates, like high stakes testing, while simultaneously promoting innovative and forward-thinking educational practice (Norton & Hathaway, 2011).

Subject Culture

The final category suggested by Hew and Brush is subject culture (2007), which refers to the instructional structures and concepts that are common to a particular content (Goodson & Mangan, 1995; Hew & Brush, 2007). This concept is similar to that identified by Shulman (1986) as pedagogical content knowledge (PCK), which combines content knowledge—what is taught, and pedagogical knowledge—how it is taught. Teachers use specific methods and conceptualizations to help others understand their content area (Mishra & Koehler, 2006; Schulman, 1986). Each content area has a shared

set of tools, approaches, practices, values, and aims that guide teachers and instruction (Hennessey, Ruthven, & Brindley, 2005; Hew & Brush, 2007). Subject culture or PCK is an important contextual factor that shapes a teacher's perception and use of technology (Lave &Wenger 1991). The concept of subject culture or PCK combines with knowledge of technology—in Mishra and Koehler's (2006) concept, Technological Pedagogical and Content Knowledge (TPACK). TPACK goes beyond the three components and is presented as an instructional knowledge that is greater than the sum of its parts. Technology implementation that ignores subject culture is more likely to be skills based rather than content focused and more likely to lead to poor technology integration (Mishra & Koehler, 2006).

21st Century Learning and Leadership

Schools must prepare students for a world where technology is making revolutionary changes in most aspects of life (Boone, 2009). Students' educational needs are also changing; teacher-focused, traditional methods are no longer sufficient. Students need to develop information literacy skills that will enable them to decode the large amount of information they will face at home and school (Holland & Moore-Steward, 2000, p. 3). Educators must develop students' technology literacy skills in a way that both supports academic rigor and prepares students "to think critically, solve problems, work in teams, and create and implement useful innovations" (Boone, 2009). Conole, Darby, de Laat, and Dillion (2008) pointed out that technology is central to how today's students organize and communicate their learning. Technology provides students "with a rich variety of alternatives for interaction and communication in relation to learning and a

flexibility of use which enables them to take control of their learning" (p. 522). Unless technology integration becomes commonplace, "Our schools are increasingly at risk of being dangerously (and ludicrously) irrelevant to the future in which our children will live" (McLeod, 2007, p. 17).

The principal as school leader is a key part of a successful school (Anderson & Dexter, 2005; Fullan, 2002; Hallinger, & Heck, 1996). Implementing a program in a school requires the support and assistance of the principal to have any lasting effect (Ertmer et al., 2002; Fullan, 2002; McLeod, 2007). Anderson and Dexter found that leadership has greater leverage on technology outcomes than infrastructure or funding (2005, p. 73). While technology leadership is critical, principals are not typically provided education regarding the importance of creating a school environment that supports technology integration (Creighton, 2003; Ertmer et al., 2002)

Research focused on school administration and technology leadership is very limited (McLeod & Richardson, 2011), but indicates that professional development can impact administrators' technology leadership skills (Ertmer et al., 2002). Most technology integration studies in K-12 schools focus on the teacher and the classroom and do not examine the role the principal (Hew & Brush, 2007; McLeod & Richardson, 2011). New technologies and the need for new instructional practices have placed additional demands on teachers and students. Principals may not be prepared to lead where technology is concerned (Anderson & Dexter, 2005; Greer, 2002; McLeod & Richardson, 2011). Principal preparation programs are not keeping pace with the additional demands technology places on school leaders (Holland & Moore-Steward,

2000). McLeod and Richardson (2011) also expressed concerns regarding the additional demands technology integration places on leaders. Being a technology leader is not simply an added responsibility of a principal. Technology leaders must develop technology skills for themselves, their staff, and their students that move beyond the traditional school leaders' role (McLeod & Richardson, 2011, p. 4). Ertmer et al. (2002) conducted a study of administrators participating in an instructional technology course where both qualitative and quantitative data were collected. By the end of the course, the administrators indicated that they had "gained ideas relevant to being effective technology leaders" (p. 8). Quantitative data collected using an analysis of pre- and posttest data indicated that there was a significant increase in the administrators' "ability to recognize and implement new ways to support technology use among teachers" (p. 8).

Vision

Principals must have a vision for technology use that teachers can apply to the classroom (Boone, 2009; Ertmer et al., 2002; Holland & Moore-Steward, 2000; Schmeltzer, 2001; Todd, 1999). Instructional leadership builds and sustains learning cultures (Cosner & Peterson, 2003). Ertmer et al. (2002) found that principals who were able to articulate a vision for technology felt better prepared to support the development of their teachers. Visionary leadership is required to transform educational practice and guide technology integration into the classroom (Todd, 1999, p. 2), and the principal's vision should be communicated in a way that assures commitment from all stakeholders (p. 7).

Planning

Principals must understand what is required to plan for the effective use of technology (Schmeltzer, 2001). The policies adopted by principals and district leaders can inhibit technology integration (McLeod, 2008). The principal's leadership is important to the capacity for change (Allensworth, Bryk, Newman, & Smith, 2001). In addition, it is the principal who evaluates teachers' efforts to implement technology integration (Ertmer et al., 2002). According to Holland and Moore-Steward, "Principals need to understand the power of planning, and the need to create a technology plan that supports the instructional goals and objectives of the school" (2000, p. 8). In addition, it is critical that the principal understand how to integrate technology into the classroom (Holland & Moore-Steward, 2000). A comprehensive technology plan goes beyond the technology and includes a guiding philosophy focused on improving teaching and learning (Baylor & Ritchie, 2002)

Principal and Technology

The basic premise of technology integration efforts is that teachers should integrate computers into their everyday pedagogy (Bichelmeyer & Keller, 2004; Schmeltzer, 2001); the principal is instrumental to this process. As Holland and Moore-Steward (2000) stated, "Even when teachers have obtained technology skills, many argue that effective technology implementation will not occur without strong leadership" (p. 3). The principal serves as an example for teachers by demonstrating learning, sharing information, and encouraging action research (Fullan, 2002), as well as modeling instructional uses of technology (Cosner & Peterson, 2003; Ertmer et al., 2002). Baylor

and Ritchie (2002) found administrators who promote the use of technology, not only in words but also in action, lend credence to a technology culture (p. 412).

In order to direct educators, The International Society for Technology in Education (ISTE) developed guidance standards for school leaders regarding technology integration (Durrington & Yu, 2006). The standards provide guidance in several key areas: (a) visionary leadership, (b) digital age learning culture, (c) excellence in professional practice, (d) systemic improvement, and (e) digital citizenship.

While the importance of the principal with regard to school change is well established in the literature on effective schools (Hallinger & Heck, 1996; Levine & Lezotte, 1990), it is alarming that the principal is relatively ignored in literature related to leadership and instructional technology (McLeod & Richardson, 2011). McLeod and Richardson (2002) surveyed key research journals and found that there currently is a "limited meaningful literature base on school technology leadership" (p. 24). The small amount of available research led the researchers to the following conclusions. First, more educational leadership faculty members need to recognize the importance of digital technologies because technology has a dramatic impact on school leadership. Second, educational leadership faculty in higher education can extend their current knowledge and expertise into the field of technology by applying a technology-related lens to traditional topics of exploration (pp. 24-25). The roles of principal and leadership responsibilities are frequently omitted from the research on technology implementation (Holland & Moore-Steward, 2000). The research base regarding school technology leadership is limited, yet it is through the literature that we learn the importance of the

field for researchers, policy makers, and practitioners (Holland & Moore-Steward, 2000; McLeod & Richardson, 2011).

CHAPTER THREE

This chapter presents the research methods used to complete this study, which used a mixed-methods approach conducted in two phases to separate the data collection into qualitative and quantitative approaches. This phased approach helped the researcher focus on one type of data collection process during each phase. Phase 1 used a qualitative approach, and Phase 2 used a quantitative approach. The chapter includes a discussion of the scope of the study. Research design, research setting, and participants involved in both phases are also addressed. A discussion of issues related to the nature of the research and efforts to protect human subjects are also addressed.

Scope of the Study

This study used a mixed-methods approach to examine perspectives of school administrators regarding technology integration and whether or not teachers endorsed administrators' perspectives with regard to vision for technology integration, administrators' role with regard to technology integration, administrators' activities to promote technology integration and administrators' perspectives of barriers to technology integration. In the first phase of the study, interviews with administrators were conducted to collect data related to leadership and technology integration. Specific questions are included as an appendix (see Appendix A). The focus of this phase of the study was to examine administrators' perspectives with regard to key leadership functions related to the adoption of innovation identified by Rogers (2003): relative advantages,

compatibility, complexity, trialability, and observability, and how these impact instructional technology. In addition, any unintended consequences (Rogers, 2003) or disruptive characteristics (Christensen et al., 2008) with regard to technology integration were examined. Phase 1 also sought to extend knowledge related to connections between technology integration and administrators' vision (Ertmer et al., 2002; Todd, 1999) and how an administrators' activities related to technology planning. Specifically, an administrator's role and an administrator's activities to promote technology integration were examined (Holland & Moore-Steward, 2000). In addition, Phase 1 examined administrators' perspectives related to barriers to technology integration identified in the literature (Hew & Brush, 2007; Norton & Hathaway, 2011).

The second phase of the study examined whether or not teachers endorsed administrators' responses from Phase 1 to determine how well administrators had communicated their views to teachers. Communication is one of the essential characteristics identified by Rogers (2003). The areas addressed in the teacher survey (Appendix B) were similar to those examined during the interviews in Phase 1, and these areas include administrators' perspectives regarding vision for technology integration, role with regard to technology integration, activities to promote technology integration, and perspectives regarding barriers to technology integration. Administrators' responses from the interview phase were used to develop survey questions representing the views of school administrators.

The goal of the survey was to determine how strongly teachers endorsed the administrators' perspectives discovered during the administrator interviews in Phase 1.

The survey used a Likert scale in which teachers were asked to rate the survey items on a 1 (strongly disagree) to 4 (strongly agree) scale. The goal of Phase 2 was to examine whether or not teachers endorsed administrators' perspectives related to administrators' vision for technology integration, administrators' role with regard to technology integration, administrators' activities to promote technology integration, and administrators perspectives regarding barriers to technology integration.

Research Design

Purpose

There is a dearth of literature addressing school leaders and instructional uses of technology. Although school leaders are critical to implementing change in schools, little is known about the perceptions of principals with regard to technology integration and how teachers might endorse administrators' perspectives. In order to examine teachers' and administrators' perspectives and attitudes, it was first necessary to determine administrators' technology perspectives. To that end, high school administrators were interviewed to identify their perspectives regarding technology. Results of these interviews were used to create a survey instrument. The survey was administered to teachers. The results of the administrators' interviews were examined with the teacher survey results to determine the extent to which teachers endorsed the administrators' perspective.

Mixed Methods

For this research study, a mixed-methods approach was used with a combination of qualitative and quantitative methods to respond to specific research questions. A

mixed-methods approach permits combining mental models and paradigms to provide the examination and discussion of complex issues (Greene, 2007). At the beginning of this research, little was known about the perspectives of administrators with regard to technology integration. A qualitative approach during Phase 1 permitted the examination of the perspectives of administrators using a social sciences field research approach. A qualitative approach was appropriate because qualitative methods allow for developing a deeper understanding of a few cases that are purposefully selected (Greene, 2007). In this instance, a group of administrators were interviewed to explore their perspectives related to their vision for technology integration, their role with regard to technology integration, their activities to promote technology integration, and their perspectives regarding barriers to technology integration. As such, qualitative methods were used in Phase 1 to examine administrators' perspectives and so that the researcher could respond to Research Questions 1-4.

Qualitative data collected during Phase 1 were used in Phase 2 to develop a quantitative instrument to collect data from teachers. Quantitative methods are more appropriate for developing information regarding a large group of subjects where a survey instrument can be used (Creswell, 2009). In this instance, survey questions were developed to examine how strongly teachers endorsed administrators' perspectives. Qualitative and quantitative data were mixed to examine how strongly teachers endorsed administrators' perspectives.

Setting

Research Site

Site selection was based on purposeful sampling. The optimal research site for this study was a school district with a strong focus on technology implementation at the district level. Because of the amount of support in the selected district, all schools had access to technology tools, and teachers had received professional development related to using technology during instruction. In addition, the district provided schools with an Instructional Technology Resource Teacher (ITRT) to provide additional assistance with technology integration.

Several aspects of Rogers' (2003) steps for the adoption of innovation had been met in this district. With regard to the first step, knowledge, the teachers in the district had knowledge and exposure to instructional technology. With regard to the second step, persuasion, professional development and the ITRT had begun the process of persuading teachers to try the innovation. The final two steps, adoption and implementation, remained for most teachers. Strong district support also provided a lens to help examine the impact of individual schools and school leaders with regard to technology integration. District-level support was important in that it reduced the variables related to technology access at the school level. In addition, strong district support meant that teachers had been provided access to professional development opportunities at the district level. In order to conduct the study, access to teachers and administrators was necessary. The researcher had access to a large, suburban school district in a Mid-Atlantic state. For the purposes of this study, the pseudonym Springfield was used to designate this school district.

District Characteristics

The Springfield School District (a pseudonym) serves over 20,000 students in over 30 elementary, middle, and high schools. During the 2010-2011 school year, the racial/ethnic composition of county students was about two-thirds Caucasian, 20% African American, and 10% Hispanic. Just over one third of the students were considered economically disadvantaged. Over 10% of the students were identified as special education. Over 10% of the students were identified as gifted. Less than 5% of the students were identified as speaking English as a second language. Less than 5% of the students were identified as Title 1. The average SAT scores for 2010 college-bound seniors were over 500 reading, and under 485 in mathematics, and writing.

During the 2010-2011 school year, the Springfield School District employed about 1,800 classroom teachers. The average teacher had 10 years of classroom experience. Most teachers were identified as highly qualified as defined by No Child Left Behind. About half of the teachers held a master's degree or higher. Fewer than 50 teachers were nationally board certified. The student-to-teacher ratio for elementary schools was less than 24:1 for grades K-5. The student-to-teacher ratio for middle and high school core academic classes was slightly higher.

District's Technology Focus

The selected district had placed an emphasis on technology. Several aspects of Rogers' (2003) steps for the adoption of innovation had been met. Springfield had provided its schools with a large amount of technology support. In 2006, Springfield School District residents passed a multimillion dollar bond referendum to improve the

technology infrastructure. Springfield developed a Six-Year Technology Plan which included goals in the areas of instructional services, effective learning environment, parent engagement and dynamic community partnerships, and a supportive organizational structure. In addition, the Springfield Technology Plan was guided by technology standards that include the National Education Technology for Administrators (NETS-A). As noted earlier, the strong level of district support meant that several of Rogers' steps for technology integration were already met (2003). Teachers had knowledge of instructional technology tools and opportunities to use these during instruction. Teachers were at the stages of persuasion and implementation. At these stages, leaders can influence teachers' decisions and promote increased instructional technology use.

Examples of how Springfield had worked to upgrade hardware included installing a fiber network across the school district, placing SMART Boards and LCD projectors in every classroom, creating mobile computer labs in each school, and providing teachers with a laptop for school and home use. To support the learning environments, Springfield provided Instructional Technology Resource Teachers (ITRT) who worked with classroom teachers on integrating technology into their instruction, and promoted student-centered learning through teacher education programs and innovative professional learning approaches. Approaches taught as part of professional learning included project-based learning, inquiry learning, and digital literacy. Virtual learning environments were promoted by providing video conferencing equipment to all schools and district offices for meetings and virtual field trips. Springfield implemented a county online resource for all students in the fall of 2007. The online system allows teachers to

work with students online. In 2009, Springfield implemented an online instructional program at all high schools. Springfield's support of technology and technology integration at the district level made it an appropriate site to conduct research on technology integration at the school level.

Phase 1: Administrator Interviews

Research Subjects

Nineteen secondary school administrators were asked to participate in interviews during Phase 1 of the study. The administrators were asked to participate using direct recruitment: Administrators were asked directly if they would be willing to take part in the research. Informed consent was obtained prior to beginning each individual interview. Copies of the interview questions and administrator informed consent document are included as appendices (See Appendices A and C).

Research Relationship

In that I am an administrator in the Springfield School District and the county was interested in exploring technology integration at the building level, physical access at the county level was possible. Since the administrators were colleagues, it was important that I maintained a good working relationship outside of the study as well as within the study. Because the intent of the study was to help improve technology integration and help school administrators with completing difficult instructional tasks, I maintained an effective research relationship. It was critical that I maintained trust with these individuals. By approaching the study as a collaborative effort (Maxwell, 2013) between the researcher and school administrators and focusing on a goal of discovering

information related to technology integration, a sound research relationship was maintained.

Interview Protocols

In order to respond to the first four research questions, data for the qualitative portion of the study were collected using interviews of Springfield high school administrators. From a potential pool of 19 administrators, 16 took part in the study. Of the 16, 11 participants were male and 5 were female with ages ranging from early 30s to early 50s. Additionally, 12 identified as Caucasian while 4 identified as African American. In terms of current positions and education, 4 participants were high school principals, 12 were assistant principals, and all participants had a minimum education level of a master's degree. Several participants were either currently involved in or had completed a doctoral program. The level of experience serving as an administrator ranged from less than 2 years to 20 years. Table 1 provides a visual representation of administrators.

Table 1

Demographic Characteristics of Interviewees

Characteristic	Participants (N = 16)
Gender	
Male	11
Female	5
Race	
Caucasian	12
African American	4
Current Position	
Principal	4
Assistant Principal	12
Educational Level	
Master's Degree	13
Education Specialist or Doctorate	3
Years Administrative Experience	
Less than 4 years	3
4 to 10 years	9
10 or more years	4

Each administrator was asked the same set of questions. Follow-up questions were asked to clarify the participant's intent or to explore a particularly interesting response. A digital recording of each interview was made using an iPod Touch. In addition, a Pulse recording pen was used to create field notes during the interview and to create a backup recording. Each interview was reviewed as soon as reasonably possible following the actual interview and a reflection was created of the researcher's general impressions.

Interviews were conducted in a setting selected by the interviewee. In most cases, this was the interviewee's office. This was appropriate because an administrator's office is the location from which the administrator directs staff and formulates decisions regarding the school. Actual selection of an interview location was determined by each

administrator. Each administrator interviewed was provided with a copy of the informed consent at the beginning of the interview (Appendix C). The study was approved and exempted by the George Mason University Internal Review Board (IRB). To protect the anonymity of the participants IRB determined that no record of the informed consent was to be maintained (Appendix D). Because the researcher knows and works with each of the participants, the researcher was familiar with the demographic information provided for this study.

Interviews were conducted over a 2-month period and lasted 25 to 60 minutes. An audio recording of each interview was made with the interviewee's full knowledge and consent and after the interviewee had read the informed consent document and agreed to be interviewed. During the interview, each participant was asked to respond to 10 interview questions which are listed in their entirety in Appendix A. The interview questions were intended to stimulate discussions related to instructional technology. Specifically, questions attempted to examine administrators' perspectives of their vision for technology, their role with regard to technology, how they promoted technology, and barriers to technology integration. In some cases, participants were asked follow-up questions to clarify specific statements or to develop specific ideas related to technology or technology integration.

Researcher as Instrument

To protect the integrity of the data, I needed to recognize the role that I played in the research in that I was the instrument of data collection. I produced several reflective memos during the course of the research to help assist with negotiating the research

process. I questioned each of my assumptions in order to be certain that my conclusions represented an accurate assessment of each administrator's perspectives. I examined via a memo a list of difficult questions for qualitative research to help guide subsequent memos and reflective journals (Maxwell, 2013).

Data Analysis for Phase 1

Data analysis for Phase 1 of the study was completed using qualitative methods. An unabridged audiotape of each interview was created and interviews were transcribed for the researcher by a professional transcription service. Transcripts of the interviews were reviewed by the researcher to gain familiarity with the content of the interview. Data was then coded using preestablished codes related to leadership, specifically: vision, administrator's role, activities to promote technology, and barriers to technology integration. Emergent codes were included when appropriate. After initial categorizing and coding, a theoretical explanation of the data was developed to help respond to each research question addressed during Phase 1:

1. What do high school administrators indicate is an appropriate vision for technology integration?
2. How do high school administrators identify their role with regard to technology integration?
3. What do high school administrators do to promote technology integration?
4. What do high school administrators perceive as barriers to technology integration?

After the initial four research questions were answered, the data were reviewed again to search for confirming and nonconfirming instances of the phenomenon (Maxwell, 2013). No follow-up interviews were deemed necessary.

After the initial coding using predetermined codes, items were separated into specific themes for each area by using a combination of predetermined and emergent codes.

Vision. For vision, the primary subcodes selected were general technology vision, instruction, and school management. Vision and a vision specific to the instructional use of technology were both identified in the literature (Boone, 2009; Ertmer et al., 2002; Holland & Moore-Steward, 2000; Schmeltzer, 2001; Todd, 1999). School management was selected as a code because this is an important part of an administrator's daily job. These codes were changed during the coding process to reflect the primary areas addressed by administrators and became the primary themes related to vision: importance of technology, technology in the management of school processes, technological impacts on instruction, and 21st century learners. These themes were further divided into subthemes by focusing on vision items discussed by administrators and how they related to each theme. Examples of subthemes for the theme importance of technology include strong and measured support. Examples of subthemes for the theme school management include administrative tasks, communication, student and teacher supervision, and building maintenance. Examples of subthemes for the theme technology and instruction include student-centered learning, technology tools, and use of technology by teachers. Examples of subthemes for the theme 21st century learners include technology in

students' hands, access to information, social media, and mobile technology. Subthemes are discussed further in the analysis in Chapter 4. A representation of the final coding structure for vision can be found in Appendix E.

Role. For role, the primary codes initially used were technology role and nontechnology role. Since the primary focus was to identify potential roles related to technology, only items coded technology role were considered for further analysis. These were coded using two emergent codes: instruction and conflicting roles. These two codes became the themes related to an administrator's technology role. Subthemes were developed for each area based on administrators' responses identified for each theme. Examples of subthemes for the theme instruction include instructional supervision, modeling, expectations, maintenance concerns, and Instructional Technology Resource Teacher (ITRT). Examples of subthemes for conflicting roles include personal technology skills and supervision. Subthemes are discussed further in the analysis in Chapter 4. A representation of the final coding structure for role can be found in Appendix E.

Promote. Promote codes were selected using a combination of items identified in the literature and items based on administrator responses in the area of promote. Initially, items were divided using the subcodes access, direct support, professional development, and modeling—items identified in the literature as activities that administrators do to promote technology use. Indirect support, expectation, and force were added as subcodes. Force was later identified as a type of expectation. Examples of subthemes for the theme access include access to tools and access to funding. Examples of subthemes for the

theme expectations include encourage use, force use, and evaluate use. Examples of subthemes for the theme skills include professional development, practice, support experimentation, and time. There were no subthemes for indirect support. A full list of codes is presented in Appendix E.

Barriers. Barrier codes were selected using barriers identified by Hew and Brush (2007). Initially the codes resources, knowledge and skills, institution, attitudes and beliefs, assessment, and subject culture were considered. Based on administrators' responses, these codes were collapsed into resources, knowledge and skills, institution, and attitudes and beliefs. Subthemes were developed for each area based on administrators' responses identified for each theme. Examples of subthemes for the theme attitudes and beliefs include fear, teacher and student roles, and resistance to change. Examples of subthemes for the theme knowledge and skills include teachers' skills, professional development, and administrators' skills. Examples of subthemes for the theme resources include time and access to technology tools. Examples of subthemes for the theme institutional barriers include systems barriers and policy. A full list of codes for barriers is presented in Appendix E.

Phase 2: Teacher Survey

The second phase of the study used school administrators' responses from the interview phase to develop survey questions representing the teachers' views of school administrators. Teachers in the targeted school district were asked to respond to the survey. The survey used a forced choice Likert scale, and teachers were asked to rate the survey items on a 1 (strongly disagree) to 4 (strongly agree) scale.

Research Subjects

Phase 2 involved teachers from the same school district as the administrators. There were approximately 480 high school teachers in the core academic areas. The survey was sent to all of them, and later a follow-up request for participation was sent to the teachers (Appendix B). A total of 195 teachers responded. Because the researcher was familiar with the teachers in several schools in the district, no demographic data was collected so as to protect the anonymity of the participants.

Instrument

The survey instrument used in Phase 2 was developed using data collected during Phase 1. Specifically, the survey items reflected the primary research categories: administrators' vision for technology integration, administrators' role with regard to technology integration, administrators' activities to promote technology integration, and administrators' perceived barriers to technology integration. When possible, survey items used evocative statements made by administrators during the interview process. The survey also included collective statements that represented the views held by administrators. Questions focused on Research Questions 1-4 and addressed vision, administrator's role, administrators' actions to promote technology, and administrators' perceived barriers to technology integration. Sixteen questions related to vision were intended to identify potential uses or directions where technology might be useful. A sample vision question was, "Technology is an important part of the management of schools." See Appendix E for a complete list of vision survey questions.

Four questions related to administrators' role were intended to identify the technology roles filled by administrators. A sample role question was, "My administrators model the effective use of instructional technology during staff meetings." See Appendix E for a complete list of role survey questions. Nine questions related to administrators' actions to promote technology were intended to identify ways that administrators promote technology use. A sample promote question was, "It is an expectation that teachers include technology in lessons." See Appendix E for a complete list of promote survey questions.

Seventeen questions related to barriers to technology integration to identify those perceived barriers. A sample barrier question was, "Teachers' use of technology in the classroom is limited by outdated policies and practices." See Appendix E for a complete list of barrier survey questions. In several instances, due to the nature of a specific question, the question was used to address multiple categories. For the final survey, a total of 42 questions were created and randomized. The final survey is presented in Appendix B.

The survey was delivered online using SurveyMonkey.com. The first item in the survey was the informed consent (Appendix B). Teachers who provided consent were permitted to continue on to the survey. Teachers who did not provide consent were exited from the survey.

Procedures

Approximately 472 high school teachers were contacted via an initial email and a follow-up email and asked to complete an online survey. Ultimately, 195 teachers

responded to the survey with 179 completing all survey questions. A link to the survey on SurveyMonkey.com was provided in the email invitation to participate in the research. Samples of teacher recruitment information are contained in Appendix F. The length of the survey window was 3 weeks. One follow-up email was sent so that an adequate number of responses were received and to provide notice to teachers that the survey window would be closing.

Data Analysis

Descriptive statistical analysis was conducted on survey results by finding the percentage of respondents who answered each of the possible responses. Specific data included the percentage of respondents who strongly agree, agree, disagree, and strongly disagree. Percentages were selected because they provided a clearer representation of how strongly teachers endorsed the principals' perspective presented in each survey item. The results of the analysis of teacher surveys were examined with the data collected through the administrator interviews to answer research question 5:

5. What are high school teachers' responses to high school administrators' perspectives regarding technology integration?

Interview and survey data collected during Phases 1 and 2 were examined to determine how strongly teachers endorsed the administrators' perspectives. Quantitative data for teachers were available through survey results. Qualitative data were available through administrator interviews. Areas where teachers endorsed administrators' perspectives and areas where teachers did not endorse administrators' perspective were identified and are discussed in Chapter 6.

Validity

To examine the ways that I might draw incorrect conclusions from the interview data, I searched for disconfirming instances, and competing explanations within the data were considered. By using follow-up questions, I provided an opportunity for the participants to relate additional data and correct misconceptions that I might have developed regarding their intended perceptions. I actively looked for nonconfirming examples within the data. By actively looking for information contrary to my ideas and assumptions, I was able to reduce the likelihood that important disconfirming information was missed. I needed to make sure that I explored any data that diverged from my basic assumptions in depth and to recognize the ways it impacted my theoretical framework (Maxwell, 2013).

A threat to validity came from my assumptions about the role I felt administrators should play in regard to technology integration. My assumptions could impact my interpretations of the data. As such, I compiled a list of assumptions. The creation of field notes and memos related to validity and other areas were used to assist with controlling the impact of my assumptions.

An analysis of field notes and memos revealed the researcher assumptions regarding administrators, teachers, students, technology, and schools. Identifying assumptions was intended to identify and guard against potential bias that might impact the outcome of the study. With regard to administrators, the researcher felt that, in general, administrators do not do a good job promoting instructional technology. Most administrators do not have skills related to technology and technology instruction. Most

administrators are focused on observing traditional methods like direct instruction, where the teacher is at the center of instruction in the classroom and students receive information from the teacher.

With regard to teachers, the researcher felt that most teachers do not feel that technology is necessary. For most teachers, technology is difficult to use. Often, when teachers do chose to use technology, the focus is more to automate current practices. Most teachers want students to learn the course content and feel that is most important. With regard to students, most students are able to adapt technology to serve their needs, but most technology use is on a surface level. Most students do not have the skills to analyze the information that they are able to find.

With regard to instruction, the researcher felt that most instruction relies on information delivery. Students often do not find this interesting, in part because they can usually find the information on their own that the teacher is providing. Instruction more often than not does not require students to evaluate information. Instead, students are just asked to give the information back to the teacher.

With regard to schools, the researcher felt that schools are hard to change. Currently, schools are more focused on SOLs and other state and federal requirements. Technology only has a place in schools where it will result in improved outcomes related to state and federal requirements.

With regard to technology, technology is the future. Information analysis skills and technology literacy are critical skills. Students with the ability to use and analyze the information available via technology will be successful. Rather than using technology to

do the kinds of things teachers have always done, teachers should search for ways to do the things that they could never have accomplished without technology.

Backyard Research

The single largest validity concern in this study was also one of its strengths. By conducting research in my own district, I risked tainting the research with a wide range of researcher and participant biases. This risk was justified because the selected site and the participants were engaged in the kind of cultural change suitable for the study. This school district also had the key elements identified by Rogers (1995) as necessary for the adoption of an innovation.

CHAPTER FOUR

Chapter 4 reports the findings of Phase 1, the qualitative part of the study. This chapter addresses the first four research questions in order to obtain information regarding administrators' vision for technology, role regarding technology integration, administrators' activities to promote technology integration, and administrators' perceived barriers to technology integration. To that end, this part of the study was designed to answer four research questions:

- Research Question 1: What do high school administrators indicate is an appropriate vision for technology integration?
- Research Question 2: How do high school administrators identify their role with regard to technology integration?
- Research Question 3: What do high school administrators do to promote technology integration?
- Research Question 4: What do high school administrators perceive as barriers to technology integration?

The study used a mixed-methods approach to answer these questions. Questions 1 through 4 were addressed using qualitative methods. Question 5—addressed in Chapter 5—is assessed through qualitative in the form of administrator interviews and quantitative data in the form of a teacher survey. As a qualitative approach, I will attempt

to tell the story of the administrators in the district of interest. Pseudonyms are used to refer to the administrators and their quotations throughout this discussion. The story presents a variety of points of view and, at times, these views contradict one another.

High School Administrators' Vision for Technology Integration

The first research question asked, What do high school administrators indicate is an appropriate vision for technology integration? Data from interviews with high school administrators indicated there were four emergent themes regarding administrators' vision for technology in schools: the general importance of technology with regard to education, technological possibilities for the management of school processes, that technology has impacts on instruction, and 21st century learners and ways that technology can be used to support them. All respondents discussed these four themes.

Importance of Technology

All 16 administrators participating in the study discussed the importance of technology. Within this theme, two subthemes emerged related to how strongly these administrators embrace technology. While all administrator participants reported that technology is important and has impacted education, the degree to which these administrators focused on technology integration varied. Five administrators indicated strong support for technology integration, and reported that technology use needs to be increased in the classroom or noted that teachers do not use it enough. In contrast, 11 administrators provided responses that indicated measured support, recognizing the importance of technology but not as a primary priority. One administrator reported that while technology is important, it is not a core value; 5 administrators identified

technology as a tool that teachers can use; 6 administrators indicated that technology was something they look for during observations; and 1 administrator indicated that technology has just made education different.

Strong support. The respondents who felt technology use needs to increase reported that there are important connections between today's students and technology that cannot be ignored. These administrators shared the belief that technology use needed to increase in order for schools to be successful with today's students. One of the respondents, Jerry, stated, "You got to incorporate and use it as much as possible now because the kids who are the end user, that's what they're used to." Another administrator, Bill, reported that teachers "use it every day, and it's meaningful. They just don't use it to be using it." Bill also stated, "There's no way for a school district to be successful unless they push technology. I do, as an instructional tool." Mark, an assistant principal, said with regard to teachers not using technology,

> It's kind of hampering the kids. Obviously, if the world and everything outside this building is going forward and is technology based, and…we're just kind of sitting status quo and not going with the times, obviously it's going to be detrimental.

Matt indicated that he likes to observe teachers using technology:

> We rarely have a day where a piece of technology isn't out in the building somewhere. And what I actually, what I like to do is go into the library and look at the log of who is using what. And then I go and visit those classrooms. Because that's the type of stuff I want to see.

Measured support. Eleven interviewees indicated they had a measured level of support for technology integration. These administrators typically viewed technology as important, but not as essential as other priorities. One administrator, Al, indicated that technology had taken a back burner to other priorities. Zeus also described this situation,

> I don't think technology is the end-all, be-all existence for instruction. I think that it's a tool that can be used to enhance instruction. I think some folks rely a little bit too heavily [on it]…. And then on the flipside of that, there are others that use it so infrequently for a variety of reasons.

Zeus further stated,

> You always want to look for [technology] in instruction and when you're stepping into a classroom. I think it's good that that's one of the criteria that we have on observations and one of the things that we're looking for in that use of technology. So just having it as an expectation I think is really important.

Reggie, an assistant principal, stated, "There is a place in education for a somewhat traditional model and a 21st century model. I think they kind of have to be blended." Arthur indicated, "We should use technology to help facilitate some of the learning, where it's usable." He also stated that he supports the use of technology but that "it could never replace the teacher." Scott, an assistant principal, indicated that after revising his school's vision statement with the inclusion of seven core values, "technology was not one of those core areas."

Frank, a school principal, said with regard to technology's impact on instruction, "I wouldn't say it's made it easier, but it's just made it different." Frank also stated,

"Socrates taught great lessons under a fig tree, and he didn't have technology. So we don't want to lose the personal aspect of it…. [Technology] can enhance, but it's not the end-all."

The range of support among administrators indicates varied levels of support for technology use. Some administrators strongly support the use of instructional technology. Other administrators limit their support for technology and indicate that it is only one of many instructional tools available that teachers may choose to use.

Management of School Processes

A second major theme emerging from administrator interviews related to technology's role in support of school management. All 16 administrators identified ways that technology can be used to manage school processes, revealing six subthemes with regard to school management processes. All 16 administrators identified ways that technology assisted them with various administrative tasks. Ten administrators discussed the importance of technology for communication. Nine administrators felt that technology assisted them with student supervision and student data. Eight administrators identified ways that technology could be used to track instructional data or support instruction. Five administrators discussed the importance of technology for tracking and scheduling building maintenance. Five administrators identified ways that technology assisted with teacher supervision.

General management. Most administrators identified ways that technology could be used to assist them with administrative tasks. Candice noted, "there's a place [for technology] in the managerial range for education. Because, bottom line, it is a

business…. And for your business to run effectively and efficiently, we can use technology to help us do the managerial jobs." Jerry echoed this statement, claiming he "kept track of everything electronically." Al indicated the importance of digital calendars for his work, "So much of my life revolves around a calendar and making sure I am where I am supposed to be…. For me, it is about my calendar, having it right here, and being able to access it." While the aforementioned administrators noted the value of technology, Mark related the benefit as well as the problems associated with technology, especially his dependence on it,

> My laptop is definitely…my main source for technology here at school. I do use it pretty much for all my purposes. It is kind of crippling, I'd say, when the Internet's down or GroupWise is down or some kind of, you know, ISeries sometime won't be responding. So all those things are kind of a pain because then I need to figure out what's my backup. How do I deal with this or how can I find this the old-fashioned way?

While technology does assist administrators in several ways, other administrators shared Mark's frustration when technology does not function properly. Candice indicated that when her computer is down it is hard for her to do most of her job. Arthur elaborated by adding that the number of systems he is required to use can be frustrating.

> I have about six or seven different systems and I don't think I'm up on all of them still. Because we use a different system to do billing and take in books and register books. And I'm not very strong with that one at all. I don't even remember what it's called.

Both the number of systems administrators need to use and functional problems with technology can frustrate administrators when they are using technology.

Two administrators, Ann and Matt, indicated that technology reduced costs and saved money. Ann felt it could reduce paper and copying costs with greater movement toward paperless schools while Matt related a story where virtual dissection was used when the science department did not have funds to purchase specimens for dissection.

Communication. All 16 administrators interviewed reported using email as a form of communication. In discussing administrative tasks, Al felt communication was critical,

> I think communication is one of the top three, at least. And that's communication with our [students'] parents, community, communication with our students, communication with each other. You know, we can use communication [so] parents can access grade books…to get the word out, that's awesome.

Zeus indicated that email is "obviously the major form of communication at work" and his primary form of communication. Mark indicated that technology is central to communication for many school tasks, "whether it's maintenance, discipline referrals… custodial complaints or requests again." Matt related how LED projectors have helped facilitate communication during Individual Education Plan (IEP) meetings,

> I like what we do now with IEP meetings. We have it literally on the SMART Board, and our case managers do not sit at the computer and type and look at the screen. They are making a presentation to the individuals in that meeting. They're up at the SMART Board. You know, everything that they need to do at the

> computer, they can do right there at the SMART Board. And it's amazing because there's this big screen that everybody's looking at, and everybody's on the same page. They're not fumbling through sheets of paper anymore. It's all right there. You can sit there and highlight different—and it really is—that's really great. That's what it's meant to do. And that's what it's meant to be there for.

Matt also indicated that the Tandburg (a video conferencing system purchased by the district) has helped facilitate meetings with other schools in the district. Overall, administrators generally felt that technology was important to daily communication.

Mobile technology has improved administrators' ability to stay in touch. However, administrators noted that this advancement in communication has side effects. Scott indicated that smart phones and email have impacted him negatively outside of school,

> I'd say it is definitely a distraction when I'm home. When I'm home and I hear it [my smart phone] ding or hear it vibrate, I go over and check it and I respond, and it takes away from family time. So I'm considering—half-heartedly—considering taking my email off my phone, just because I'd like to be more focused at home.

Mark, who did not have a smart phone, expressed how this lack limited his ability to access information, such as email or work, when disconnected from his computer.

> I feel like when I'm on evening activities down at the field or something like that, that would be a good opportunity for me to be able to catch up with some emails or take a look at some things that would require online access. And right now I just don't have that. You know, I can bring my computer down to games and set

up in the press box or something like that. But there's limited amounts of things that you can do other than data input if you don't have connection.

Administrators appear to be seeking ways to improve communication, and smart phones appear to play an important role.

Building maintenance. Five administrators, one from each high school, discussed using technology to manage maintenance issues. Scott related that he spends a large amount of time with building maintenance, specifically drafting work orders. Mark and Zeus both reported using technology such as SCORE and email to help facilitate work orders. Frank, a principal, noted the various ways he uses mobile technology to facilitate building maintenance. During his interview, he stated, "Today I was on the tennis court and there was an issue, and I just took a picture." He further clarified, "even work orders are submitted through or phones now to the secretary. If I'm on the field and there is a light out, we just shoot an email immediately."

Student supervision. Student supervision comprises a great deal of every administrator's day. Thus, it is not surprising that nine administrators discussed using technology to assist with student supervision. Mary discussed using tablets to access student schedules while in the hallway: "So we have the iPads…this allows us to…have PASS [Parent Access for Student Support] up, and be walking around and actually see the child, and say, 'Okay, what is your name?' Type [it] in. 'You should be sitting in math right now.'" Sue indicated that the administrator role "forces" the constant use of technology, "I use it for looking at my students and looking at where they are, some of their needs…. I'm always using it to look at the history of a student."

Several administrators discussed using technology to monitor student attendance and track disciplinary issues. One administrator, Frank, indicated he used a flip camera to monitor student behavior at school events "to capture kids doing something good, kids doing something not so good."

Bill discussed how various student data systems can be used together to facilitate discussions with parents,

> I can go to my computer and run a profile from business objects. If I got a meeting with parents when they get here…I got a print-out of everything. The demographics, the grades, the attendance, how much money they got in their lunch account…whether they passed the SOL test. I don't have to fumble through records to find this.

Instructional data and instructional support. Eight administrators discussed using technology to track student data or provide some type of instructional support. Mary described an application that her chemistry teacher used for grading, "[He] literally has on his desk the school laptop, his own little laptop, because he uses that quick grading program where he just holds the test sheet up to the camera on his computer and scores it." Candice (and several other administrators) mentioned that, "it would be nice if [students] could all have their textbooks on the computer." With regard to the impact of technology on education, Bill said,

> A good example would be data mining, being able to access the information right at the push of a button. I mean, SOL data—we had our benchmark review meetings and the data was there…. [The teachers] went through every question

> that the kids didn't do well on that benchmark and asked for suggestions on…what can we do.

Furthermore, with regard to using data effectively, Reggie noted, "the goal is to have them [look at data] on a routine basis, to have conversations about that, to evaluate progress, and to look at strengths and weaknesses." Reggie also discussed using data in combination with Professional Learning Communities (PLCs) to improve instruction and meet student needs.

Teacher supervision. Five administrators identified ways that technology can assist with teacher supervision. These individuals discussed using an employee attendance tracking program, AESOP, as a way to assist with both tracking teacher attendance and locating substitute teachers as well as other applications to improve such tasks. Bill discussed using several items to assist with teacher observations, stating,

> I like to go in unannounced and just observing the teacher for a few minutes whether they're using technology—I got my laptop with me and I can check on whether they are on point with the curriculum map. I go to SCORE, look at their lesson plans, and I'm still absorbing what they are teaching.

Scott indicated that teachers in his building are creating online portfolios as part of the evaluation process, especially as "a lot of the things we're doing now are online."

Impacts on Instruction

The third theme that emerged from the data related to technology's influence on instruction as all 16 administrators involved in the study discussed instructional impacts of technology. Several subthemes emerged with regard to technology and instruction.

Twelve administrators discussed ways that technology increased student-centered learning. All administrators identified at least one specific technology tool used in connection with instruction. Seven administrators indicated that technology use varied widely among teachers in their building. In general, all administrators agreed that technology has important impacts on instruction.

Student-centered learning. Twelve administrators directly addressed technology's impact on student engagement; eight identified ways that technology assists by making learning more interactive; and four discussed collaboration with regard to technology.

Engagement. Twelve administrators linked technology with impact on student engagement. They reported that technology helped engage students through access to information in a format that they understand. Scott stated that, "I think technology enhances student engagement by allowing students to see, understand things differently, that they wouldn't normally otherwise have a chance to. And also they have all this information at their fingertips." Jerry indicated that simply including technology in a lesson helps with student engagement, noting,

> I've seen where—have the one teacher teaching down in the CTE [Career and Technical Education] department—utilizes technology every day. She is eccentric in the use of the technology, and she incorporates technology—even when it's hard to, she finds a way to incorporate it. And because of that, the kids eat it up.

Bill indicated that using technology was more work for the teacher but that the results with regard to student engagement were worth the effort. In reference to a particular

incident, he stated, “It took a lot of planning for this particular teacher to engage his kids and get it done. And what I liked about it, and I talked to him—he had 100% participation.”

Interactive learning. Eight administrators identified ways that technology assists by making learning more interactive, noting how technology helped students interact more effectively with the content. Jerry described a lesson where the teacher used social media. In the lesson, the teacher instructed students, telling them to do the warm-up on the board and then submit it to Facebook or to Twitter. He stated that “it’s one of those, because the kids are using the technology, it’s almost like we’re tricking them into learning.” Candice described how one teacher uses stations to permit students to direct their learning.

> I saw the kids really wanting to be active participants. You know, there were a limited number of laptops available at the time. The kids were actually in stations. Some were using books to do research about their historical figure, and some were on the computer interfacing with that, doing additional research, and some were actually setting it up on the computer. So, there were limited resources, but there was that enthusiasm with the kids. It was like, “wow, you’re speaking my language now.”

Zeus described a lesson he used with students before becoming a school administrator which asked students to use real-time seismogram information. Zeus indicated

> This was a great activity. It was great because it was kind of real, showing them real, live seismograms. And so it wasn’t just chalk and talk. They had to actually

> do it, so that was one of my favorite ones that I know when I was still teaching that I did.

Mark indicated he felt just involving technology promoted interactive learning, stating,

> I think just any time that you can use some kind of technology is going to be a good thing. Just like we were saying, because I think the use of technology is more likely to get the kids interested and hopefully involved.

Collaboration. Four administrators discussed collaboration with regard to technology and generally felt technology could help with collaboration. Bill stated, "It's all about collaboration, and this is technology that's going to push this out here for me." Sue felt technology was a way to help teachers collaborate on instructional matters,

> We have some people here that are really, really good with technology, and we could pool that skill at maybe a faculty meeting or set up small groups where they could help teach other, and they could collaborate to talk about, "oh, this is what I feel as if I need—so who has this skill and who has that skill," and I believe coming together and talking as a department, then as a school, we could find out what we already have, and then we could all grow.

Technology tools. All 16 administrators identified specific technology tools used in connection with instruction and felt these tools served to assist teachers to facilitate student learning. Eleven administrators discussed student response systems and how the SRS enables teachers to check student understanding throughout a lesson. All 16 administrators discussed SMART Boards ubiquitous in county schools and used for a wide variety of instructional purposes although they reported that, in many cases, these

systems were not used to their greatest potential. Ten administrators discussed using web-based tools for class management. (Of note, the county provides teachers access to a classroom management program similar to Blackboard, but instructional use of this tool varies widely). Six administrators discussed WebQuests or wikis as learning tools, especially in terms of their ability to open up the world to students. Nine administrators discussed mobile computer labs known as COWs (computers on wheels) and their consistent use within the classroom. Nine administrators discussed online learning. Ten administrators discussed mobile technology, expressing mixed perceptions. Some administrators felt that mobile technology enhanced instruction while other administrators felt mobile technology interfered with instruction.

Inconsistent use of technology. While administrators provided uses for technology, seven administrators indicated that technology use varied widely among teachers in their building. Candice indicated,

> I think that—unfortunately, I'm seeing various degrees of usage of technology, even again with the SMART Boards. I mean I have seen some teachers, who basically are using it as an electronic blackboard or chalkboard, as opposed to going into the different programs that you could use, and the graphics that you can pull up, and so on with that. I have seen an overabundance of the use of PowerPoint, where again it's not interactive. It's sit and get, but you're just looking at colorful graphics or colorful font, and that type of thing.

Ann indicated that the style of instruction impacted technology use, stating, "Some teachers, unfortunately, you see a little bit more teacher led, teacher directed and teacher

talking." Mary felt that, in her school, technology use varied by department, "In English class, too many of the teachers are…using the SMART Board as a projector, not as a SMART Board. But, now, if you go into a science classroom…it's going to be a very, very different look."

Administrators identified a wide range of tools available to and used by teachers to include hardware, software, and cloud-based tools. In addition, administrators discussed both school-provided and student-provided devices. However, despite the variety of resources reported, interviewees indicated their use varied within each building and between departments and classrooms.

21st Century Learners

The fourth theme discussed by all administrators related to supporting 21st century learners. Three subthemes emerged from the data regarding this theme. Ten of 16 administrators indicated that technology needed to be directly in the students' hands. Nine administrators discussed information access and ways that access opened the world to students. Ten administrators discussed student access to cell phones.

Technology in students' hands. Ten administrators discussed increasing the amount of technology directly in students' hands, and most of these administrators supported providing students with computers. Frank noted, "I would love to have a tablet in every kid's hand," while Betty also felt providing a student with a computer was important, "I think it would be nice if we were able to actually issue kids their own laptops or iPads or MacBooks. I think that would solve a lot of our problems." These administrators suggested that many technology access problems would be reduced if

students were issued a computer. Alex believed strongly that technology needed to be in students' hands,

> The teacher needs to stop being the caretaker of technology and let the kids be the caretaker of technology. Kids can do far more things with technology than this old man will ever be able to do. But if we teach them—see we have to teach expectation. If we teach them what we want technology to be, which is this incredible tool to be able to help us express thought and reason and inductive and deductive processes. Then give them the tool. Stop holding and hoarding the tool for ourselves and give it to the kids and let them do it. Let them create from the technology what you want.

Alex depicted a different type of instructional design that technology offered which would allow the student to express and create.

> Mary described how a student-focused design might look in a classroom:
> Every unit is so many things they can choose from doing, and they walk in every day and they grab laptops, and they are on there, and you know, she's working individually with kids on what they're doing. But they're all kind of working at their own pace…. They can work on it at home, they can work on it here, they can take their tests when they're ready.

The theories set forth in Mary's description were echoed by Scott, who indicated that letting students bring their own devices (BYOD) to class would help provide more technology, "I think technology—if it was embraced in a 'bring your own device' type atmosphere…would be a good thing." Similarly, Candice felt that students learn better

with technology, stating, “I think our jobs as administrators and certainly as educators are to give these kids the opportunity to use as much technology as they can, because that is how they best, in their minds, communicate and also learn.”

Information access. Nine administrators discussed information access. In general, administrators indicated that the availability of information has impacted instruction. Scott stated,

> The access to information has changed the way, or needs to change the way, we think about teaching. I don’t know if it has yet or not. I think we still do a lot of drill and kill, and I think we still require students to know bits of information. But if we moved to a skills-based—which a lot of the tests are now incorporating these skills-based questions instead of just content. If we could figure out how to teach that as opposed to acquisition of information, then I think we’d be better off.

The availability of information, however, seemed to go beyond learning how to access information. Jerry discussed the issue of information availability pitted against the need to analyze it, “All the information’s right there…so, okay, what to do with the wealth of information that you have at your disposal…how do you determine what’s good information and what’s bad information.” Furthermore, Al indicated that students now seem to question teachers’ requests for information, asking, “If you can access it, why do I need to memorize it? Why do I really need to learn all the steps if I can just constantly look it up online?”

Information availability has not only impacted instruction, it has changed the way students handle information. Ann indicated that the availability of technology and information has altered the way students think,

> The generation that we're starting to serve, they've always had something in their hand. They've always had something engaging them. And so I see a need to do that more, because all it is, is an avenue to the information. And I don't think we're using it as an avenue.

While information access has changed students, it has also created a gap between students and educators.

In addition to accessing information, administrators reported technology has created a way for students to publish and present information to others. Al described a web-based publication assignment in which the result "was being put out there on the web for everyone to see, and other students to access, and next year's students to access, and students at other schools to access," overall, forcing the student to provide an effective product for, potentially, a global audience. He remarked improved quality is a result because "you don't want your name attached to something that looks dumb"; specifically, it seems publication increases student ownership. In addition to cultivating agency and ownership, Reggie felt sharing information was critical to student growth,

> I think that sharing knowledge is one of the best ways to grow. That people share knowledge via the Internet and students suck it up and share their own knowledge. I think that it's a vehicle to express their ideas, and it's just a wealth of information that anybody can access.

Summary of Administrators' Vision for Technology

Interviews with 16 high school administrators indicated four emergent themes regarding administrators' vision for technology: the general importance of technology with regard to education, technological possibilities for the management of school processes, the impact of technology on instruction, and 21st century learners and ways that technology could support them.

All administrators involved in the study discussed the importance of technology. Within this theme, two subthemes emerged related to how strongly the administrator embraced technology. While all administrators reported that technology was important and had impacted education, the degree to which these administrators focused on technology integration varied. One group of administrators indicated strong support for technology integration. These five respondents directly reported that technology use needs to be increased in the classroom or that teachers do not use it enough. Eleven administrators provided responses that indicated measured support for technology use. While these 11 administrators all indicated that technology was important, it was not a primary priority for them. Five administrators identified technology as a tool that teachers can use during instruction. Six administrators indicated that technology was something that they look for during observations. One administrator indicated that technology just made education different.

The second major theme related to administrators' vision for technology in schools concerned the use of technology to support school management. Six subthemes emerged with regard to school management processes. All administrators identified ways

technology assisted them with some kind of administrative tasks. Ten administrators discussed the importance of technology for communication. Nine administrators felt that technology assisted them with student supervision. Eight administrators identified ways that technology could be used to track instructional data or support instruction. Five administrators discussed the importance of technology with regard to tracking and scheduling building maintenance. Five administrators identified ways that technology assisted with teacher supervision.

A third theme related to technology's influence on instruction. All administrators discussed instructional impacts of technology. Three subthemes were apparent with regard to technology and instruction. Twelve administrators discussed ways technology increased student centered learning. All 16 administrators identified specific technology tools used in connection with instruction. Seven administrators indicated that technology use varied widely among teachers in their buildings.

The fourth theme related to administrators' vision for technology related to the use of technology to support 21st century learners. Four subthemes emerged from the data regarding this theme. Ten administrators indicated that technology needed to be directly in the student's hands. Nine administrators discussed information access and ways that it opened the world to students. Eleven administrators discussed social media. Ten administrators discussed student access to cell phones. Table 2 summarizes the themes and subthemes emerging from interview questions related to vision.

Table 2

Question One Themes and Subthemes

Themes	Subthemes
Importance of Technology	Strong Support Measured Support
Technology in the Management of School Processes	Administrative Tasks Communication Student Supervision Support Instruction Building Maintenance Teacher Supervision
Technological Impacts on Instruction	Increased Student-Centered Learning Technology Tools Available for Instruction Varied Use of Technology by Teachers
21st Century Learners	Technology Directly in Students' Hands Access to Information Social Media Mobile Technology

High School Administrators' Role in Technology Integration

The second research question asked, How do high school administrators identify their role with regard to technology integration? Data from interviews with 16 high school administrators indicated two emergent themes: instructional supervision and technology, and administrative roles or other factors that conflict with integrating technology. While the data contained a wide range of examples supporting technology integration, it was also apparent that support for technology integration conflicts with other established administrative roles.

Instructional Supervision and Technology

The first theme that emerged related to instructional supervision intended to promote technology integration in instruction. All administrators discussed instructional supervision regarding the inclusion of technology during classroom instruction, and five primary subthemes emerged. All 16 administrators discussed instructional supervision. Eight administrators discussed modeling technology use. Thirteen administrators discussed creating expectations that technology be included during instruction. Four administrators discussed their role in addressing maintenance concerns with regard to technology as a way to assist instruction. Seven administrators discussed relying on the Instructional Technology Resource Teacher (ITRT) to assist in fulfilling their technology role.

In general, the role of an administrator involved a variety of functions, and administrators were asked to describe their activities during a typical day. In response to this question, interviewed administrators reported their primary role in school operations included supervision of both teachers and students. The administrators readily identified daily activities that involved attending meetings, communicating with stakeholders, managing student discipline, conducting classroom observations, supervising student areas, providing for building maintenance, and attending athletic events. Alex's response offered an effective summary of these duties,

> Some of the consistent things that I do revolve around watching teachers teaching, watching the student interaction through their learning, dealing with building and facility issues, parent issues, student issues that may not necessarily be related to

instruction. It could be behavioral or social. Dealing with the myriad of teacher issues that could come up that are from professional to personal.

In describing a typical day, administrators indicated ways they used technology in daily activities. While all administrators noted that technology was important to instruction, only two administrators directly addressed technology as it related to instruction: One discussed supervision of online classes while the other discussed technology in connection with classroom observations. Furthermore, there was a lack of clear examples that integrated technology into daily activities, which could indicate that such integration—while assessed as important—is superseded by other more pressing roles. In response to other questions, administrators indicated they do see themselves as having a role with regard to technology integration.

Instructional supervision. All 16 administrators discussed instructional supervision, stating the primary focus of administrators during these discussions was to express that technology may be used to enhance instruction. Candice conveyed a point of view shared by several administrators: that the job of administrators and educators is "to give these kids the opportunity to use as much technology as they can, because that is how they best, in their minds, communicate and also learn." Like her colleagues, she demonstrated avid support for technology and its ability to help students express their learning capabilities. Sue indicated that a primary role for administrators with regard to technology is to assist teachers "by offering assistance, making sure they get the training that they need, and making sure they incorporate it in their lessons." In this role, administrators offer support to teachers that, in turn, enhances their technological

capabilities. In a similar vein, Arthur takes Sue's recommendation a step further through active engagement, stating he attended professional development activities with teachers for support, "I went and sat in on [the professional development]…. I wanted to be there physically, my presence, to support what the teachers were presenting and what they were sharing with their peers and giving examples of."

Several administrators indicated that one way to support teachers' use of technology was to provide them time to learn to use technology and time to plan instruction. Sue felt her job included this role and further stated, "If it's something that they need to do at a time where they don't have a substitute or something of that nature, I'm going to say, 'okay, I can get someone to cover so you can have that time.'" Similarly, Scott expressed the need to provide teachers with time, but he also mentioned that teachers are also able to provide support each other,

> So, administratively, I think the best thing that we can give our teachers is time. Because we have teachers who have so much more, are so much more tech savvy than I am…. But we have teachers that grew up with this stuff, so it's second nature to them. If we could get them to share their ideas and to show these other teachers the usefulness of this technology, I think that's going to be our most effective encouragement to use it.

Modeling. Eight administrators discussed modeling technology, but while these administrators indicated that modeling was important, there were few clear examples of modeling behaviors provided. Alex stated he felt modeling was important but relayed that his job was more to "model really maybe what makes technology cool and fun." Mark

also mentioned modeling's importance but, in terms of encouraging use of technology, he stated, "I guess it kind of starts up top with trying to use it ourselves and model it and push forward with that, and then kind of providing the opportunity for that to happen." Sue indicated, with regard to technology integration, "We modeled the behavior, we're giving you—this is your resource, we want you to use it." All of these responses indicated that modeling technology is important, but the examples are vague in terms of practical application.

Several administrators discussed modeling in connection with using SMART Boards as a presentation tool during faculty meetings. Mark mentioned using faculty meetings as an opportunity for professional development involving technology,

> We kind of throw in a little something about technology…during the faculty meetings, we'll have a 5- or 10-minute technology tip. ITRT or somebody will come up and just say, "Hey this is a little trick. Something that you might not have known about."

In this example, someone other than the administrator—a subject matter expert—was asked to provide technology instruction.

Expectations. Thirteen administrators discussed their role in creating expectations that technology be included during instruction. Al explained that his school developed minimum requirements for teacher technology use; for example, teachers were required to post benchmark assignments, such as papers, tests, quizzes, and other graded material on to SCORE "by the end of the day for which they were assigned, at the latest." Zeus indicated that "just having [technology] as an expectation…is really important,"

suggesting that such requirements elevate the importance of technology in the classroom. He also noted that by having technology as an expectation, clearly stating it, and then "obviously praising [teachers] when they're doing what they're supposed to be doing" encourages and incorporates it in the classroom. Similar to Zeus and Al, Bill noted that using technology is an expectation in his school, "I don't have any issues with teachers not using technology in this building, because it's an expectation [that they use it]. It was an expectation before I got here."

Matt and Candice both indicated they helped generate an expectation that teachers include technology through classroom observations. Matt stated, "What I like to do, is actually go into the library and look at the log of who's using what. And then I just go and visit those classrooms. Because that's the type of stuff I want to see." Candice conveyed a similar response,

> I think that any time that a teacher is telling me that they're trying something new in the classroom, and they invite me to see what they're doing, and then I like to go in and watch and see what's going on.

In both instances, the administrators indicated that looking for technology use helped stress its importance to teachers.

Maintenance. Four administrators discussed their role in addressing maintenance concerns with regard to technology as a way to assist instruction. Their comments focused primarily on the location of technology in the classroom. Mark mentioned that his role as the "maintenance guy" helped teachers position their equipment, such as SMART Boards or projectors, for class use. Like Mark, Zeus also indicated that he

managed equipment relocation, "We need to move this big SMART Board from this wall to that wall, or move the projector. That would come to me." In both instances, the administrators indicated that part of their role was to submit work orders so that building repairs, or in this case, SMART Board relocation, can be accomplished. In this role, the administrators supported teachers and instruction by helping create a better classroom environment.

Instructional Technology Resource Teacher (ITRT). Seven administrators discussed using the ITRT to assist them in fulfilling their technology role. In many instances, administrators asked the ITRT to assist with professional development while in other instances administrators asked the ITRT to actually model technology use for teachers. Bill described an instance when the ITRT demonstrated the use of the Smart Response System,

> At my faculty meetings, I will have the ITRT have an activity. We had several activities during the course of the year where it was a fun, educational activity that I remember [the ITRT] did for us twice, and it had everybody involved, and a great part about it, when you look up at the board there, you could tell how many people hadn't answered yet…it got people engaged and it got people thinking, you know.

Matt indicated that most of the teachers in his school were consulting and using the ITRT for assistance with technology. Arthur provided an example of this consultation in action,

> Last year I watched [the ITRT] work with no less than 10 teachers and…3 of them I believe were just afraid of technology. And I watched her work with those

> people and get them more comfortable and talk to them and do demos in their classroom and encourage them to use their SMART Board, to use their computer technology. And they did.

Betty indicated that she encourages teachers to ask the ITRT for assistance with technology but noted how the resource is in high demand but low volume,

> We have a great ITRT at school who's always willing to help. And I always encourage my departments not only to go to her, but to invite her into their meetings. And even working with professional goals. Trying to help teachers find resources or find ways where they can get more comfortable with technology so that they can use it. And I would say overall most of my teachers are pretty open to trying…. It would be great if we had more than one ITRT per building or one ITRT per three buildings, because a lot of our ITRTs—I mean like our ITRT now—is helping to cover at least one or two other schools while other people are out. They're such a fabulous resource, but they're getting spread so thin. And I think ultimately it's the students and teachers that lose out on having them.

Administrators' responses indicated the ITRT plays an important role in helping them fulfill their role with regard to technology integration. In many instances, the ITRT provides the teacher instruction, modeling, and general assistance that administrators associate with their role.

Conflicting Roles

The second theme related to administrative roles and other factors that conflict with an administrator's role in promoting the integration of technology in schools. Ten

administrators discussed a lack of specific instructional technology skills, and 10 administrators discussed supervision concerns regarding technology use in the classroom. These two factors were identified by administrators as interfering with their ability to implement their role with regard to instructional technology integration.

Lack of skills. Ten administrators discussed a lack of specific instructional technology skills. Ann identified the importance of technology skills for administrators in order to lead by example, "when we don't…use technology or teach the way that we envisioned, you know, like the greatest teacher is, then they don't see that. So I think it's—is it your Achilles heel." Sue also indicated that, as a teacher or administrator, "you're expected to know," and that administrators are limited if they do not understand how to integrate technology into schools.

Most administrators are no longer in the classroom and, in many cases, have not had the opportunity to work with instructional technology directly. Mark provided an example of the difficulties he faced developing instructional technology skills,

> Well, I mean, teachingwise…. We didn't have [technology systems] when I was in the classroom…. I know I can definitely model it in faculty meetings or stuff like that. But so far I just haven't done it. So, no, there's not really a reason other than maybe just not knowing enough about it, and saying, "well, I'll do that someday." And I just don't have the time or whatever to learn how to best do it right now.

Sue recognized that her limited instructional technology skills were a challenge and noted, "I'm not where I should be with technology." Mary explained that because she

does not use the SMART response system, it is difficult for her to help teachers, "I can't very well be the person to do that." Because they are removed from the classroom and have a wide range of responsibilities, administrators felt they were not prepared to help teachers use technology.

Student/teacher supervision. Ten administrators discussed supervision concerns involving technology use in the classroom to include concerns with both student and teacher supervision as well as the impact of such events on administrators' ability to focus on technology integration. A primary concern was student supervision. Mary indicated that "unfortunately, too much time is focused on discipline and other things," and such events tended to consume the administrator's time. This concern also involved supervising student use of technology, specifically social media. According to Mark, administrators deal with social media concerns most frequently, "from the kids checking their smart phones in school, posting messages during school hours, taking pictures and posting them of other kids or something like that." He admitted, "I know there are positives and positive things that it could be used for. But right now it just kind of seems like we see more of the negatives." The negative view of technology was not uncommon among administrators. While they observed positive aspects of technology, they also were aware of problems that technology can create.

In addition to creating discipline concerns, administrators recognized the potential for technology to impact instruction negatively. Sue indicated a concern that students can use mobile technology to email test answers and cheat on assignments, but her most pressing concern focused on the impact to learning, "they can readily get [the answer]

and do very well [on the test] but not get an understanding of what they just did. So I feel like sometimes it's misused." Zeus added that the potential for misuse increases when teachers do not fully understand the technology they are using,

> I think that people that aren't up to speed with technology can get duped very quickly by kids who are very savvy. And I always think of it as I would like to—I know I'm not going to be smarter than the kids, you know, and up to speed on what they're doing, but I at least want to have an understanding as to what's going on, because I would never want to be in a position where a student can have free reign on something that I am completely oblivious to.

Administrators also recognized potential problems regarding teacher supervision. Al noted issues involving teacher use of social media. "I've seen a lot of bad with the teachers, with the kids, people getting fired, it's just not good. So, social media has not been great for the school." Mark indicated that he does not use social media because of these types of concerns, stating, "I guess I'm not curious enough or maybe I'm just a little concerned, because you hear about all the—some of these other things that people get themselves into with those situations online, you know."

While technology and social media may hold promise for instruction, administrators recognized that it also raises employment concerns. Zeus discussed the struggle that he has with regard to implementing technology.

> I struggle with the desire for kids to be able to, and staff, to be able to use a handheld device, you know, to access information. I want them to do that, but I

> don't want them to do all the other things that they can do with that, that they shouldn't do.

Frank expressed a similar view, stating,

> Well, just bring in the world into the classroom. Bring the world's resources. And that's a Pandora's box. But being able to access with Google Earth and all the things we can do, Google Docs, kids sharing information, bringing the world into the classroom at the kids' fingertips, at the same time being able to monitor, maintain, manage—that is the scary part. I mean, that's essentially what technology is for, is to ease our load, ease our workload, increase our information, increase our abilities, while maintaining it appropriately at the same time.

Summary of Administrators' Role in Technology Integration

The first theme that emerged from the data related to instructional supervision and technology and the second theme related to administrative roles or other factors that conflict with integrating technology. While the data contain a wide range of examples supporting technology integration, it was also apparent in the data that support for technology integration conflicts with other established administrative roles.

Regarding the first theme, the data related to instructional supervision intended to promote technology integration into instruction. All 16 administrators involved in the study discussed including technology during classroom instruction. Five primary subthemes were present in the data. All administrators discussed instructional supervision. Eight administrators discussed modeling technology use. Thirteen administrators discussed creating expectations that technology be included during

instruction. Four administrators discussed their role of addressing maintenance concerns with regard to technology as a way to assist instruction. Seven administrators discussed using the ITRT to assist in fulfilling the administrators' technology role.

The second theme pointed to the ways in which the administrators' role is hampered by conflicts with administrative roles or other factors that conflict. Ten administrators discussed a lack of specific instructional technology skills, and 10 administrators discussed supervision concerns regarding technology use in the classroom. These two factors were identified by administrators as interfering with their ability to implement their role with regard to instructional technology integration. A summary of themes and is included in Table 3.

Table 3

Question Two Themes and Subthemes

Theme	Subthemes
Instructional Supervision	Instructional Supervision Modeling Technology Use Creating Expectations of Technology Use Addressing Maintenance Concerns Role of Instructional Technology Resource Teacher (ITRT)
Conflicts With Administrative Roles and Technology Integration	Lack of Personal Technology Skills Concerns With Supervision

High School Administrators' Actions to Promote Technology Integration

The third question asked, What do high school administrators do to promote technology integration? Data from interviews with 16 high school administrators

indicated four emergent themes regarding what administrators do to promote technology integration: providing access to technology tools, expectations administrators place on teachers with regard to integrating technology, actions administrators take to develop teachers' technology skills, and indirect support provided by administrators.

Provide Access

The first theme related to providing access to technology tools. Eleven administrators indicated they promote technology integration by improving teacher and student access to technology. Two subthemes emerged from the data: six administrators discussed promoting technology through access to technology tools and three discussed providing funding as a way to improve access.

Access to technology. Six administrators indicated access to technology tools was an area where they were able to assist teachers and students. Administrators reported promoting access by actions related to positioning technology (e.g., SMART Boards, so these items are easier for teachers to use). Mark addressed the need to reposition items and indicated, "When [teachers] need…their SMART Board positioned in a different way or their projector or something like that, I'll kind of take care of that for them." Zeus also indicated assisting teachers with regard to placement of technology,

> If it makes sense to move a SMART Board and even move a projector to make it more helpful for the teacher and more importantly for the kids, that's the right thing to do. And so I know that there are several here that the request came and it took a little bit of nudging and cajoling and all that. But you make it happen, so to help.

It appears from Zeus' response that while some technology has been relocated in the classroom, there was some resistance to relocating the technology. This is critical to note as the support and assistance of an administrator may be essential for submitting work orders of this nature as well as ensuring the changes happen.

Frank indicated that his school attempts to assist students who may lack access to technology by increasing opportunities to use technology during noninstructional time including free class periods and weekends.

> All computer labs are open during free period. We also have—last year we did several Saturdays where we actually opened up our computer lab and taught free of charge to the public, the community, how to apply online for jobs, how to use Excel. We actually had workshops for parents. You know, it was attended—three or four parents would come at a time. But we actually opened up our computer lab for parents to use on weekends…. For the kids who don't have high-speed Internet, we burn discs. They can check it out in the library and take it home for the math help. The experts are in the classroom, not at home. So we've been trying to bridge that gap as well.

Based on Frank's response, extending technology learning opportunities to parents appears to be a way to promote technology use at home. When parents learn to navigate technology, it potentially helps students use technology at home.

Access to funding. While funding was an important concern when administrators discussed technology, only three administrators indicated that access to funding was a way to provide support to teachers. They perceived a lack of funding to be a barrier to

technology integration, but additional funding granted teachers greater access to technology. In most cases, the discussion with regard to funding centered on how to provide teachers with funding for technology tools. Betty stated, "When it comes to the money, obviously if teachers want something or request something we try and figure out where the resources may be. So we try and help them there." In this instance, Betty qualified her response by indicating that administrators "try" to help teachers with accessing technology. Zeus discussed several different avenues for solving funding concerns including encouraging teachers write grants and prioritizing choices as to what items were needed most,

> Find solutions to the money. Okay, we can't afford that, but what can we afford and how can we meet the need? Look for those kinds of solutions…look at grants. Look at things like that to see if we can solve some of the money problems.

According to administrators, providing access to funding as a means to promote technology and support teachers involved either determining priority purchases or attempting to find funding outside the school system. This response seems to indicate that administrators generally found funding to be a difficult resource to provide

Expectations That Technology Will Be Used

The second theme related to expectations administrators place on teachers that technology will be used. Three subthemes emerged from the data. Ten administrators discussed expectations for technology use; three administrators indicated that, at times, teachers need to be forced to use technology; and six administrators indicated that they

help create an expectation of technology use through classroom observations or teacher evaluations.

General expectation. Ten administrators discussed expectations for technology use. The words used by administrators included "expectation" and "force," which intimated a requirement for teachers to use technology to cultivate familiarity. Al mentioned a "minimum expectation" for using the program SCORE (a district-provided course management similar to Blackboard) which required that "all assignments…be posted by the end of the day for which they were assigned, at the latest." Bill expressed a similar idea but added, "I don't have any issues with teachers not using technology in this building, because it's an expectation. It was an expectation before I got here, and I think, you know, even myself, I had to sharpen my skills."

Another means administrators used to press teachers to use technology was by encouraging them to develop new instructional techniques for classroom application. Betty stated,

> If you notice that a teacher's kind of in a rut, maybe doing some of the same things over and over again, maybe challenge them a little bit to find something that's a little bit more contemporary that they could do.

According to Betty, innovation may be a way to help teachers improve instructional practices and use technology. In this instance, the administrator's focus was on improving instructional situations through technology. Mark provided a similar discussion, encouraging teachers to move from their comfort zone,

> Trying to show them that some of these technology tricks or tips can actually make things a little bit easier or make things, you know, I don't want to say better in their classroom, but you know, sometimes when they bring that stuff in…it kind of helps with their relationships with their students and their classes and kind of does make things a little bit easier and better for them as well.

Mark saw technology as a way to help build relationships with students. By encouraging teachers to move from their comfort zone, instruction may become easier.

Ann indicated that dialogue with teachers is an important way to help teachers overcome concerns regarding technology. She emphasized the necessity of such conversation, rather than force, to encourage teacher involvement, "If you force, and you say, 'You need to do this,' they go into a class and they're like, 'Okay, I'm doing this because I'm told to do this,' etc." Presumably, by generating a more positive approach, the potential for positive experiences increased; however, when force was used, the potential for teachers to comply reluctantly—that is, without adopting any beliefs to support continued use of technology—increased.

Force. A variation on the subtheme of expectation is the idea of forcing teachers to use technology. Three administrators used the term "force" in describing ways they promoted the use of technology in the classroom. Al suggested forcing change by manipulating teacher assignments.

> You force them. You switch the subject level. Force them into doing something new, which makes them recreate rather than just falling back on something they

created 20 years ago, which is ridiculous. And then you can always modify those.

If it was good 20 years ago, you can still modify it. You can at least update it.

By switching teachers' subject level, Al indicated an administrator can push teachers to create new assignments that presumably would include newer technologies. Jerry also used the term force, but his description seemed more subtle regarding the approach used to motivate teacher to use technology. Jerry said,

> Kind of forcing them to, hey, try it, because once they try it and once they have that level of comfort with it, okay, and they feel comfortable enough to use it in a classroom, they'll see the way the kids react.

In this description, the administrator provided a push to move the teacher out of his or her comfort zone and to try technology; he suggested that creating positive technology experiences would result in improved teacher use of technology.

Evaluation. Six administrators indicated they help create an expectation of technology use through classroom observations or teacher evaluations. In this approach, administrators included technology use as a behavior to be observed by administrators in the classroom. Jerry indicated, "Give [teachers] time to work on it, and tell them, 'hey, when we do your observations, this is what we want to see.'" According to Jerry, this approach incorporated professional development that prepared teachers to use technology and motivated administrators to target specific technologies in future observations.

Bill provided a description of how he has observed technology use during classroom visits.

> I know from my walkthroughs, they use [technology] every day. And it's meaningful. They just don't use it just to be using it. They may show a video clip in science or biology. I've been by biology classes. I've been by chemistry classes. And you can actually show an experiment using the website, and step by step. And you look around, that's related to the SOL objective that they're working on.

This administrator noted the various ways he has observed technology employed in the classroom, but he emphasized the need for observed technology integration to be meaningful and tied to SOL objectives. Zeus seemed to agree with this idea of meaningfulness. He indicated, "You always want to look for [technology] in instruction and when you're stepping into a classroom" and that he looked for good instructional use of technology when he evaluated during observations.

Skill Development

The third theme concerning promotion of technology use related to the actions administrators reported focusing on developing their teachers' technology skills. Four subthemes were present in the data. Eleven administrators discussed providing some type of professional development for their teachers. Four administrators discussed providing time for teachers to practice or play with technology. Two administrators indicated that administrators as a group need to be open to permitting teachers to experiment with technology. Eleven administrators discussed time as a critical factor related to technology use.

Professional development. Eleven administrators discussed providing professional development for teachers, indicating that professional development enhances teacher knowledge and skill in relation to technology. Bill indicated that new teachers receive instruction on specific web-based programs required for routine activities, and all teachers engage in professional development during faculty meetings.

> Say, for instance, we got new teachers coming in. We got six new teachers. We'll get our ITRT to run through how to use SCORE. That's technology because you can post things on SCORE for your students. And your grade book is technology…. [A]t my faculty meetings I will have the ITRT have an activity. We had several activities during the course of the year where it was a fun, educational activity that I remember she did for us twice, and it had everybody involved.

This latter element, Bill indicated, was exciting. Teachers responded positively to the technology-based professional development, and Bill felt there was a high level of involvement and enthusiasm, increasing teachers' willingness to use technology in the classroom. Similar to Bill, Candice described breakout sessions during professional development that addressed several different technology tools available to teachers including whiteboards, SMART Boards, a "clicker system," and new systems and programs available to the school division.

Another way that administrators discussed promoting technology was by having teachers share technology ideas with other teachers. They reported that one potential avenue for sharing ideas was through faculty meetings—a regular practice at select district schools. Matt described how this worked at his school.

> We'll do a technology at each faculty meeting…. Something that we've seen in a classroom. Like when we saw that, I was like, "Okay, Miss Smith, you've got to come down. You've got to show us at the faculty meeting what the heck you did, how did you do it."

Several administrators mentioned the idea of teachers sharing ideas and skills with their fellow teachers as a way to improve professional development offerings for teachers. Sue stated,

> We have some people here that are really, really good with technology, and we could pool that skill at maybe a faculty meeting or set up small groups where they could help teach each other, and they could collaborate to talk about, "oh this is what I feel as if I need—so who has this skill and who has that skill," and I believe coming together and talking as a department, then as a school, we could find out what we already have, and then we could all grow.

Scott felt teachers sharing ideas was the most effective type of professional development. He stated, "If we could get [teachers] to share their ideas and to show these other teachers the usefulness of this technology, I think that's going to be our most effective encouragement to use it."

Other potential avenues identified by administrators for information sharing included the Professional Learning Communities (PLC) that exist within most county schools. PLCs are usually groups of teachers working to address a common concern. Several administrators involved in the study discussed using PLCs as a way to have teachers share instructional strategies including technology. Scott stated,

> In our PLC meetings this year, [teachers] will be sharing more effectively what strategies they use, some of which are technology…. So if they're in their PLC meeting and Suzy has a great SMART response lesson that she shares with the team, hopefully they will take that and consider using that in their classrooms.

Here, the administrator is relying on a teacher bringing a technology lesson to others in a PLC meeting with hopes that the other teachers will opt to use the technology. The administrator indicated that, during the PLCs' instructional strategies, there should be technology and nontechnology-based sharing.

Time for practice/play. Four administrators discussed providing time for teachers to practice or play with technology as an important way to promote technology use. Zeus stated, "You can't really use technology unless you use technology." The interviewees reported the importance of providing teachers with an opportunity to improve technology skills rather than simply learn about the technology. For example, Betty stated, "I think sometimes…the teacher's learning curve can be a little bit of a challenge for them…helping them with that, knowing where to find the resources and giving them practice before they actually put it into play [is beneficial]." Betty explained how practice helped her and others learn to use technology.

> You can sit here and tell me how to use something, but until I actually sit down and do it myself, you might as well be talking to a brick wall because it's going to go in one ear and out the other. And I think with technology, you do—you need to actually sit down and figure out, "okay, oh, this is how this works. Oops, don't

> want to do that." And also it helps you, so when the kids have questions, you have the answers because you've been there.

Providing time for teachers to practice using technology permits teachers to work through potential problems outside of the classroom. These administrators felt that practice helped teachers use technology more effectively when working with students.

Experimenting. A subtheme related to providing professional development and time for teachers to practice using technology was the concept of being open to teachers experimenting with technology. Reggie discussed such openness regarding this experimentation.

> I think [teachers] need a supportive administration to take a leap of faith. To say "this might flop, this might be a complete nosedive and might crash and burn." You know, as long as they can articulate how they're going to pick up the pieces and move forward, hey, I got no problem. Your intentions are good. As long as we're not going off the deep end and we keep it in between the ditches, I got no problem with a lesson that blows up in your face and doesn't work. It's a learning opportunity, and learning experience.

In this instance, the administrator indicated that teachers were more willing to take risks using technology if administrators created an environment where failure was acceptable—that is, as long as it is part of a learning experience. Like Reggie, Matt also felt teachers needed administrative support when navigating technology.

> You know, I think that's kind of what we try to do, is promote the idea of technology. Get in and see technology. Let the teachers know we appreciate them

> trying something new. Letting them know that, if you make a mistake it's okay. That's, I mean, if you realize, "oh that was horrible. That didn't work the way I want, change it the next block." We're not going to dock you for…trying something new and making a mistake. So long as they know that, I think they will do different things.

While supportive of teacher experimentation and potential failure, administrators qualified their own statements by stressing that teachers needed to make adjustments to correct problems with technology-based lessons. Jerry expressed this idea of failure and learning through failure in stating, "Try it. Don't be afraid to fail. Okay. The failing piece is what's going to help you overcome that hurdle to get ready for the next time." By supporting teachers experimenting with technology use without directly evaluating the teacher's performance, administrators believed they were helping teachers learn to use technology effectively. Presumably, each opportunity to practice helped prepare teachers and improve subsequent use.

Time. Eleven of the administrators discussed the impact of time in relation to technology in several ways. They discussed providing time for professional development, for practice, and for planning. Scott stated, "Administratively, I think the best thing that we can give our teachers is time." Likewise, Betty said, "Create more time in the day; create more time in the school year." Sue placed the burden of finding time for technology use on the shoulders of administrators. She stated, "I feel like my job would be to make sure that I provide them the time to do it." These administrators indicated that

teachers needed time to understand technology, and they intimated that the administrator's role was to determine ways to fulfill that requirement.

Another approach to providing teachers time to develop technology skills centered on common planning periods. In essence, these periods would "create" additional time for teachers to learn and apply such skill. Betty stated,

> For time, I mean you try and be creative. Is there a way to bring it into your common planning? Is there a way to…[work] together to have people help you so it's not only you trying to do something but share the load so that you guys can take some of the burden on yourselves?

Al also discussed using common planning since it allowed teachers "40 minutes, where they cannot make copies, cannot be pulled out, cannot have a parent meeting," which would help "expose teachers to some things that are new." In this instance, the administrator indicated that by limiting distractions, administrators are able to more effectively promote technology use. Although it is not required that common planning periods be used to develop technology skills, administrators hoped that teachers would attempt to do so of their own volition.

Indirect Support

The fourth theme that emerged regarding administrator promotion of technology use involved indirect support. Eight administrators discussed using the services of the ITRT or other individuals to support teacher technology use. The ITRT is a staff member employed to help teachers develop technology skills. Administrators indicated that the ITRT often leads technology discussions during faculty meetings and assists teachers

with using technology during classroom instruction. Matt stated, “We really emphasize here the use of our ITRT. Our ITRT actually likes going in and not just teaching the teacher how to do a lesson with it, but actually going in and working with each class.” According to Matt, administrators encouraged teachers to seek out the ITRT to assist with developing technology skills.

In some instances, administrators encouraged teachers to let the ITRT teach their class to demonstrate ways that technology can be used. Betty provided a description that included inviting the ITRT to department meetings. She stated, “We have a great ITRT at school who’s always willing to help. And I always encourage my departments not only to go to her, but to invite her into their meetings.” The administrators’ intent appears to be to help make teachers more comfortable with using technology. Administrators reported asking the ITRT to assist with a wide range of technology-related instructional goals as a strategy to promote technology use. Administrators saw assistance from the ITRT as something that teachers are open to accepting.

Summary of Administrators’ Actions to Promote Technology Integration

Data revealed four emergent themes regarding what administrators believe they do to promote technology integration: providing access to technology tools, expectations administrators place on teachers with regard to integrating technology, actions administrators take to develop teachers’ technology skills, and indirect support provided by administrators.

The first theme that emerged from the data related to providing access to technology tools. Eleven of 16 administrators indicated that they promote technology

integration by improving teacher and student access to technology. Two subthemes emerged: Six administrators discussed promoting technology through access to technology tools and three administrators discussed providing funding as a way to improve access.

The second theme related to expectations administrators communicate to teachers about technology use. Three subthemes emerged: Ten administrators discussed expectations for technology use; three administrators indicated that, at times, teachers need to be forced to use technology; and six administrators indicated that they help create an expectation through classroom observations or teacher evaluations.

The third theme related to actions administrators take to develop teachers' technology skills. Four subthemes were evident: Eleven administrators discussed providing some type of professional development for teachers, four administrators discussed providing time for teachers to practice or play with technology, and two indicated that administrators need to be open to permitting teachers to experiment with technology. All 16 of the administrators involved in the study discussed time as a critical factor related to technology use.

The fourth theme related to indirect support provided by administrators to help support teacher technology use. Eight administrators discussed using the support of the Instructional Technology Resource Teacher (ITRT) or other individuals to promote teacher technology use. Themes and subthemes are summarized in Table 4.

Table 4

Question Three Promote Themes and Subthemes

Themes	Subthemes
Access	Access to Tools Access to Funding
Develop Expectations for Technology Use	Encourage Use Force Use Evaluate Use
Develop Teacher Skills	Professional Development Practice Support Experimentation Time
Indirect Support	
Concerns Regarding Administrators' skills	

Barriers to Technology Integration Identified by High School Administrators

The fourth question asked, What do high school administrators perceive as barriers to technology integration? Data indicated four emergent themes related to barriers to technology integration: teachers' attitudes and beliefs about technology and technology integration, teachers' knowledge and skills regarding technology integration, technology resources, and institutional barriers that impact technology integration.

Attitudes and Beliefs

The first theme related to barriers centered on teachers' attitudes and beliefs about technology and technology integration. All 16 administrators identified teacher attitudes or beliefs that served as barriers to technology integration. Four subthemes emerged from the data: Twelve administrators identified fear; six administrators identified teacher concerns regarding student and teacher roles in the classroom; eight administrators

indicated that teachers are resistant to change; and five administrators indicated that, in some cases, teachers do not feel that technology is worth the extra effort.

Fear. Twelve administrators identified fear as a barrier to technology integration. However, fear as a subtheme incorporated several dimensions. Fear included fear of change, fear of uses of technology, and the fear of technology in general. Arthur explained that, in many instances, teachers may not even realize what it is that they fear:

> I think it's fear of the unknown; I think it's fear of having to adjust the way we think about situations or circumstances or interactions with students. I think it's the unknown. I think when you're fearful, you may not know what you're fearful of.

Frank indicated that teachers do not have a full grasp on what changes technology may bring to their classrooms. He stated, "So I think the whole fear factor is not fear of technology, of using it. It's fear of what it could do. Fear of consequences of what technology can bring into you."

There was also the perception that some teachers are fearful of technology in general. Zeus indicated that teachers do not want to use technology that they do not understand or do not feel comfortable using. He relayed that,

> Older teachers are fearful of technology. I think when they don't understand what they're doing, they would rather not. It's, you know, you do what you're comfortable with. And if I don't understand how this works, then I'm not going to put myself out there for all of my students to see that I don't understand how that

> works. And I think that can be a big—that's probably the biggest barrier for folks who are not comfortable with technology.

Matt indicated that, in some cases, teachers are afraid of damaging the technology, "the teachers get afraid. They're afraid they're going to break it. They're afraid that, 'oh my gosh, I'm going to mess up.'"

Sue indicated that teachers are concerned with making mistakes with technology in front of students.

> If I make a mistake by myself I'm okay. But I don't want to make a mistake around 30 people. You know, that's even more—that's fear empowered….
>
> Because people expect you to know…I've got to know what I'm doing here, or everybody's going to think I'm an idiot.

According to the administrators, teachers may be fearful that they will damage the technology or potentially embarrass themselves because they do not fully understand how the technology works. Regardless of the specific form the fear takes, administrators stated results are the same: The teacher is less comfortable using technology and is less likely to integrate it into instruction.

Teacher/student roles. Six administrators identified teacher concerns regarding student and teacher roles in the classroom. Matt indicated teachers may feel that "this isn't how I was taught. I did not go to college and take a technology course." Candice indicated that teachers are reluctant to give control to students. She stated,

> I think that oftentimes teachers are held back because they think that students are going to veer off of the lesson at hand and just go web surfing and get into things

> that they shouldn't get into and crack secret codes of things that the teachers can't control…. I think maybe preconceived notions of the fact that kids know and probably are more familiar with technology than they are, scares teachers from just kind of going all out with the use of technology in the classroom, more than anything.

Matt claimed that teachers "don't want to look stupid in front of students" while Al pointed out that giving up control is a challenge for teachers. He felt that "one of their challenges also is overcoming the fear of giving up control of the classroom to the students, and just being the facilitator instead of the teacher who's out in front." Reggie also indicated that giving up control was a concern for teachers:

> Control. I'm not in the driver's seat of this lesson; the students are. And letting go of some of that control of who's providing the opportunity to learn. It's easy for me to stand up there and say, "I taught this strand, I know I did, I said this, look at slide 24 of my PowerPoint from Unit 8." There it is. It's not me that didn't teach it. It's you who didn't learn it. With some of the technology pieces, its students [who] explore and learn through the exploration, learning by doing. And so I think there's a little bit of that control. Letting go of the reins a little bit.

He indicated that when teachers present material they believe they have more control over student learning. However, when students learn by exploring, teachers give up control.

Resistance to change. Eight administrators indicated that teachers are resistant to change. Scott stated, "Another part of it is kind of being stuck in their ways. They have

done it this way for 20 years, and why do I need to change just with technology." Similarly, Jerry relayed that "as a field, education is wedded to yesterday's ideals, yesterday's methods."

Reggie indicated administrators want teachers to change and use more technology, but they also expect results from the teacher. Reggie stated, "Going back to what you've always done is comfortable. And that's the easy thing to do, and it's hard to argue with when a teacher's getting decent results." Jerry echoed Reggie's comment indicating that teachers are not willing to change if they do not feel there is a problem with their current instructional methods:

> We use what we always use because it works and we know it works, and you don't fix it if it's not broken. And that goes back to what I said before: Teachers need to be willing and want to step out of their comfort zone, okay, push the envelope.

Bill expressed a similar view.

> If it's not comfortable, then it's effort. You know, if you are a calculus teacher and you've been teaching calculus for 20 years, it's so much easier to just write out some sample problems. To create a presentation with all the bells and whistles takes a lot of time.... Some of our teachers have really gotten good at creating wonderful presentations. I don't know that they're any better teachers than the teacher writing on a chalkboard. I think we've become great presentation makers. But I don't know if that makes you a better teacher. I'm pretty confident it doesn't make you a better teacher.

Mark indicated that while teachers may be open to using technology, teachers will default to what they already know. He explained that experienced teachers tend to have products for a particular class that they teach year after year and are reluctant to "reinvent the wheel": "I'm going to go with what I have…if I can use a SMART Board lesson, if somebody throws something my way, I'll try it out. But it's going to take some time and effort to restructure a whole lesson."

Another dimension of resistance that Al discussed was that some teachers do not see technology as a particularly useful instructional tool. Furthermore, teachers may not see a need to learn to use a SMART Board over a chalkboard. Al stated, "I think it's tough…to learn. I don't think teachers see an immediate benefit. Okay, so I'm writing on this whiteboard here instead of writing on the chalkboard. What's the difference?"

Knowledge and Skills

The second theme related to teachers' knowledge and skills. Ten administrators indicated concerns about teachers' and administrators' technology skills. Three subthemes emerged. Seven administrators expressed concerns with teachers' technology skills, 4 administrators indicated that the technology professional development provided to teachers was inadequate, and 10 administrators indicated some level of concern with their own technology skills as they relate to instruction.

Teachers' technology skills. Seven administrators expressed concerns about teachers' technology skills. They expressed a belief that, in some instances, teachers do not have the skills to fully use technology. Jerry stated, "I think there's a lot of teachers that aren't using the technology to its full potential. I don't think the majority of the

teachers utilize the SMART Board as a $5,000 whiteboard." Candice offered the possible explanation that technology changed too fast for the teachers to keep up. She mentioned, "I think that, sometimes, you feel like you learn this piece of technology, and the next thing you know, it's outdated or something else is coming down the pike that's newer and faster and holds more." Bill expressed a similar view, "As soon as you get used to using one thing, something else comes up that's better." Reggie admitted that he believed very few teachers possess the skills needed to use technology effectively. He stated, "There's not a whole lot of teachers…who are really into technology and really take advantage of it. I could count that on one hand and then on that same hand how many of them are effective using it."

Professional development. Four administrators indicated that they felt the technology professional development provided to teachers was inadequate. Jerry stated, "SMART Boards were installed…. We've shown teachers how to use them to the minimum of their abilities." Zeus shared a similar concern, "So you don't use it because you really don't know how and no one's ever showed you." In both instances, administrators felt that the professional development provided was insufficient to educate teachers in using the technology available. Jerry indicated that teachers need more time to practice using technology.

> I think the biggest challenge that the teachers face is the fact that we provide them with the technology and we will give them a brief—very brief—in-service time of how to use the technology. So, in a sense, we give it to them. "Hey this is how

> you turn it on, this is how you"—we'll show them how to manipulate a couple of things, but then we kind of leave them to their own devices.

The general theme relayed by these administrators indicated a lack of depth to the training provided, believing that this deterred teachers from using technology resources to their fullest potential.

Administrators' technology skills. Ten administrators identified concerns regarding their own instructional technology skills. In many instances where administrators discussed providing support for teacher, the administrator was not providing assistance directly. Rather, the administrator was helping the teacher find someone to resolve the technology problem. Several administrators indicated they lacked specific instructional technology skills which limited their ability to help directly. Mark stated, "I don't know that I do too much. I think, more than anything, I'll maybe point them in the right direction of somebody that can help them more than I can." While knowing available resources to address issues can be helpful, it provides an additional—and, arguably, unnecessary—step for a teacher attempting to use technology. Not fully understanding all that is involved with technology use also limits the ability of administrators to fully comprehend the demands that using technology places on teachers. Jerry provided an example of a teacher looking for assistance with technology.

> I had one of the teachers come about the new version of the clickers…the ones that are fully programmable.... I said, "Listen, you know, we could spend all day talking about this, or you could go talk to so-and-so and they can get you squared away.'"

The question response system or "clickers" is a technology item that many administrators discussed. While the administrators felt it is useful and wanted to see teachers avail themselves of technologies like this, some administrators involved indicated they cannot provide teachers direct assistance.

Jerry pointed out that technology has changed in the six years since he left the classroom.

> If [teachers are] asking questions I don't have the answers to, I send them in the direction to get those answers. Even in the past six years since I've been out of the classroom, the changes have been done by leaps and bounds. You know, the stuff I use you don't even find anymore. Now it's progressed and it's on the fourth or fifth generation and it's something totally different.

Since the technology Jerry used in the classroom has changed, he is limited in his ability to assist teachers directly. If administrators do not fully understand the technology that teachers are expected to use during instruction, their ability to assist teachers is limited.

Resources

The third theme related barriers to technology integration was limited technology resources. Two primary subthemes emerged related to this theme: All 16 administrators discussed time as a resource and five administrators discussed inadequate access to technology tools as a concern.

Time. All 16 administrators discussed time as a limited resource that impacted several different areas. Mary identified the sprawling impact of time and noted, "between planning with other people and looking at your data and grading papers, there's just not

enough time at school." In some ways, time also represented as a dilemma. As Al explained,

> To learn [technology] takes time, so that's the frustrating part. You got to learn it, which takes time, which no one has time. But once you do learn it, you're going to save yourself time in the long run. So it's a Catch-22."

Five administrators specifically discussed inadequate time to practice using technology. Betty stated, "With everything else that we have to do, sometimes finding the time to sit down to [use technology], to play with it, to get it to work, and then to implement it and revise the lesson plans [is difficult]." Ann stated, "I think also just the time it takes to learn it." Mary indicated "the time to actually practice doing it" was a concern. Zeus also felt that time was a factor related to practice but in terms of the student knowledge of technology, "For some [teachers] it could be time, that they don't feel like, even in the 90-minute block, that they necessarily have time to use the technology in a manner that's more student-centered."

Time to plan was also identified as a barrier to technology integration. Ann stated, "I think if you're not—if that's not your strength, then I think it takes a lot of time to plan a lesson. You know, even if you're utilizing the skills of the ITRT." Jerry indicated that time to plan technology use becomes more of an issue as the school year progresses.

> From a teaching perspective, they may revamp the first two or three units, but then November rolls around, and time starts becoming something that's in shorter and shorter supply. "Well, I'll just roll with what I did, or I'll use what I used last year." Or the tweaking and the changing doesn't come as frequently as it should.

In general, lack of teachers' time to plan, practice, and learn to use technology was an important concern for administrators.

Access to technology tools. Five administrators discussed inadequate access to technology tools as an issue. Candice indicated that, at times, access to technology tools was a concern. She said,

> Sometimes it can be limited resources, if we have our COWs, computers on wheels, per department, someone else has signed it out so I can't use it because I can't get to the technology. I think that's a problem for teachers.

Reggie shared this concern and indicated that access to computer labs can be a challenge for teachers, "There's not enough computers. I can't get the lab when I want the lab because somebody's got it signed up or there's testing going on." Betty indicated that class sizes have increased without a concomitant increase in the number of computers in labs, and with the lack of sufficient COWs, "the reality is we don't have enough for every teacher to have enough for every student." Overall, administrators identified limited teacher access to technology tools as a barrier to technology integration.

Funding was identified as a barrier that impacted teacher access to technology tools. Zeus indicated, "there are things that we can and can't afford. And if we could afford more of this, you know, more site licenses for something or more laptops or iPads or something like that." Candice shared the same concern.

> There are a ton of things I'm sure that are out there, but as a division, either financially we're not providing or we can't provide it…. I think that it all ties into

> resources, whether it's equitable distribution or the money involved, that there are a lot of obstacles to expand in what we could do with technology in schools.

Another barrier identified by administrators that impacts access was school technology infrastructure. Mary indicated that "there are frustrations. Like some days it doesn't work. The Internet's down for us, or there are any number of things that could be a problem. SCORE is shut down and so you can't access anything." Al indicated that problems with infrastructure keep teachers from using technology. He stated, "A couple times of [technology] not working when you're trying to do something and you're done. You spend a lot of time on a presentation and it doesn't work, you lose it. Bad experiences."

Equal access to technology for students outside of school was also seen as a barrier impeding technology integration. Mary stated, "I think only about 30% of our kids have access to even the opportunity to get high-speed Internet, out by us. They're still on dial-up. And so they can't really use SCORE. There's so much that they can't use." Reggie shared the same concern.

> In terms of using electronics to assess or give homework…. Not everybody has the same access to computers, Internet, printers, at home. So you assign a project that involves those. How equitable is it for certain students?… So that's an issue too, in terms of other challenges, students' knowledge of how to work with technology. Some students were raised with a iPad in their hands by their second birthday. Other kids are just kind of getting into it just what is offered in the school, and at home there is not a whole lot. So again, the equity challenge—is it

equal for all kids? Do we have a level playing field for kids to demonstrate mastery of the content?

Institutional Barriers

The fourth theme related to institutional barriers that impact technology integration. Seven administrators identified such barriers: Three identified systems barriers where practices within school organizations impacted technology use and four identified specific policies they felt were barriers to technology use.

Systems barriers. Three administrators identified systems barriers where practices within school organizations affect technology use. Zeus indicated that Internet and software security inhibited technology use and that "we create barriers for ourselves with some of the things." Frank indicated that access to information on the Internet is sometimes a barrier, "sometimes [teachers] want to use clips that are blocked, and we have to go through and unblock them." Candice indicated that, in some cases, technology controls hold back innovations, stating,

> If the technology folks aren't necessarily familiar with it, they may not be willing to let it be implemented in all of the schools. Perhaps there's some opportunities for piloting various programs. But I think that everything has to be filtered through the central office as opposed to even the teachers saying, you know, "I found this really neat program, I'd love to let my students use this to help in their learning." And they get met by that closed door. "That? Well no, we're not familiar with it." Or, "No, that's going to be too expensive." Or, "All the schools can't have it, so you can't have it either."

Administrators also identified problems with change coming too quickly as a barrier to technology integration. Alex mentioned, "We seem to flood everything all in at once, and it's jumbled up." Matt indicated that problems with teacher follow up hurt technology implementation. Matt stated, "We introduce these ideas, we say we want to implement these ideas, but we don't support the idea by doing follow up." Scott addressed shifting priorities as a barrier. He stated, "The encouragement through the 21st century skills-type initiative. That kind of fizzled out this past year because we changed our priorities."

Policy. Four administrators identified a specific policy they felt was a barrier to technology use: student cell phone use on school grounds. Scott indicated, "I think we're hamstrung by old policies that prohibit new ways of instruction, and that's the reason why I wish we could use cell phones. But I understand also the negatives and what not." Jerry also indicated that he supported the use of smart phones, "I'd love to see the kids incorporate smart phones. And I know that goes against policy, but it's here."

Summary of Administrator-Identified Barriers to Technology Integration

There were four emergent themes related to barriers to technology integration: teachers' attitudes and beliefs about technology and technology integration, teachers' knowledge and skills with regard to technology integration, technology resources, and institutional barriers that impact technology integration.

The first theme related to teachers' attitudes and beliefs about technology and technology integration. All 16 of the administrators identified teacher attitudes or beliefs that served as barriers to technology integration. Four subthemes emerged from the data:

Twelve administrators identified fear as a barrier to technology integration, six administrators identified teacher concerns regarding student and teacher roles in the classroom, eight administrators indicated that teachers are resistant to change, and five administrators indicated that teachers often do not feel that technology is worth the extra effort.

The second theme related to teachers' knowledge and skills with regard to technology integration. Ten administrators indicated that they had concerns related to teachers' or administrators' technology skills. Two primary subthemes were present: Seven administrators expressed concerns with teachers' technology skills, 4 administrators indicated that the technology professional development provided to teachers was inadequate, and 10 administrators indicated some level of concern with their own technology skills as they relate to instruction.

The third theme that emerged from the data related to technology resources. Two primary subthemes emerged: All 16 administrators discussed time as a resource and 5 administrators discussed inadequate access to technology tools as a concern.

The fourth theme involved institutional barriers that affect technology integration. Seven administrators identified prohibition of cell phones at school as an institutional barrier that affected teacher technology use, three administrators identified systems barriers where practices within school organizations impacted technology use, and four administrators identified specific policies that they felt were barriers to technology use. Themes related to barriers are identified in Table 5.

Table 5

Question Four Barriers to Technology Integration

Theme	Subthemes
Attitudes and Beliefs	Fear
	Teacher/Student Roles
	Resistance to Change
Knowledge and Skills	Teachers' Skills
	Professional Development
	Administrators' Skills
Resources	Time
	Access to Technology Tools
Institutional Barriers	Systems Barriers
	Policy

Conclusion

This chapter reported the perceptions of 16 administrators with regard to their vision for technology integration, role as it related to technology integration, activities to promote technology integration, and potential barriers to technology integration. In describing administrators' vision for technology integration there were four emergent themes. Administrators reported the general importance of technology with regard to education and the technological possibilities for the management of school processes. Administrators indicated that technology has affected instruction and identified ways that technology can support 21st century learners. In discussing administrators' role as it relates to technology integration, administrators identified conflicts with other established administrative roles that might hamper technology integration. Administrators identified several activities to promote technology integration. By providing access, expectations, professional development, and indirect support, administrators felt they helped promote

technology integration. In discussing barriers, administrators identified teachers' attitudes and beliefs about technology and technology integration, teachers' knowledge and skills with regard to technology integration, school technology resources, and institutional practices and policies as barriers that impact technology integration.

CHAPTER FIVE

Chapter 5 presents the results of the survey administered to 195 teachers and examines teachers' perspectives along with those of administrators identified in Chapter 4 as a result of administrator interviews. Using a mixed-methods approach, this chapter addresses research question 5: What are high school teachers' responses to high school administrators' perspectives regarding technology integration?

The four areas examined included administrators' perspectives regarding their vision for technology integration, their role in supporting and promoting technology integration, the actions they take that they believe promote technology integration, and the barriers they perceive to technology integration.

Vision for Technology Integration

Data from interviews with high school administrators indicated there were four areas of focus for administrators' vision for technology. Administrator participants indicated that technology is important to instruction, discussed ways that technology could be used to assist with the management of school processes, indicated that technology has impacted instruction, and regarded support for 21st century learners and ways that technology can be used to support them as important to instruction. Teachers were asked to respond to 16 survey items reflecting administrators' vision. A summary of teachers' responses to these items are provided in Table 6.

Table 6

Vision for Technology Integration Survey Questions

Survey Questions	*(N = 195)*	Strongly Agree	Agree	Disagree	Strongly Disagree
• Technology can contribute much to teaching and learning, but the teacher remains an essential part of the process.	192	78.65%	20.83%	0.52%	0.00%
• Technology is an important part of the management of schools (e.g. attendance, grading, and communication).	195	61.03%	27.18%	0.00%	11.79%
• Technology and email are effective ways to communicate.	181	41.44%	53.04%	4.97%	0.55%
• Technology is changing the way we teach.	195	41.54%	48.72%	6.67%	3.08%
• Technology offers possibilities for providing students with alternative learning opportunities.	192	35.94%	62.50%	0.52%	1.04%
• Using technology in classrooms increases student interest and engagement.	192	26.04%	57.29%	16.67%	0.00%
• Using technology in classrooms leads to improved attentiveness and performance.	192	11.46%	53.65%	30.73%	4.17%
• Technology should be used to support interactive approaches to learning.	192	30.73%	65.63%	2.60%	1.04%
• Educators must respond to today's tech-savvy students by using technology as a part of teaching and learning.	190	25.79%	49.47%	21.58%	3.16%
• Using technology in classrooms supports research and study skills.	192	23.96%	56.77%	17.19%	2.08%
• Technology should be used to support student-centered learning.	192	28.13%	63.54%	7.81%	0.52%
• Using technology supports group work and student collaboration.	190	11.58%	61.58%	23.16%	3.68%
• Technology integration prepares learners for the 21st century workforce.	190	39.47%	52.11%	7.89%	0.53%
• Teachers need to stop being the caretaker of technology and let the students be the caretaker.	195	7.18%	45.64%	43.08%	4.10%
• Most students are tech savvy.	195	21.03%	58.97%	14.87%	5.13%
• Access to technology tools and programs should be an educational priority.	181	28.18%	54.14%	15.47%	2.21%

Importance of Technology

The importance of technology with regard to education was discussed by all of the administrators involved in the study. While all of the administrators reported that technology was important and had impacted education, the degree to which these

administrators focused on technology integration varied. One question in the teacher survey focused on the importance of technology to teaching and learning. Teachers were asked to indicate their degree of agreement or disagreement with this statement, "Technology can contribute much to teaching and learning, but the teacher remains an essential part of the process." Of the teachers who responded, 79% strongly agree and 21% agree. Based on their response to this question, it would seem that teachers support the integration of technology in instruction but also recognize that the teacher is an important part of the instructional process.

Both administrators and teachers indicated that they believe most students are tech savvy. Teachers were asked to provide their level of agreement with the statement, "Most students are tech savvy"; 21% strongly agree and 59% agree, so 80% of the teachers indicated some level of agreement. When asked to respond to the statement, "Educators must respond to today's tech-savvy students by using technology as a part of teaching and learning," 26% strongly agreed and 49% agreed. With regard to technology tools, administrators discussed a wide range of tools and uses. When teachers were asked to respond to the statement, "Access to technology tools and programs should be an educational priority," 28% strongly agree and 54% agree. A total of 83% agreed with the concept that technology tools should be an educational priority.

Management

The second major theme regarding administrators' vision for technology centered on technology's potential to support the management of schools. All of the administrators identified ways technology can be used to manage school processes. With regard to the

use of school management, teachers were asked to indicate their level of agreement with two statements. The first statement was intended to indicate their level of agreement regarding management in general by responding to this statement, "Technology is an important part of the management of schools"; 88% indicated some level of agreement: 61% of these strongly agree. Of the teachers who disagreed with the statement, all 12% strongly disagreed.

An additional area addressed with regard to management of school processes is communication. Administrators indicated that they frequently used email as a means of communication. Teachers were asked to provide their level of agreement with the statement, "Technology and email are effective ways to communicate"; 94% of the respondents indicated some level of agreement with the statement: 41% strongly agreed and 53% agreed.

Instruction

All administrators involved in the study identified instructional impacts of technology as part of their vision for technology. Teachers were asked to indicate their level of agreement with the statement, "Technology is changing the way we teach"; 90% of the teachers responding agreed or strongly agreed with the statement. Of those who agreed, 42% strongly agreed.

Administrators indicated that technology had an important impact on student engagement. Teachers were asked to respond to the statement, "Using technology in classrooms increases student interest and engagement"; 83% of the teachers responding indicated some level of agreement. In this instance, only 26% of those strongly agree.

Administrators indicted that they believed using technology improved student attentiveness and performance. Teachers were asked to respond to the statement, "Using technology in classrooms leads to improved attentiveness and performance"; 11% strongly agree, 54% agree, 31% disagree, and 4% strongly disagree. The level of disagreement indicates that a number of teachers do not endorse administrators' perspective of technology's potential to improve student attentiveness and performance.

Teachers were asked to respond to the statement, "Technology offers possibilities for providing students with alternative learning opportunities"; 98% agree. Of those who agreed, 36% strongly agreed. This indicates that teachers endorsed the administrators' perspective that technology offers alternative learning opportunities for students.

21st Century Learners

Administrators discussed several uses of technology to support 21st century learners, and all 16 administrators identified ways that schools provided support for these learners. Teachers were asked to respond to several statements related to 21st century learners. When asked to respond to the statement, "Technology should be used to support student-centered learning," 28% strongly agreed and 64% agreed. Therefore, 92% agree with the vision of using technology to support student-centered learning. Teachers were asked to respond to the statement, "Technology should be used to support interactive approaches to learning"; 31% strongly agreed and 66% agreed. Teachers endorsed the administrators' vision that technology can support 21st century learners by supporting student centered learning and interactive approaches to learning.

With regard to skills connected to 21st century learners, the majority of teachers endorsed the administrators' perspective. When asked to respond to the statement, "Using technology in classrooms supports research and study skills," 24% strongly agreed and 57% agreed. Teachers were also asked to respond to a statement regarding collaboration, "Using technology supports group work and student collaboration"; 12% strongly agreed and 62% agreed. With regard to using technology to prepare students for the workforce, teachers responded to the statement, "Technology integration prepares learners for the 21st century workforce"; 39% strongly agreed and 52% agreed.

Administrators indicated that technology needed to be directly in the students' hands. Teachers were asked to respond to the statement, "Teachers need to stop being the caretaker of technology and let the students be the caretaker"; 7% strongly agreed, 46% agreed, 43% disagreed, and 4% strongly disagreed. Teachers were fairly evenly divided on this concept. While many teachers agree with letting the students control technology, it is also apparent that many teachers are opposed to giving students more control over technology.

Summary of Vision for Technology Integration

Teachers endorsed the perspective of administrators with regard to the vision for technology in education. Both teachers and administrators indicated that technology is important to instruction and that the teacher remains an important part of the instructional process. While both groups indicated that technology was important, teachers indicated that technology tools and programs should be an educational priority. Both administrators and teachers indicated that most students are tech savvy and that schools should respond

to these students through technology. Teachers endorsed the administrators' perspective that technology is an effective means of communicating. With regard to management of school processes, both administrators and teachers indicated that technology is important to the management of school processes. It is important to note that the teachers who disagreed with administrators when responding to the survey question felt strongly about this area.

Teachers and administrators both indicated that technology has had an impact on instruction. Administrators and teachers both indicated that technology had an impact on student engagement. With regard to the impact of technology on student attentiveness and performance, teachers do tend to endorse the administrators' perspective, but the level of disagreement would seem to indicate that many teachers do not feel that technology improves student attentiveness and performance. Conversely, teachers endorsed the concept that technology offers students alternative learning opportunities.

Teachers tended to endorse administrators' perspectives regarding 21st century learners. Teachers endorsed the administrators' vision that technology supported 21st century learners through student-centered learning and interactive approaches to learning. Teachers also endorsed the administrators' perspective that technology supported specific 21st century skills related to research and collaboration.

Administrators' Role in Promoting Technology Integration

Data from interviews with high school administrators indicated that there were two areas of focus with regard to an administrator's role concerning technology. Administrators identified their role as it relates to instructional supervision and

technology, and also indicated that other administrative roles may conflict with integrating technology. While the data contain a wide range of examples supporting technology integration, it was also apparent in the data that support for technology integration conflicts with other established administrative roles. Teachers' responses to survey questions about administrators' role related to technology integration are presented in Table 7.

Table 7

Administrators' Technology Role Survey Questions

Survey Questions	(*N* = 195)	Strongly Agree	Agree	Disagree	Strongly Disagree
My administrators model the effective use of instructional technology during staff meetings.	181	2.21%	30.39%	52.49%	14.92%
Administrators encourage the use of technology in the classroom.	181	13.81%	74.59%	11.05%	0.55%
Using technology is not a major priority.	185	10.27%	46.49%	37.30%	5.95%
When I need assistance with technology I usually seek help from:	182				
a. An administrator	0.00%				
b. An ITRT	61.54%				
c. A librarian	6.04%				
d. Another teacher	22.53%				
e. I don't usually need help	9.34%				
f. I don't use technology	0.55%				

Note. ITRT = Instructional Technology Resource Teacher.

Instructional Supervision

With regard to instructional supervision and technology, administrators discussed the importance of modeling technology use and indicated that it was something they do

during faculty meetings. Teachers were asked to respond to the statement, "My administrators model the effective use of instructional technology during staff meetings"; 2% strongly agreed, 30% agreed, 52% disagreed, and 15% strongly disagreed. Teachers did not endorse the administrators' perspective that administrators are effectively model instructional technology. Based on the teachers' responses, most teachers do not feel that administrators model technology effectively during staff meetings.

Administrators discussed creating the expectation that technology be included during instruction by encouraging the use of technology. Teachers were asked to respond to the statement, "Administrators encourage the use of technology in the classroom"; 14% strongly agreed and 75% agreed. Teachers were also asked to respond to the statement, "Using technology is not a major priority"; 10% strongly agreed, 46% agreed, 37% disagreed, and 6% strongly disagreed. Teachers were evenly divided in their responses with 57% indicating some level of agreement and 43% indicating some level of disagreement. Teachers seem to endorse the administrators' perspective that administrators encourage the use of technology, but their divided response regarding use as a priority indicates that there is not a clear expectation that teachers use technology.

Instructional Technology Resource Teacher (ITRT)

Administrators discussed seeking the assistance of the Instructional Technology Resource Teacher (ITRT) in fulfilling the administrators' technology role. In many instances, assistance provided by administrators was limited to directing teachers to someone else who could provide assistance. Teachers were asked to respond to the statement, "When I need assistance with technology I usually seek help from…."

Teachers were offered six possible responses including an administrator, an ITRT, another teacher and etc. (see Table 7). No teacher indicated that their primary source of assistance is from an administrator, 62% indicated their primary source of assistance was an ITRT, and 23% seek assistance from another teacher. That no teachers selected an administrator as a person from whom they would seek assistance indicates that teachers do not see an administrator as someone who can help them use instructional technology.

Summary of Administrators' Role in Promoting Technology Integration

Administrators identified several roles they felt were important with regard to integrating technology into instruction. Modeling technology use was one area where teachers did not endorse the administrators' perspective. Teachers indicated that administrators do not effectively model technology use. The teachers' responses are in direct contrast with the perspective of most of the administrators that administrators effectively model technology.

Teachers endorsed the administrators' perspective that administrators encourage the use of technology. Teachers are divided with regard to the use of technology in the classroom as a priority. These two responses from teachers are similar to the conflict expressed by administrators. Administrators indicated that technology use is encouraged, but also identified other roles that conflict with promoting technology use. For teachers, the administrators' conflicting roles may create ambiguity as to the priority placed on the use of technology in the classroom.

Teachers did not identify administrators as people who could help them with technology integration. The teachers' response is consistent with the administrators'

perspective. Administrators indicated that they often sent teachers to an ITRT or another teacher for assistance with technology. Administrators also indicated that their technology skills were not sufficient to provide assistance with instructional technology.

Teachers' and administrators' perspectives do seem to be in conflict with regard to the administrators' role. While administrators indicated they effectively model technology use, teachers' responses indicated that they did not endorse this perspective. Teachers endorsed the administrators' perspective that technology use is encouraged, but for teachers this did not translate into the perspective that technology use is a priority. Teachers indicated that administrators are not a primary source of assistance with instructional technology.

Administrators' Actions to Promote Technology Integration

Data from high school administrators indicated five ways administrators believe they promote technology integration. Administrators indicated that providing access to technology tools promotes technology use, that expectations for technology use placed on teachers promote integrating technology, that actions administrators take to develop teachers' technology skills help promote technology use, and that they provide indirect support for teachers. Responses to survey questions related to administrators' role are included in Table 8.

Table 8

Ways Administrators Promote Technology Integration Survey Questions

Survey Questions	(N = 195)	Strongly Agree	Agree	Disagree	Strongly Disagree
• Teachers would use more technology if schools provided more computers for students.	182	44.51%	37.36%	17.58%	0.55%
• It is an expectation that teachers include technology in lessons.	179	13.41%	56.98%	26.82%	2.79%
• It is an expectation that teachers use classroom support tools like SCORE and Google apps.	179	35.20%	56.42%	7.82%	0.56%
• Teachers are being forced to use technology.	179	12.85%	45.81%	40.78	0.56%
• When other teachers share ideas during staff meetings or school-based professional development, teachers are encouraged to use technology.	179	13.41%	78.21%	6.15%	2.23%
• Administrators are open to teachers trying new ideas and uses for technology.	179	28.49%	63.13%	6.70%	1.68%
• Access to technology tools and programs should be an educational priority.	181	28.18%	54.14%	15.47%	2.21%
• Teachers need more technology-oriented professional development.	182	28.57%	54.95%	13.74%	2.75%
• Teachers need more time to practice using technology.	182	46.15%	47.80%	6.04%	0.00%

Providing Access

Administrators indicated that they promote technology integration by improving teacher and student access to technology. In teachers' responses to the question, "Access to technology tools and programs should be an educational priority," 28% strongly agreed and 54% agreed. Teachers were also asked to respond to the statement, "Teachers would use more technology if schools provided more computers for students." Of teachers who responded, 45% strongly agreed and 37% agreed. Teachers indicated that they would use more technology if schools provided more access for students. Both

teachers and administrators indicated that access to technology is important, but teachers' responses indicate that they would like more access.

Expectation That Technology Will Be Used

Administrators indicated that they work to convey an expectation that teachers use technology. Teachers were asked to respond to the statement, "It is an expectation that teachers include technology in lessons"; 13% strongly agreed and 57% agreed. When teachers were asked to respond to the statement, "It is an expectation that teachers use classroom support tools like SCORE and Google apps," 35% strongly agreed and 56% agreed. Teachers' responses indicated that while there is an expectation that teachers use technology and an expectation that they use classroom support tools, teachers indicated stronger endorsement for the administrators' expectation that teachers use classroom support tools.

Administrators stated that in some instances teachers need to be forced to use technology. Teachers were asked to respond to the statement, "Teachers are being forced to use technology." Teachers were divided in their response to this statement: 13% strongly agreed, 46% agreed, 41% disagreed, and 1% strongly disagreed. Nearly half of teachers responding to this item endorsed the administrators' perception that teachers are being forced to use technology. This is consistent with administrators' perspective that forcing technology use is sometimes necessary.

Teacher Skill Development

Administrators indicated that they support teachers' technology use by improving teachers' technology skills. Administrators discussed providing professional development

for teachers but indicated that more professional development was needed. Teachers were asked to respond to the statement, "Teachers need more technology-oriented professional development." Teachers' responses indicated endorsement of the administrators' perspective in that 29% strongly agreed and 55% agreed. Teachers were also asked to respond to the statement, "When other teachers share ideas during staff meetings or school-based professional development, teachers are encouraged to use technology." Teachers indicated endorsement of this perspective as well; 13% strongly agreed and 78% agreed. Both teachers and administrators see professional development as important to promoting technology use.

Administrators indicated that practice and experimentation were important to teachers developing technology skills. Teachers were asked to respond to the statement, "Administrators are open to teachers trying new ideas and uses for technology." Teachers indicated a strong level of support for this statement: 28% strongly agreed and 63% agreed. Teachers were also asked to respond to the statement, "Teachers need more time to practice using technology." Teachers indicated a strong level of support for this statement: 46% strongly agreed and 47% agreed. Teachers endorsed the administrators' perspective that practice was important to improving teachers' technology skills. Both groups also indicated that having more time to practice using technology was important.

Summary of Administrators' Actions to Promote Technology Integration

Both administrators and teachers indicated that access to technology is important. While administrators indicated that they promote technology use by providing access, teachers indicated that they would use more technology if schools provided more access

for students. Both administrators and teachers indicated that administrators have created expectations related to technology use and with the expectation that they use classroom support tools. Teachers did not endorse the administrators' perspective that there is an expectation that teachers use technology during lessons. This indicates that while administrators have clearly created an expectation that teachers use specific classroom support tools, this has not translated into as strong an expectation that teachers actually use technology during instruction.

Profession development was a way that administrators indicated they support teacher technology use. Both teachers and administrators see professional development as important to promoting technology use. Both teachers and administrators acknowledged a strong level of support for teacher led professional development. Teachers endorsed the administrators' perspective that more professional development for teachers is needed.

Experimentation and time were important to both teachers and administrators. Both teachers and administrators indicated that practice was important for improving teachers' technology skills. Both groups also indicated that having more time to practice using technology was important.

Teachers tended to endorse administrators' perspectives with regard to promoting technology. Both groups see access to technology as important and that increased access would be better. Both groups identified expectations for technology use as important although administrators' expectation that technology be used during instruction was not endorsed as strongly by teachers as the administrative expectation that teachers use technology support tools. Teachers endorsed the administrators' perspective that

professional development and practice help promote technology use. Teachers also indicated that administrators were supportive of novel ideas related to technology use. Both groups identified time as an important part of professional development and practice.

Identified Barriers to Technology Integration

Administrators identified four types of barriers to technology integration. Administrators indicated that teacher perceptions, knowledge, and skills regarding technology and technology integration were barriers, along with access to technology resources. Institutional barriers that impact technology integration were also identified by administrators. Teachers' responses to survey questions regarding barriers were divided in many instances. Table 9 summarizes teachers' responses to survey items related to technology integration barriers.

Table 9

Barriers to Technology Integration Survey Questions

Survey Questions	(*N* = 195)	Strongly Agree	Agree	Disagree	Strongly Disagree
• Students' misuse of technology is a major concern.	190	42.63%	39.47%	14.74%	3.16%
• To use technology, teachers need to know more about it than students.	188	7.45%	23.94%	64.36%	4.26%
• Technology does not and cannot replace effective teaching.	185	54.05%	39.46%	5.95%	0.54%
• There is no need to integrate technology if a teacher is successful without it.	188	5.32%	22.34%	63.30%	9.04%
• The biggest hurdle to getting teachers to use more technology is getting teachers to see that it is useful.	188	11.70%	44.68%	34.04%	9.57%
• Technology is just not worth the additional time, effort, and planning.	188	2.66%	12.77%	59.04%	25.53%
• Some teachers avoid technology because they do not understand how to incorporate it in their lessons.	190	30.00%	56.32%	11.58%	2.11%
• Teachers need more technology-oriented professional development.	182	28.57%	54.95%	13.74%	2.75%
• If administrators had a better understanding of instructional uses for technology, it would be easier for teachers to use technology in the classroom.	181	9.39%	48.07%	39.78%	2.76%
• Teachers need more time to practice using technology.	182	46.15%	47.80%	6.04%	0.00%
• Students' lack of technology access outside the classroom makes it difficult to include it in lessons.	185	18.38%	55.14%	24.32%	2.16%
• Teachers would use more technology if schools provided more computers for students.	182	44.51%	37.36%	17.58%	0.55%
• Using student-owned devices is a good way to increase access to technology in the classroom.	182	19.78%	50.00%	24.18%	6.04%
• Schools are not prepared to handle problems associated with the technology available to students.	188	25.53%	46.81%	26.06%	1.60%
• Pressure to use more technology hinders teachers' ability to prepare students for standardized state tests.	185	5.41%	21.62%	64.32%	8.65%
• Technology is difficult to use because as soon as I learn to use something it is phased out and replaced by something new.	182	12.09%	46.70%	37.91%	3.30%
• Teachers' use of technology in the classroom is limited by outdated policies and practices.	185	15.14%	43.24%	38.92%	2.70%

Attitudes and Beliefs

Administrators identified teacher attitudes and beliefs as barriers to technology integration. Administrators identified fear of student misuse of technology as a barrier. Teachers were asked to respond to the statement, "Students' misuse of technology is a major concern." Teachers' responses indicated that 42% strongly agreed and 39% agreed. Administrators also indicated that schools may not be prepared for problems associated with technology. Teachers were asked to respond to the statement, "Schools are not prepared to handle problems associated with the technology available to students." Teacher responses indicated 26% strongly agreed and 47% agreed.

Administrators indicated that teachers are resistant to change and many do not see technology as useful. Teachers were asked to respond to the statement, "The biggest hurdle to getting teachers to use more technology is getting teachers to see that it is useful." Teachers were divided in their responses: 12% strongly agreed, 45% agreed, 34% disagreed, and 10% strongly disagreed. When teachers were asked to respond to the statement, "Technology is just not worth the additional time, effort, and planning," teachers' responses indicated 3% strongly agreed, 13% agreed, 59% disagreed, and 26% strongly disagreed. Teachers did not endorse the administrators' perspective that teachers do not feel technology is worth the additional effort.

Knowledge and Skills

Administrators indicated that teachers' and administrators' technology skills were a barrier to technology integration. Administrators indicated that some teachers were reluctant to use technology because students' technology skills are stronger than teachers'

skills. Teachers were asked to respond to the statement, “To use technology, teachers need to know more about it than students.” Among responding teachers, 64% disagreed and 9% strongly disagreed. Most teachers do not endorse the administrators’ perspective that teachers need to know more about technology than students in order to use technology. Administrators also indicated that inadequate technology skills may prevent some teachers for using technology. Teachers were asked to respond to the statement, “Some teachers avoid technology because they do not understand how to incorporate it in their lessons”; 30% of teachers strongly agreed, and 56% agreed. Teachers do endorse the administrators’ perspective that some teachers’ avoid technology because of inadequate skills.

Administrators indicated that the technology professional development provided to teachers was inadequate. Teachers were asked to respond to the statement, “Teachers need more technology-oriented professional development.” Teachers’ endorsed the administrators’ perspective in that 29% strongly agreed and 55% agreed. Administrators expressed some level of concern with their own technology skills as they relate to instruction. Teachers were asked to respond to the statement, “If administrators had a better understanding of instructional uses for technology, it would be easier for teachers to use technology in the classroom.” Teachers were divided in their response to this statement: 9% strongly agreed, 48% agreed, 40% disagreed, and 3% strongly disagreed. This would indicate that slightly more than half of the teachers responding endorse the perspective that inadequate skills on the part of administrators negatively impact teacher technology use.

Resources

Administrators discussed several areas related to technology resources. Administrators frequently expressed barriers to technology integration related to time. Teachers were asked to respond to the statement, "Teachers need more time to practice using technology." Teachers indicated a strong level of support for this statement with 46% of responding teachers strongly agreeing and 48% agreeing.

Administrators identified access to technology tools as a barrier to technology integration. Teachers were asked to respond to the statement, "Access to technology tools and programs should be an educational priority"; 28% strongly agreed and 54% agreed. Teachers were also asked to respond to the statement, "Teachers would use more technology if schools provided more computers for students"; 45% strongly agreed and 37% agreed.

An additional barrier identified by administrators related to student access to technology outside of school. Administrators indicated that poor student access outside of school limited teachers' ability to use technology. Teachers were asked to respond to the statement, "Students' lack of technology access outside the classroom makes it difficult to include it in lessons." Teachers' responses indicated that 18% strongly agreed and 55% agreed.

Institutional Barriers

Administrators identified institutional barriers that impact technology integration. Teachers were asked to respond to the statement, "Technology is difficult to use because as soon as I learn to use something it is phased out and replaced by something new."

Teachers' responses were divided with 12% strongly agree, 47% agree, 38% disagree, and 3% strongly disagree. While more than half of teachers endorsed the administrators' perspective that continual changes to technology limits teachers' ability to use technology, a large number of teachers do not see this as a barrier.

Administrators identified school district policies as barriers to teacher technology use. Teachers were asked to respond to the statement, "Teachers' use of technology in the classroom is limited by outdated policies and practices." Teachers were divided in their response to this statement: 15% strongly agreed with the statement, 43% agreed, 39% disagreed, and 3% strongly disagreed. Slightly more than half of the teachers endorsed the administrators' perspective that that policy limits technology use.

A specific policy identified by administrators related to student-owned devices. While some administrators support the use of student-owned devices, other administrators were opposed. Teachers were asked to respond to the statement, "Using student-owned devices is a good way to increase access to technology in the classroom." Of teachers who responded, 20% strongly agreed, 50% agreed, 24% disagreed, and 6% strongly disagreed. Teachers tended to be more positive in their support the use of student-owned devices than administrators in that most teachers endorsed their use.

Another barrier identified by administrators related to state-mandated testing. Administrators indicated that pressure to perform well on state-mandated tests negatively impacted technology use. Teachers were asked to respond to the statement, "Pressure to use more technology hinders teachers' ability to prepare students for standardized state tests." Of teachers who responded, 5% strongly agreed, 22% agreed, 64% disagreed, and

9% strongly disagreed. While some administrators expressed a concern regarding testing, teachers did not endorse the administrators' perspective that testing impacted technology use.

Summary of Identified Barriers to Technology Integration

Teachers tended to endorse administrators' perspectives regarding technology. Teachers endorsed the administrators' perspective that student misuse of technology is a concern. Teachers did not endorse administrators' perspectives with regard to teacher attitudes about planning and technology. Administrators indicated that many teachers do not believe technology is worth the extra effort, but teacher responses indicated that teachers do feel technology is worth the effort. While teachers and administrators had similar views about the potential for misuse of technology, teachers did not endorse administrators' perspectives with regard to teacher attitudes and perceptions regarding technology's usefulness and the effort teachers are willing to provide in order to use technology.

Teachers endorsed administrators' perspectives regarding knowledge and skills as they relate to technology use. Administrators indicated that inadequate technology skills may prevent some teachers for using technology. Teachers endorsed the administrators' perspective that, in some cases, teachers' avoidance of technology is related to inadequate technology skills. Teachers endorsed administrators' perspective that teachers need more technology professional development. Administrators indicated that their own instructional technology skills might be lacking. Slightly more than half of the teachers

responding indicated that inadequate skills on the part of administrators negatively impacts teacher technology use.

Administrators frequently identified time as a barrier to technology integration. Teachers endorsed the administrators' perspective that more time is needed to work with technology. Teachers endorsed the administrators' perspective that access to more technology would lead to more teacher use of technology. A large number of teachers shared administrators' concerns that a lack of student access to technology outside of school limits the ability of teachers to use technology.

Administrators indicated that institutional barriers impact technology integration. While more than half of teachers endorsed administrators' perspective that continual changes to technology limits teachers' ability to use technology, a large number of teachers do not see this as a barrier. Administrators also identified policies as barriers to teacher technology use. Slightly more than half of the teachers endorsed the administrators' perspective that some policies limit technology use. Teachers tended to support the use of student-owned devices more strongly than administrators and indicated that using student devices may positively impact technology use in the classroom. While administrators expressed a concern regarding testing, teachers indicated that testing did not impact technology use.

Conclusion

While teachers tend to endorse administrators' perspectives in many areas, there were several important differences. With regard to vision, both groups indicated that technology was important, but teachers indicated that technology tools and programs

should be an educational priority. This seems to indicate that teachers value instructional technology more than it is valued by administrators. With regard to the administrators' role, teachers identified areas in which they indicated that administrators were not as effective as they might be. Modeling technology use was one area where teachers did not endorse the administrators' perspective: Teachers indicated that administrators do not effectively model technology use, while administrators identified modeling technology use as one of the ways in which they promote technology integration. Teachers also seek assistance with technology from sources other than administrators which suggests that teachers are not confident in administrators' knowledge and skills related to technology integration, and that teachers do not believe that administrators can assist teachers with technology. With regard to promoting technology, teachers seem to indicate that administrators could do better. While administrators indicated that they promote technology use by providing access, teachers indicated that they would use more technology if schools provided more access for students. Both teachers and administrators see professional development and skill development as important to promoting technology use, but both groups also indicated that having more time to practice using technology was important.

With regard to barriers to technology use, administrators and teachers see the same types of barriers but have different perceptions regarding their cause. Administrators indicated that many teachers do not believe technology is worth the extra effort, but teacher responses indicated that teachers do not endorse this perspective. With regard to knowledge and skills, administrators' instructional technology skills appear to

be a concern for teachers. Slightly more than half of the teachers responding agreed that inadequate skills on the part of administrators negatively impacts teacher technology use.

CHAPTER SIX

Despite efforts to promote technology integration in K-12 schools, relatively little progress has been made. While there are examples in the literature of research examining teachers and technology integration, relatively little is known of the administrators' knowledge of and support for integrating instructional technology into the classroom, particularly with regard to overcoming barriers to technology integration. The literature does not adequately address school leaders and instructional uses of technology. School leaders are critical to implementing change in schools, but little is known about administrators' perspectives with regard to technology integration and whether or not teachers endorse those perspectives.

This study identified high school administrators' perspectives related to their technology vision, role in promoting technology integration, administrative activities to promote technology integration, and perspectives regarding barriers to technology integration, and to what extent teachers endorse those perspectives. A mixed-methods approach was used to conduct this study. A qualitative approach during Phase 1 permitted the researcher to explore the perspectives of administrators and respond to research questions 1-4. Quantitative data was collected as part of Phase 2 using a survey instrument. The survey instrument was developed using categories and themes identified

during Phase 1 and sought to obtain teachers' responses to administrators' perspectives. The findings of this study represent the mixing of these two data sources.

Conclusions

In general, teachers endorsed administrators' perspectives regarding their vision for the uses of technology in education. Teachers endorsed the administrators' perspective that technology is important to instruction but that the teacher is also important. Teachers endorsed the administrators' perspective that students are tech savvy and that schools should respond to these students using technology. The majority of teachers endorsed the administrators' perspective that technology is important to managing school processes, although teachers who did not endorse this perspective had strong feelings.

Teachers endorsed the administrators' perspectives that technology has had a significant impact on instruction and a positive impact on student engagement, but many teachers did not endorse the administrators' perspective that technology improves student attentiveness and performance. Teachers endorsed the administrators' perspectives that technology has the potential to enhance alternative learning opportunities and that technology supported 21st century learners through student-centered learning and interactive approaches to learning. Teachers also endorsed the administrators' perspective that technology supported the development of specific 21st century skills related to research and collaboration.

Administrators identified several roles that they felt were important with regard to integrating technology in instruction. Modeling technology use was one area where

teachers did not endorse the administrators' perspective. Teachers' responses were in contrast with the perspective of most administrators, stating that administrators were not effectively modeling technology. Teachers endorsed the administrators' perspective that administrators encourage the use of technology, but were split with regard to administrators' conveying that the use of technology was a priority. This is similar to the conflict expressed by administrators. Administrators indicated that technology use is encouraged, but they also identified other roles that conflict with promoting technology use. Administrators also indicated that their technology skills were not sufficient to provide assistance, and they often sent teachers to an ITRT or another teacher for assistance with technology. Teachers recognized administrators' lack of knowledge and did not identify administrators as people who could help them with regard to using instructional technology.

Teachers endorsed the administrators' perspectives regarding most issues related to administrative actions to promote technology. Teachers endorsed administrators' perspective that access to technology is important and that improving access may increase teacher technology use. Both groups indicated that administrators have created expectations related to technology use. While administrators have created an expectation that teachers use specific classroom support tools, this did not translate to teachers, however, as a strong expectation that teachers actually use technology during instruction. Teachers endorsed administrators' perspective that professional development is important to promoting technology use. Both groups indicated that practice was important to

improving teachers' technology skills, and that having more time to practice using technology was important.

Teachers endorsed administrators' perspectives with regard to barriers to technology use. While teachers and administrators had similar views about students and the potential for misuse of technology, teachers did not endorsed the administrators' perspective with regard to teacher attitudes and beliefs about technology's usefulness and the effort teachers are willing to provide in order to use technology. Administrators saw teachers' attitudes and efforts as barriers, but teachers did not endorse the administrator's perspective. Teachers endorsed administrators' perspective regarding knowledge and skills as they relate to technology use, and that, in some cases, teachers' avoidance of technology is related to inadequate technology skills. Teachers endorsed the administrators' perspective that teachers need more technology professional development. Slightly more than half of the teachers responded they believe that inadequate skills on the part of administrators negatively impact teacher technology use. Teachers endorsed administrators' perspective that more time is needed to work with technology, and shared administrators' concerns that a lack of student access to technology outside of school limits the ability of teachers to use technology in the classroom. More than half of teachers endorsed the administrators' perspective that continual change to technology limits teachers' ability to use technology, but a large number of teachers did not endorse continual technology change as a barrier. Slightly more than half of the teachers endorsed the administrators' perspective that some policies limit technology use. Teachers tended to endorse the use of student-owned devices and

indicated that using student devices may positively impact technology use in the classroom. Teachers indicated that testing did not impact technology use.

Discussion

Both administrators and teachers indicated that technology is important to the management of school processes: 97% of teachers responding indicated that administrators expect teachers to use technology for management purposes. This response is consistent with data related to teacher technology use reported by Gray et al. (2010) which indicated that teachers are most likely to use technology to support activities like grading and tracking student data. Administrators have created clear expectations for teachers' use of school management technology, and teachers understand this mandate. Grading and attendance technology are essential for daily school management. Administrators appear to understand the purpose of the software and promote its use. The result of clear expectations and support from administrators results in widespread use of the technology for school management purposes.

The basic premise of technology integration efforts is that teachers should integrate computers into their everyday pedagogy (Bichelmeyer & Keller, 2004; Schmeltzer, 2001), but everyday instructional use was where teachers indicated concerns with administrators' technology skills and leadership. Administrators and teachers both indicated that technology was important to meeting the needs of 21st century learners and both indicated that technology had a positive impact on student engagement, but teachers did not endorsed the administrators' perspective that technology improved student attentiveness and performance. If teachers feel that something does not improve

instruction, Cuban (1986) indicated that they were not as likely to use it. Teachers may believe technology is important and even feel it is a priority, but if teachers believe technology leads to distractions in classrooms and does not improve instruction they will be less likely to use it.

Most administrators, because of the demands of their daily job, have not been able to devote the time to develop skills needed to promote technology integration. Administrators have been able to communicate that technology is important, fulfilling an important aspect of Rogers' (2003) adoption of innovation framework, but their actions and inadequate skills with regard to technology integration communicate a different message where instruction is concerned. In addition, where technology is adopted, it is used to facilitate existing practices rather than to promote new instructional activities (Cuban, 20001). As Christensen et al. (2008) pointed out, most instruction involves direct instruction focused on a single objective. Administrators understand and support direct instruction, but teachers and administrators may not understand how incorporating technology during instruction may alter existing practices.

Mishra and Koehler's (2006) conceptual model of technological, pedagogical, and content knowledge (TPACK) indicated that teaching is a complex activity that requires teachers to combine different kinds of knowledge during instruction. As technology, content, and pedagogy combine, these types of knowledge interact and impact one another and how each might be used to inform instruction (Mishra & Koehler, 2006). When teachers work with technology during instruction, administrators need to be able to understand and support the ways in which technology integration may change instruction.

Administrators involved in this study indicated that they often rely on other individuals to assist teachers with using technology during instruction. Often, the reason for sending teachers to someone else is that administrators do not have the technology skills to provide the assistance themselves. The lack of instructional technology skills limits the administrator's ability to thoroughly understand the demands and changes technology may bring to the practicing teacher, and this prevents the administrator from adequately modeling the kinds of teaching behaviors that integrate technology into instruction or establishing instructional technology priorities.

Rogers (1995) indicated that modeling is important to the adoption of an innovation. Modeling is also an important part of leadership (Fullan, 2002). Hope (1997) indicated that, "Principals should be role models for technology implementation. Teachers need to see the principal exhibiting positive emotions toward technology and modeling its use" (p. 3). Administrators were not seen by teachers as particularly effective instructional technology models or leaders. Administrators reported that, in many cases, they sent teachers to someone else for assistance with technology. Teachers reported that they did not regularly seek assistance technology assistance from administrators. Teachers' lack of confidence in their administrators' abilities to lead technology integration efforts may well be an important deterrent to effective instruction-based technology use.

The result of the absence of modeling technology skills on the part of administrators may explain teachers' reporting a much weaker message from administration about the expectation that technology actually be used during instruction.

With regard to technology tools related to school management, administrators are very clear about expectations as to how these tools will be used. Yet, likely because they lack sufficient knowledge, administrators do not have as great an understanding of instructional uses for technology, and thus they do not communicate the expectation for technology use during instruction well to teachers. The finding that administrators' technology skills may not be sufficient to provide technology leadership is consistent with the findings reported by other researchers (Anderson & Dexter, 2005; Creighton, 2003; Greer, 2002; McLeod & Richardson, 2011).

Research indicated that leadership in the form of vision, planning, modeling, and skill development can help teachers overcome barriers to technology integration (Baylor & Ritchie, 2002; Cosner & Peterson, 2003; Ertmer et al., 2002). However, this study's findings suggest that while administrators have provided a partial vision for technology focusing on school management and have helped promote the development of teachers' technology skills through professional development, they are not providing the kinds of instructional technology leadership needed to promote technology integration during instruction.

In this study, teachers responded to administrators' perspectives via a survey, but teachers did not have the opportunity to express additional or different perspectives. Thus, this study is limited to administrators' perspectives and does not reflect teacher-initiated visions, roles, actions, or barriers. It might well be that there are teachers' perspectives of administrative behaviors in these categories that were not captured by focusing on administrators and their perspectives. For example, Hew and Brush (2007)

identified subject-specific culture, the set of practices and expectations that are consistent with a particular school subject, as a barrier to technology integration. Administrators did not articulate how expectations consistent with teaching a particular content might impact a teacher's perspective with regard to barriers. The same issue might apply to other areas that influence technology and technology integration.

In addition, teachers who are high technology users might present an entirely different perspective because of their experiences using technology. Mishra and Koehler (2006) indicated that content and pedagogical knowledge are influenced and changed by the introduction of technology. The confluence of pedagogical knowledge, content knowledge, and technological knowledge might also change teachers' perspectives regarding visions for technology use; students', teachers', and administrators' role in technology integration; activities by administrators or other stakeholders to promote technology; and barriers to technology integration.

Recommendations

The greatest concerns raised by this study are related to administrators' technology skills, understanding of technology integration, and the ability to communicate to and support teachers' efforts to make technology a part of instruction. In order to adequately evaluate teachers' technology use, administrators should understand how technology changes the classroom. Administrators should also be able to model the use of instructional technology themselves. Increased instruction-oriented technology professional development for all administrators should be considered. This professional development should focus on ways that technology can change instruction, rather than

ways that technology can automate or support current instructional practices. One approach might be district-level professional development for administrators to provide them with opportunities to engage with teachers, ITRTs, and other administrators as well as providing hands-on experience using technology to support learning goals.

Both teachers and administrators rely heavily on the ITRT for assistance with technology. In recent years, budget concerns have resulted in the reduction of several positions within the school district, limiting the number of ITRTs available to assist teachers and administrators with instructional technology. While the ITRT was not a major focus of this research, the information obtained indicated that the ITRT is an important support position. In the future, the impact of the ITRT on administrators, teachers, and instruction should be a consideration.

Recent nationwide changes to district policies related to using student-owned devices may provide teachers with additional access to technology tools. Because of the very nature of student-owned devices, these devices will more often than not be used by students. This provides a response to teachers' concerns about access and administrators' desire that more technology be placed into the hands of the students. It is important for administrators to understand potential uses of student-owned devices and how these will change typical activities in the classroom. Administrators also need to work with teachers to develop ways to help bridge gaps created by students who do not own a personal device or do not have access to technology outside of the classroom.

It is important to note that the teachers who did not endorse administrators' perspectives regarding technology related to school management had strong feelings

opposing technology use in general. These teachers may oppose increased technology use either due to opposition to technology, opposition to change, or both. Teachers who are opposed to using technology for school management will be more likely to resist using instructional technology as well. Professional development should be designed specifically to address the concerns of this group of teachers.

Limitations

This study examined the perspectives of a small group of administrators and a somewhat small group of teachers in a single district. The results should not be generalized to other populations, nor should the results be applied as a broader representation of administrators' or teachers' perspectives. The research included only high school administrators and high school teachers. The findings may not be applicable to middle and elementary schools.

Another limitation was that the study only addressed administrators' perspectives, translated to a survey, to see whether teachers agreed or disagreed with administrators' ideas. Further study that goes beyond the surface of issues, and beyond "agree" and "disagree" may provide a more in-depth explanation as to the reasons why teachers have the same or differing perspectives.

Recommendations for Further Research

It would be beneficial to determine if any of the findings of this study apply to administrators in general. A larger study examining a more representative population of administrators would provide more insight into administrators' perspectives regarding instructional technology. Research into the impact of administrators' instructional

technology skills would also be beneficial. Researchers might examine administrators who are seen as technology leaders to determine how their technology skills might differ from other administrators.

It would be beneficial to explore technology integration in a variety of localities. Replicating this study in rural or urban school districts might indicate concerns specific to those types of districts. Urban research might want to focus on the impact of widely available broadband service. Likewise, rural districts might find it useful to explore concerns related to students' access to technology outside of school.

Because this study was limited to high school administrators and teachers, it would be beneficial to examine middle and elementary schools, which have different populations. Results at middle and elementary schools might stress different concerns. In addition, personnel at the district level might have different perspectives regarding instructional technology than school-based personnel. It would be beneficial to study division-level administrators and curriculum leaders and the impact that they have on instructional technology.

An additional limitation was that this research was conducted by an administrator working in the district being studied. A researcher more removed from the research site may better be able to examine how teacher demographic factors like years of experience, content area, age, and other factors impact the teachers' responses.

Final Thoughts

The results of this study indicated that teachers generally endorse administrators' perspectives related to vision and barriers for technology integration. Teachers and

administrators both expressed concerns regarding administrators' instructional technology skills. While administrators reported that one of their roles was modeling technology for teachers, teachers did not endorse the administrators' perspective and apparently did not see administrators as effective models for the instructional use of technology. Both teachers and administrators indicated that administrators create an expectation that teachers use technology tools that have an administrative purpose, but this expectation was not articulated into action with regard to actually using technology during instruction.

APPENDIX A

ADMINISTRATOR INTERVIEW QUESTIONS

Administrator Interview Questions

1. Walk me through a day in your building. Describe a typical day. What do you do?
2. Describe what you normally see happening in classes in your school? What might I expect to see instructionally? What would I see students doing? What would I see the teachers doing?
3. What are your thoughts regarding technology and student learning? (challenges/misconceptions)
4. How would you describe your personal use of technology/social networks (Facebook, twitter, phones)
5. What are some things that you do to help support teacher's use of technology? (social networks/phones)
6. Can you give me some examples of ways teachers use technology in your school? Tell me some stories.
7. What challenges do you think schools face with regard to using technology effectively during instruction? How do you think these impact teachers and teaching?(challenges)
8. What are some things you would like to do to help teachers use technology?

9. What are some of the formal processes that are used where technology is concerned? How do you get something fixed, replaced, new software, etc.
10. What are some of the informal processes that are used where technology is concerned? How do you "really" get something fixed, replaced, new software etc?
11. What do you feel are the most appropriate uses of technology in education? (If you could wave a magic wand and make everyone do it, what would it look like?) (potential areas: vision, sustaining, disruptive)
12. What technology do you think has or will have the biggest impact on schools? Why/How?

APPENDIX B

TEACHER SURVEY AND INFORMED CONSENT

Teacher Survey and Informed Consent

RESEARCH PROCEDURES

This research is being conducted to compare high school administrators' and high school teachers' views regarding the use of technology in [Name] County Public Schools. The data collected through this online survey will be compared to data collected from [Name] High School administrators to examine the level of agreement between administrators and teachers regarding the use of instructional technology. If you agree to participate, you will be asked to take part in an online survey that should take about 20 minutes to complete.

RISKS

There are no foreseeable risks to participating in this research.

BENEFITS

There are no direct benefits to you as a participant other than to further research in the field of instructional technology.

CONFIDENTIALITY

The data in this study will be confidential. You will not be asked any personal information or to identify to which [school] you are assigned. Participants in the survey will remain anonymous. Only the researcher will see individual survey responses. No names or lists of participants will be collected. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

ALTERNATIVES TO PARTICIPATION

No course credit or compensation will be provided in exchange for participation in this study.

CONTACT

This research is being conducted by Steven Hall, Ph.D. candidate in Instructional Technology, under the direction of Dr. Priscilla Norton, Instructional Technologies Research, at George Mason University. Steven Hall may be reached at (xxx)xxx-xxxx or by email at xxxx@xxx.xxx for questions or to report a research-related problem. Dr. Norton may be reached at (xxx)xxx-xxxx or by email at xxxx@xxx.xxx. You may contact the George Mason University Office of Research Integrity & Assurance at (703)993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

1. Multiple Choice

CONSENT

I have read this form, all of my questions have been answered by the research staff, and I agree to participate in this study.

- Consent
- Do not Consent (you will exit the survey)

*** 2. Which best describes your position with SCPS?**

- Teacher
- ITRT, Librarian or other Media Specialist
- Paraeducator or noninstructional staff
- Administrator, Guidance or other instructional support

*** 3. Technology is an important part of the management of schools (e.g. attendance, grading, and communication).**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 4. Most students are tech savvy.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 5. Technology is changing the way we teach.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 6. Teachers need to stop being the caretaker of technology and let students be the caretakers.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 7. Technology offers possibilities for providing students with alternative learning opportunities.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 8. Using technology in classrooms increases student interest and engagement.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 9. Using technology in classrooms leads to improved attentiveness and performance.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 10. Technology should be used to support interactive approaches to learning.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 11. Technology should be used to support student-centered learning.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 12. Using technology in classrooms supports research and study skills.**

- Strongly disagree

Disagree

Agree

Strongly agree

*** 13. Technology can contribute much to teaching and learning, but the teacher remains an essential part of the process.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 14. Using technology supports group work and student collaboration.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 15. Educators must respond to today's tech-savvy students by using technology as a part of teaching and learning.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 16. Technology integration prepares learners for the 21st century workforce.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 17. Students' misuse of technology is a major concern.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 18. Some teachers avoid technology because they do not understand how to incorporate it in their lessons.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 19. Schools are not prepared to handle problems associated with the technology available to students.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 20. There is no need to integrate technology if a teacher is successful without it.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 21. To use technology, teachers need to know more about it than students.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 22. The biggest hurdle to getting teachers to use more technology is getting teachers to see that it is useful.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 23. Technology is just not worth the additional time, effort, and planning.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 24. Technology does not and cannot replace effective teaching.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 25. Technology does not and cannot replace effective teaching. (Note: question 25 repeated question 24 in the survey. This error was noted by the researcher and question 25 was omitted from reported results.)**

Strongly disagree

Disagree

Agree

Strongly agree

*** 26. Pressure to use more technology hinders teachers' ability to prepare students for standardized state tests.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 27. Students' lack of technology access outside the classroom makes it difficult to include it in lessons.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 28. Using technology is not a major priority.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 29. Teachers' use of technology in the classroom is limited by outdated policies and practices.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 30. Technology is difficult to use because as soon as I learn to use something it is phased out and replaced by something new.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 31. Teachers need more technology-oriented professional development.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 32. Teachers need more time to practice using technology.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 33. Teachers would use more technology if schools provided more computers for students.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 34. Using student-owned devices is a good way to increase access to technology in the classroom.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 35. When I need assistance with technology I usually seek help from:**

- An Administrator
- An ITRT
- A Librarian
- Another teacher
- I don’t usually need help
- I don’t use technology

*** 36. My administrators model the effective use of instructional technology during staff meetings.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 37. If administrators had a better understanding of instructional uses for technology, it would be easier for teachers to use technology in the classroom.**

- Strongly disagree
- Disagree
- Agree

Strongly agree

*** 38. Administrators encourage the use of technology in the classroom.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 39. Technology and email are effective ways to communicate.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 40. Access to technology tools and programs should be an educational priority.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 41. Administrators are open to teachers trying new ideas and uses for technology.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 42. It is an expectation that teachers include technology in lessons.**

Strongly disagree

Disagree

Agree

Strongly agree

*** 43. It is an expectation that teachers use classroom support tools like SCORE and Google apps.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 44. Teachers are being forced to use technology.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

*** 45. When other teachers share technology ideas during staff meetings or school-based professional development teachers are encouraged to use more technology in the classroom.**

- Strongly disagree
- Disagree
- Agree
- Strongly agree

APPENDIX C

INFORMED CONSENT FORM (INTERVIEW)

INFORMED CONSENT FORM (Interview)

RESEARCH PROCEDURES
This research is being conducted to examine the impact the administrators have on the use of technology in the classroom. If you agree to participate, you will be asked to take part in an interview that should take about 45 minutes to 1 hour.

RISKS
There are no foreseeable risks for participating in this research.

BENEFITS
There are no direct benefits to you as a participant.

CONFIDENTIALITY
The data in this study will be confidential. To protect confidentiality pseudonyms will be used for all participants. All references to the interview and interviewee will use a pseudonym or a predetermined coded reference selected by the participant. If the participant does not want to select a pseudonym or coded reference, one will be chosen by the researcher. Names and other identifiers will not be placed on transcripts of interviews. The interviewee will be asked to review the transcript for accuracy and intent.

AUDIO RECORDING
During the interview, an audio recording will be made of the interview using an IPOD digital recorder. The audio recording will be used to develop an accurate transcript of the interview and to assist the researcher with reviewing the information collected. Only the researcher will have access to the recorded data. The recording will be deleted at the end of the study. Please let the researcher know whether or not you agree to be audio taped.

PARTICIPATION
Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party

CONTACT
This research is being conducted by Steven Hall through the Graduate School of Education at George Mason University. He may be reached at xxx-xxx-xxxx ext. xxxx or xxxx@xxx.xxx. Mr. Hall is being supervised by Pricilla Norton, she may be reached at xxx-xxx-xxxx or xxxx@xxx.xxx for questions or to report a research-related problem. You may contact the George Mason University Office of Research Subject Protections at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT
I have read this form and agree to participate in this study.

APPENDIX D

INTERNAL REVIEW BOARD APPROVAL LETTER

GEORGE MASON UNIVERSITY
Office of Research Subject Protections
Research Hall
4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-4121; Fax: 703-993-9590

TO: Priscilla Norton, College of Education and Human Development

FROM: Aurali Dade
Assistant Vice President, Research Compliance

PROTOCOL NO.: 8055

PROPOSAL NO.: N/A

TITLE: A Mixed-Methods Examination of Administrator and Teacher Agreement Regarding Technology Integration and Leadership

DATE: April 18, 2012

Cc: Steven Hall

Under George Mason University (GMU) procedures, this project was determined to be exempt by the Office of Research Subject Protections since it falls under DHHS Exempt Category 2, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior.

A copy of the final approved consent document is attached. Please use this stamped copy for your research.

You may proceed with data collection. **Please note that all modifications in your protocol must be submitted to the Office of Research Subject Protections for review and approval prior to implementation**. Any unanticipated problems involving risks to participants or others, including problems regarding data confidentiality must be reported to the GMU Office of Research Subject Protections.

GMU is bound by the ethical principles and guidelines for the protection of human subjects in research contained in The Belmont Report. Even though your data collection procedures are exempt from review by the GMU HSRB, GMU expects you to conduct your research according to the professional standards in your discipline and the ethical guidelines mandated by federal regulations.

Thank you for cooperating with the University by submitting this protocol for review. Please call me at 703-993-5381 if you have any questions.

APPENDIX E

TABLES

Table E1

Codes for Vision

Codes	Subcodes
Importance of Technology	Strong Support Measured Support
Technology and School Management	Administrative Tasks Communication Student Supervision Support Instruction Building Maintenance Teacher Supervision
Technology and Instruction	Student-Centered Learning Technology Tools Available Use of Technology by Teachers
21st Century Learners	Technology in Students' Hands Access to Information Social Media Mobil Technology

Table E2

Codes for Role

Codes	Subcodes
Instructional Supervision	Instructional Supervision
	Modeling
	Expectations
	Maintenance Concerns
	Instructional Technology Resource Teacher (ITRT)
Conflicts With Other Roles	Personal Technology Skills
	Supervision

Table E3

Codes for Promote

Codes	Subcodes
Access	Access to Tools
	Access to Funding
Expectations	Encourage Use
	Force Use
	Evaluate Use
Skills	Professional Development
	Practice
	Support Experimentation
	Time
Indirect Support	

Table E4

Codes for Barriers

Codes	Subcodes
Attitudes and Beliefs	Fear Teacher/Student Roles Resistance to Change
Knowledge and Skills	Teachers' Skills Professional Development Administrators Skills
Resources	Time Access to technology tools
Institutional Barriers	Systems Barriers Policy

Table E5

Vision for Technology Integration Teacher Survey Questions

Teacher Survey Questions
• Technology can contribute much to teaching and learning, but the teacher remains an essential part of the process. • Technology is an important part of the management of schools (e.g. attendance, grading, and communication). • Technology and email are effective ways to communicate. • Technology is changing the way we teach. • Technology offers possibilities for providing students with alternative learning opportunities. • Using technology in classrooms increases student interest and engagement. • Using technology in classrooms leads to improved attentiveness and performance. • Technology should be used to support interactive approaches to learning. • Educators must respond to today's tech-savvy students by using technology as a part of teaching and learning. • Using technology in classrooms supports research and study skills. • Technology should be used to support student-centered learning. • Using technology supports group work and student collaboration. • Technology integration prepares learners for the 21st century workforce. • Teachers need to stop being the caretaker of technology and let the students be the caretaker. • Most students are tech savvy. • Access to technology tools and programs should be an educational priority.

Table E6

Administrators' Technology Role Teacher Survey Questions

Teacher Survey Questions
• My administrators model the effective use of instructional technology during staff meetings. • Administrators encourage the use of technology in the classroom. • Using technology is not a major priority. • When I need assistance with technology I usually seek help from: a. An administrator b. An ITRT c. A Librarian d. Another teacher e. I don't usually need help f. I don't use technology

Note. ITRT = Instructional Technology Resource Teacher.

Table E7

Ways Administrators Promote Technology Integration Teacher Survey Questions

Survey Questions
• Teachers would use more technology if schools provided more computers for students. • It is an expectation that teachers include technology in lessons. • It is an expectation that teachers use classroom support tools like SCORE and Google apps. • Teachers are being forced to use technology. • When other teachers share ideas during staff meetings or school-based professional development, teachers are encouraged to use technology. • Administrators are open to teachers trying new ideas and uses for technology. • Access to technology tools and programs should be an educational priority. • Teachers need more technology-oriented professional development. • Teachers need more time to practice using technology.

Table E8

Barriers to Technology Integration Survey Questions

Survey Questions
• Students' misuse of technology is a major concern. • To use technology, teachers need to know more about it than students. • Technology does not and cannot replace effective teaching. • There is no need to integrate technology if a teacher is successful without it. • The biggest hurdle to getting teachers to use more technology is getting teachers to see that it is useful. • Technology is just not worth the additional time, effort, and planning. • Some teachers avoid technology because they do not understand how to incorporate it in their lessons. • Teachers need more technology-oriented professional development. • If administrators had a better understanding of instructional uses for technology, it would be easier for teachers to use technology in the classroom. • Teachers need more time to practice using technology. • Students' lack of technology access outside the classroom makes it difficult to include it in lessons. • Teachers would use more technology if schools provided more computers for students. • Using student-owned devices is a good way to increase access to technology in the classroom. • Schools are not prepared to handle problems associated with the technology available to students. • Pressure to use more technology hinders teachers' ability to prepare students for standardized state tests. • Technology is difficult to use because as soon as I learn to use something it is phased out and replaced by something new. • Teachers' use of technology in the classroom is limited by outdated policies and practices.

APPENDIX F

RECRUITMENT INFORMATION

Recruitment Information

Pre recruitment email to administrators:

"Hello I am Steven Hall, I am a graduate student at George Mason University and an assistant principal at a county high school. In few days I will be contacting you to discuss a study that I am conducting in connection with George Mason University. The study will examine technology integration and leadership in the county. I would like to ask if you would be willing to participate in this study by permitting me to interview you regarding technology integration and leadership? The interview should take less than one hour. Participation is voluntary and you can withdraw your consent to participate at any time. Thank you for your time and consideration. It is only with the help of administrators like you that this research can be completed.

If you have any questions or comments about the study, I would be happy to talk with you.

I can be reached by phone at xxx-xxx-xxxx ext. xxxx or by email at xxxx@xxx.xxx. If you would like to report a problem or concern, please direct these Pricilla Norton with GMU. She can be reached at xxx-xxx-xxxx or xxxx@xxx.xxx.

Thank you again for helping with this study.
Steven Hall

Administrator interview recruitment script.

Hello I am Steven Hall, I am a graduate student at George Mason University and an assistant principal at a county high school. As part of my graduate program, I am conducting a study of technology integration and leadership in the County. I would like to ask if you would be willing to participate in this study by permitting me to interview you regarding technology integration and leadership? The interview should take less than one hour. Participation is voluntary and you can withdraw your consent to participate at any time.

If you have any questions or comments about the study, I would be happy to talk with you now. I can also be reached by phone at xxx-xxx-xxxx ext. xxxx or by email through GroupWise.

If you would like to report a problem or concern, you can direct these anonymously to Pricilla Norton, at GMU. She can be reached at xxx-xxx-xxxx or xxxx@xxx.xxx. Thank you again for helping with this study.
Steven Hall

Teacher Initial recruitment email

Dear Educator,
My name is Steven Hall, and I am a PhD candidate in Instructional Technology at George Mason University. I am contacting you to invite you to participate in a doctoral research study being conducted by me with Dr. Pricilla Norton. The study seeks to compare the views of teachers and administrators regarding technology in SCPS. You're eligible to be in this study because you are an educator in a county high school. I obtained your contact information from the high school Google mail lists.

If you decide to participate in this study, you will be asked to complete an online survey that should take about 20 minutes. The survey is anonymous and no identifying information will be requested. Remember, this is completely voluntary. You can choose to be in the study or not.

If you'd like to participate or have any questions about the study, please email or contact me at xxxx@xxx.xxx or Dr. Norton at xxxx@xxx.xxx.

To access the study, click the link below, or copy the URL into your web browser:
https://www.surveymonkey.com/s/shallsurvey

Thank you very much.
Sincerely,
Steven Hall

Follow-up email

Dear Educator,

This email is to serve as a reminder. If you have completed the survey associated with my study, thank you. If you intend to complete it, please try to do so in the near future.

To access the study, click the link below, or copy the URL into your web browser:
https://www.surveymonkey.com/s/shallsurvey

Thank you very much.
Sincerely,
Steven Hall

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