Fostering a School Technology Vision in School Leaders

This manuscript has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of school administration and K-12 education.

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This study focused on understanding how and to what extent school leaders shift their vision of school technology leadership as a result of being exposed to theoretical, practical, and empirical data focused on school technology leadership. Prior to the intervention, educational leadership doctoral students were asked to write their vision statement for school technology leadership. After completing a three-credit hour graduate level course developed around the National Educational Technology Standards for Administrators (NETS-A) (ISTE, 2011), the students were asked to revise their vision statement. Pre- and post-treatment analyses were conducted to determine the depth of conceptual shifts as measured by the technology leadership standards. The researchers found that each student experienced shifts in their vision that more closely aligned to the NETS-A.

In 2001, a consortium of educational leaders and technologists from across the globe gathered to articulate a set of technology standards that would address the needs of school leaders (Brooks-Young, 2009). Since that time, the National Educational Technology Standards for Administrators (NETS-A) have been adopted by many states and educational leadership preparation programs as foundational guidelines for modern school leadership (International Society for Technology in Education, 2011). The widespread adoption of the NETS-A is largely a reaction to a paradigmatic shift where school leaders have come to understand that modern technologies are creating new challenges and unique opportunities for educational systems (Bonk, 2009; Christensen, 2008; Farmer, 2010; Means, 1995; Morrison, 2010). The school leader, being responsible for leading, navigating, and changing schools within this modern, digital context, must thus embrace and prepare for this new learning environment. Central to this responsibility

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is having a vision of technology integration for the school. With that said, there has been little scholarly examination of this important role of school leaders until recently (Dexter, 2011; McLeod & Richardson, 2011; Rutkowski, 2011; Schrum, 2011).

The purpose of this study was to further the scholarly base on school technology leadership by examining vision. The core assumption of this research was that school leaders must lead schools with a clear vision of how technology will and can be used to enhance the educational learning experiences of all students and teachers. The researchers sought to examine how fostering skills described by the NETS-A influence a school leader's vision of how technology should and will be used in the school.

REVIEW OF THE LITERATURE

Digital technology continues to put pressure on the education system to change, to adapt, to improve, to streamline, to become more effective, and to become more efficient. At the core of this shift is the school leader. If the school leader does not understand the trends in educational technology then the leader is ill prepared to harness the power of modern digital technologies. The following section provides a description of recent trends in educational technology followed by a discussion of how the field of school technology leadership has been researched. The importance of leading a school with a vision that takes into account these technological changes is then discussed.

Trends in Educational Technology

Because of shifts in information technology, the challenges facing today's schools are immense (Christensen, 2008). Technologies are causing disruptive changes that require a rethinking of nearly all elements of the education system (McLeod, Richardson, & Bathon, 2011). The Internet's popularity at the beginning of the 1990s introduced numerous tools to educators and learners alike. For instance, in the early 1990s, videoconferencing became available and today's students can now interact with others from around the world for free to do things such as discuss cultural differences and similarities (Bonk, 2009; Picciano, 2011) or engage in collaborative problem solving activities.

Videoconferencing and other digital technologies have led to the development of online course platforms. The International Association of K-12 Online Learning (2012) reported that 1,816,400 students were enrolled in distance education courses (predominantly online) in 2009-2010. This number does not include fully online schools that, as of 2010-2011, enrolled an additional 250,000 students. The omnipresent nature of technology and its impact on the education system as a whole can no longer be ignored. These technologies are disrupting the educational experience of students, teachers, and leaders.

Increasingly, modern digital technologies have been adapted to the educational setting. For example, the creation of the wiki has given way to Wikipedia and other open-source collaborative projects (Bonk, 2009; Picciano, 2011). Richardson (2010) discussed how using RSS feeds, social bookmarking, and social networking tools can facilitate the collaboration and organization of large amounts of information. TeacherTube (a spin-off of YouTube) was started in 2007 and offers a large collection of resource videos for use

by teachers and students (Bonk, 2009). Whereas textbooks have been one of the more important resources of education for nearly a century, e-books are now becoming more popular (Bonk, 2009). Students can download textbooks, articles, and other resources onto an e-book at less expense for the school and the individual, thus helping school systems 'go green' while remaining relevant and providing the most updated information possible. Teachers are using blogs to engage in conversations, share information, and distribute electronic resources. The Khan Academy has disrupted educational content by providing a platform where academic lessons are offered free of charge to anyone who wants online academic content. These examples allude to the fact that technology is rapidly changing how and where teaching and learning occurs (Richardson, 2010).

Over the last decade, schools in the United States have been successful at providing a minimal level of technology hardware. However, the rise of networked computer systems, database management systems, automated assessment systems, graphing calculators, presentation software, and handheld computers has significantly changed the way teachers teach and students learn (Morrison, 2010; Picciano, 2011). Students are uploading video projects to YouTube (Picciano, 2011), learning on personal laptops through 1:1 initiatives (Morrison, 2010), and connecting didactic content with instructional gaming software (Picciano, 2011). Teachers are using interactive whiteboards (Morrison, 2010) to teach, administrators are using computer software and data systems to make data-driven decisions (Picciano, 2011), and school systems are transforming libraries into media centers so students can have access to a wider range of resources available outside of traditional print media (Means, 1995).

Simply having the hardware and software in place does not mean that teachers are using these tools in a pedagogically sound manner or that students are learning from the tools in value enhanced ways. One study of high schools near Silicon Valley, California showed that although schools may have some of the best technology infrastructure in the country, teachers did not use the available technology in meaningful ways. Results of the study indicated that teachers were occasional or non-users of the technology at their disposal (Cuban, Kirkpatrick, & Peck, 2001). This is despite the fact that as early studies indicated computer-based instruction can raise students' scores by approximately .32 standard deviations (from 50th percentile to the 63rd percentile)(Kulik, Bangert, and Williams, 1983).

In response to the increase in technology in schools, Bass, Avolio, Jung, and Berson (2003) suggested that organizations need to be flexible and must be led by adaptable, innovative administrators. School leaders must be able to work efficiently within a constantly changing technological environment. Bass et al. (2003) noted how constantly shifting environments bring about challenges for both school leaders and the teachers. One major challenge is the expense of creating 21st Century digital classrooms in ways that enhance student learning and are not simply an add-on. Wells (2010) noted that many schools are operating in the mode of a 1950s classroom (e.g., chalk and talk; rote memorization; using technology only as a tool for remediation), leaving students unprepared for successful, productive, future-ready careers while at the same time dwindling valuable scarce resources.

School Technology Leadership

Technology in schools is becoming increasingly vital, as students entering the job market need more training and experience with digital technologies. However, without schools providing these learning opportunities, students find themselves wholly underprepared for the demands of the modern workforce. Teachers obtain the skills needed to prepare these students primarily through professional development opportunities that often directly align with the vision set by the school leader. However, students and teachers are often not led by technology-savvy leaders (McLeod & Richardson, 2011).

Numerous studies support the need for technology leadership in K-12 schools (Anderson & Dexter, 2005; Davies, 2010; Flanagan & Jacobsen, 2003; Gosmire & Grady, 2007; Leonard & Leonard, 2006). School technology leadership must be actively impressed upon pre-service school leaders in order for effective implementation and change to occur. "Without basic technology competency, it stands to reason that most school leaders lack the ability to understand the various policy and planning issues related to the successful implementation of technology" (Rivard, 2010, p. 10). Furthermore, administrators need more opportunities to obtain knowledge regarding these challenges and how they can be effective digital change agents (Holland & Moore-Steward, 2000). The knowledge and understanding of school technology leadership can either be infused in a preparatory program or a current administrator can obtain the needed information and skills while on the job through professional development.

McLeod, Bathon, and Richardson (2011) discussed school technology leadership and noted the field of educational leadership must do a better job of preparing future leaders. These authors described how school technology leadership traditionally has been researched in three domains. The first domain includes researching how digital technologies are used to teach traditional educational leadership content. The second domain is focused on training school administrators how to better use digital technologies. The third domain focuses on how to prepare school administrators to be better technology leaders. McLeod, Bathon, and Richardson suggested that, "sadly, little research or preparation yet exists regarding the third domain, which is the most important and impactful of the three" (p. 296).

The scholarship on school technology leadership is of utmost importance as the current generation of students will encounter tremendous difficulty navigating and performing in the workforce. Educational reform in the 21st Century needs to come from administrators with an instructional vision for such things as digital literacy and digital citizenship (Rivard, 2010). Thus, it is vital that administrators are able to properly integrate technology into their school vision (Dexter, 2011; Picciano, 1998).

Principals must ensure that technology is a tool to enhance learning, teaching, and leadership or they risk squandering valuable student and teacher time along with limited school and district resources. Lemke (1998) noted how "technology can be an effective catalyst for education reform, as it requires educators to rethink current practices and inspires them to make fundamental improvements in the system" (p. 15). With regards to the NETS-A, Afshari, Bakar, Luan, Samah, and Fooi (2008) detailed how school administrators must: (1) inspire others and create shared visions; (2) demonstrate effective uses of technology in the areas of learning and teaching; (3) incorporate technology as they support, manage, and operate the school; and (4) actively involve

themselves in the assessment and evaluation of technology in the school. These four areas, however, require that the school leader create and foster a shared vision for technology in their school.

Limited research has been done on how school administrators learn about or even navigate effective school technology leadership. Outlets for most research studies about technology leadership are limited to conference proceedings, unpublished literature, and dissertations (McLeod & Richardson, 2011). As early as 1998, authors noted this dearth in the leadership literature (Michael, 1998). Recently, some peer-reviewed literature in leadership journals has begun to emerge. For instance, in the spring of 2011, the *Journal of School Leadership* published a special issue on the topic of school technology leadership. In this issue, a lack of focus on school technology leadership was thoroughly researched and noted by McLeod and Richardson (2011). Other research in this special issue included an analysis of distributed leadership in a middle school laptop program (Dexter, 2011), an investigation of technology leadership preparation in administrator programs (Schrum, 2011), and a predictive study of technology support on technology integration (Rutkowski, 2011).

Schrum and Levin (2009) discussed how the current generation of learners has high expectations of its leaders. If school leaders are unable to grasp and implement the processes necessary to lead with a digital-age vision, then professional development sessions and mentoring will continue to hamper the progress in the 21st Century school. Leaders need to be trained appropriately on how to handle the tools that are used outside of the classroom and integrate such technology into the learning culture.

Garland (2009) noted how the school principal is responsible for ensuring that the "school is an equal opportunity technology environment for every learner" (p. 46). To help administrators define and understand what technology leadership looks like, ISTE (2002) developed the first set of National Educational Technology Standards for Administrators (NETS-A). Since their original inception, these standards have been revised, but both versions highlight the need for visionary leadership in schools. Larson, Miller, and Ribble (2010) suggested that educational administrators use the five NETS-A standards to implement and integrate a technology vision for their unique schools. Creighton (2003) warned that without a clear vision, these standards might divert attention back toward hardware and software and orient planners towards goals and objectives that do not align with their individual educational setting. Therefore, setting a clear vision is central to achieve broader, student-focused educational standards.

Technology adoption begins with a vision about organizational learning, objectives and standards, and how these can support goals, policies, and procedures of the organization. A vision must be clear, concise, measurable, and describe a future that is better than the present (Keengwe, 2003). Successful school principals should inspire a shared vision for the comprehensive integration of technology while fostering an environment and culture conducive to the realization of that vision. The current study focuses on measuring how school leaders in training create and modify a school technology leadership vision that better aligns with the NETS-A.

Leading Schools with a Vision of Technology Use

Due to the constant evolution of technology, schools need leaders who have a vision for leading and learning with technology. However, most school-based vision research has focused on structural conditions around certain technology implementation, leaving a research gap around the overall issue of technology visioning (Vanderlinde, 2012). Without a technology vision that is communicated to all stakeholders, school leaders often fail to fully understand and support the role of technology in the school. Many authors suggest that the building principal fills this central organizational and leadership need (Davies, 2010; Larson, 2010).

Davies (2010) noted that administrators often attempt to fill the technology leadership gap by hiring an information and communications technology (ICT) coordinator rather than addressing the need themselves. Even in this situation, these administrators must learn to expand their personal technology skills and dispositions in order to understand trends and developments in technology and learning. In doing so, they can better support technology initiatives and better assess the potential value of such initiatives. The literature details that administrators are key to technology implementation due to their status and engagement with faculty and the community (Whitehead, et al 2003). Whitehead, et al. (2003) suggested that principals must be personally vested in technology as a communication mechanism given their interactions with public stakeholders including parents, politicians, and the community. Given the power of their position and level of community involvement, principals are pivotal when setting the school vision as it relates to how technology is used for teaching and learning.

Creighton (2003) explained how school technology leadership is vital when it comes to changing existing paradigms. This shift "requires the principal as technology leader to become involved in discovering, evaluating, installing, and operating new technologies of all kinds, while keeping in mind teaching and student learning as the guide and driving force behind it all" (p. 3). Thus, shifting principals' paradigms so they can effectively lead future-ready schools should be a central focus for school leadership preparation programs. A vision statement is not just a document referred to when making decisions about technology integration; it is a vital part of the e-capacity of the school. This e-capacity refers to the school's ability to "create and optimize sustainable school level and teacher level conditions that can bring about effective ICT change" (Vanderlinde, 2010, p. 543). Lai and Pratt (2004) mentioned that a technology leader who desires to be an agent of change has a responsibility to develop a vision and foster a school culture that is directly linked to the adoption and use of modern digital tools.

Bennett and Everhart (2003) noted that the first step in technology planning is setting the vision. "Vision statements are compelling stories that describe how students will be using the technology and how teachers and other staff will be using it for data-driven decision making, increased productivity and planning" (p. 22). The school technology vision includes specific details on how the learning environment will support the use of technology. These authors also noted how school technology visions must focus on emerging practices and current technologies.

Visioning is an important part of school leadership. In fact, the practice of visioning can be used to determine a clear focus of a school. Setting a vision has been found to be one of the most important elements of school leadership (Leithwood &

Jantzi, 2005). A clear and well-articulated school vision helps define the type of individual an institution wants to develop (Abelman, 2006). School vision statements set objectives for improving the quality of education. Pekarsky (1998) wrote a "well conceived vision is an informing idea that is shared, clean and compelling" (p. 280). Pekarsky further noted that a vision statement is the unifying idea of an institution. It is an agreement between the administration and the critical stakeholders, such as the student body, faculty, and staff regarding the trajectory of the institution.

The formation of a school vision that centers on technology requires building a shared belief among stakeholders about how technology will be used to advance teaching and learning. For example, Reksten (2000) noted that if a technology plan begins with the purchasing of equipment, then the school has already lost sight of the reason for using technology in education. Hence, school leaders must start by evaluating how a school vision relates to technology before thinking about what hardware to purchase. Creighton (2003) noted that even when school leaders create and implement a school vision of technology, they often disregard institutional learning priorities such as the mission of the school. These priorities can and should be evident in a school technology vision statement.

Levin and Schrum (2012) provided eight examples of schools that have demonstrated remarkable achievements through technology integration. In each case, the leader's vision was a pivotal lever of success. These exemplars indicate that "you have to create a vision so that you know where you are headed" (p. 50) and "having a clear vision is essential, but so is testing every new idea against that vision" (p. 113). Levin and Schrum's work provides rich details of how the vision of the leaders impacts every facet of any technology integration effort.

CONCEPTUAL FRAMEWORK

The research presented in this article is conceptually grounded in the most recent NETS-A as developed by ISTE (2009). The NETS-A "represents a national consensus of the things P-12 school administrators need to know and do to support technology integration effectively in schools" (Brooks-Young, 2009, p. 2). The five standards are intended to help school leaders better understand and refine their role as school technology leaders. Roblyer (2003) noted, "the NETS-A originators recognized the importance of achieving broad-based consensus on what it means to be a technology-ready individual, whether at the student, teacher, or administrator level" (p. 9). Roblyer found that as early as 2003, 45 states have, in full or in part, adopted the NETS-A in their "state technology plans, certification, licensure, curriculum plans, assessment plans, or other official state documents" (p. 12). The following description of the standards has been adapted from the NETS-A as described by ISTE (2009).

The first standard is called *visionary leadership*. A technology leader must have the ability to inspire a shared vision among stakeholders and foster changes that maximize the use of digital resources to support instruction, learning, and student performance. Visionary leaders must: (a) inspire and facilitate a shared vision; (b) iteratively develop, implement, and communicate the technology plan; and (c) advocate for policies, programs, and funding.

The second standard stresses the need for a *digital-age learning culture*. School administrators must ensure that instruction supports digital-age learning and that the building is sufficiently equipped with appropriate digital technologies. A school leader must: (a) ensure instructional innovation focused on digital-age learning; (b) model and promote the use of technology; (c) provide tech-rich environments to meet needs of all learners; (d) ensure effective practice in studying about technology; and (e) promote and participate in global learning communities.

Excellence in professional practice is the third standard. Effective school technology leaders remain current on research and trends in technology as they relate to student learning and provide appropriate teacher professional development. There are four parts to this standard: (a) allocate time, resources, and access to ensure professional growth in technology fluency and integration; (b) facilitate and participate in learning communities; (c) promote and model effective communication among stakeholders; and (d) stay abreast the research.

The fourth standard is titled *systemic improvement.* This standard is focused on data-driven decision-making and school improvement. It includes the following elements: (a) maximize the achievement of learning goals; (b) establishing metrics, collecting and analyzing data, interpreting results, and sharing findings to improve staff and student performance; (c) recruiting and retaining highly competent personnel who use technology creatively and effectively; (d) establishing and leveraging strategic partnerships; and (e) establishing and maintaining an infrastructure for technology.

The final standard is that of *digital citizenship.* This standard focuses on the school leader's responsibility to ensure safe and equitable access to digital tools. This final standard notes how a school technology leader must: (a) ensure equitable access to appropriate digital tools and resources; (b) promote, model, and establish policies for safe, legal, and ethical use of technology; (c) promote and model responsible social interactions related to the use of technology; and (d) model and facilitate the development of a shared cultural understanding and involvement in global issues.

METHODOLOGY

In this qualitative study, the researchers took a phenomenological approach to explore and understand shifts in creating a vision for school technology leadership. Patton (2002) describes how phenomenological approaches explore "how human beings make sense of experiences and transform experience into consciousness, both individually and as shared meaning" (p. 104). The phenomenon under investigation in this study is the process of setting a school technology vision. The goal was to understand how current school leaders create meaning with regard to school technology leadership visioning. Additionally, this study is exploratory in nature since there is a lack of literature on the intersection of vision setting and school technology leadership. The aim of this study was to explore how and to what extent shifts in school technology leadership visions occur through the participation in a school technology educational leadership course. These shifts were measured by the five NETS-A standards.

The population for this study included two cohorts of doctoral-level students over a span of two years. The study consists of 20 students in total. All participants were current school leaders seeking a Doctor of Education (Ed.D.) in Educational Leadership

from a mid-sized, regional university. Although students were given the option to not participate, the participation rate was 100%. The first group consisted of 13 students: 2 males and 11 females. The second group consisted of seven students: three males and four females. The entire population for the study consisted of 25% males (n=5) and 75% females (n=15).

The researchers used inductive analysis to understand the phenomenon of technology leadership visioning. Patton (2002) describes how "the strategy of inductive designs is to allow the important analysis dimensions to emerge from patterns found in the cases under study without presupposing in advance what the important dimensions will be" (p. 56). Inductive analysis paves the way to understanding the extent and depth of change noted in the pre- and post-measures.

Intervention

The intervention was a three-credit, graduate level hybrid course focused on emerging educational technology and school leadership. The course was developed to explicitly address the five 2009 NETS-A. At the onset of the course and after being initially exposed to the NETS-A, students were asked to write a school technology leadership vision. After completing the course, students were asked to revisit their vision statement and edit, revise, expand, or improve upon it based on their experiences in the course.

In this hybrid course, the students met face-to-face eight times for three hours as well as completed online activities. Learning activities included: analyzing and creating technology plans; researching technology funding options; developing and analyzing technology focused professional development for staff; using data-driven decision-making as leaders; investigating legal and ethical issues around technology; and understanding shifts in educational systems as a result of modern digital technologies. Products of this course included: creating a technology vision; analyzing an existing school technology plan and developing an improved version of that plan; researching and presenting on a class of school management technologies; engaging in biweekly online discussions; and developing a final project focused on school technology leadership.

Data Analysis

Data analysis was guided by the five NETS-A. Changes in vision were categorized as major or minor as measured against each of the five NETS-A. A *major change* in the school technology leadership vision was defined as a conceptual shift between a student's pre and post vision statement. A *major change* was defined as a modification in one's thought processes regarding one of the standards. This was typically exemplified through the addition or a reconceptualization of components of the vision statement. As an example, a student may have only mentioned the first part of visioning (i.e., inspire and facilitate a shared vision) in their first vision statement and then added another aspect of vision setting into their second vision statement (e.g., engage in an ongoing process to develop, implement, and communicate technology-infused plans). The addition of an entire performance indicator within a standard indicated more than just a partial change in understanding, thus qualified as a *major change*.

A *minor change* was defined as a change in language or a shift from partial understanding in the pre-treatment statement to a more robust understanding in the post-treatment statement. A *minor change* could be as simple as rewording a sentence or as involved as refining concepts. To qualify as a *minor change*, only the expansion of a concept was present rather than including a new concept found in the NETS-A. As an example, a student may have written that an administrator should "inspire stakeholders to implement a technology vision plan" in their pre-intervention vision statement and then add that an administrator should "inspire *and facilitate* a technology vision plan." The addition of wording within the same performance indicator signified a more robust understanding of this particular standard.

Inter-rater reliability across the three researchers was achieved through three rounds of individual coding until full agreement was reached across all standards and performance indicators for each of the 20 participants in the study. When disagreement was not quickly resolved, researchers met as a group to discuss coding conflicts and shifts and then coded again individually until consensus was reached.

FINDINGS

The pre and post vision statements were analyzed by seeking elements that addressed each NETS-A. The vision statement was thus the mechanism that gave students the opportunity to contextualize how they would enact school technology leadership and, in effect, display mastery of the five NETS-A. What follows are the results of the analyses as categorized by each of these five standards.

Standard 1: Visionary Leadership. Student 2 showed a major change in Standard 1c. This specific standard focuses on advocating for policies, programs, and funding at the local, state, or national level. In the pre-treatment vision statement, Student 2 wrote, "I envision a school that has the funding and support from local and state governments." This statement was conceptualized differently in the post-treatment vision statement. "In order to receive this funding and make this vision a reality, I will have to be data-driven and goal-oriented." Here, the original statement was vague while the post-treatment vision statement included a description of the student's specific intention to advocate for funding to support the technology-infused plan.

As detailed in Table 1, all of the students experienced some minor changes across the three indicators of Standard 1. This standard focuses on how a leader engages in an ongoing process to develop, implement, and communicate the technology plan. For example, Student 1 showed a minor change across this standard by initially writing, "stakeholders at every level will be essential in creating, implementing, and supporting the success of the technology plan." The student then rephrased the statement in the post-treatment vision to include the concept of communication. "To accomplish this goal, there will be shared communication of this vision and alignment of curriculum goals." This rephrasing was an example of a minor change since this student was better able to describe future actions but did not reconceptualize the standard.

Table 1
Standard 1 Degree of Change

	1a	1b	1c
Minor Change	19	20	18
Percentage of Students	95%	100%	90%
Major Change	1	0	2
Percentage of Students	5%	-	10%

Standard 2: Digital Age Learning Culture. Table 2 details the shifts in Standard 2 of the NETS-A. Standard 2a focuses on the need to ensure that instructional innovation is centered on digital-age learning. Table 2 details the shifts experienced within Standard 2. Three students experienced major changes in Standard 2a as well as Standard 2b. For example, Student 12's initial vision statement did not include any Standard 2a concepts. However the post-vision statement included a new phrase that did have this focus. This student now focused on particular tools and learning experiences such as "hands on learning activities using technology tools will consist of desktops, laptops, global positioning satellite systems, Skype, microphones, clickers, projectors, video and digital cameras, MP3 players and SMART Boards." Likewise, Student 15 did not mention any concept related to Standard 2a in the initial vision statement, but did in the post-treatment vision statement. In the post-vision statement, Student 15 discussed how the "curriculum will provide instruction and opportunities for applying digital tools in research. Students will be provided authentic opportunities to collect, organize, analyze, and evaluate information to solve problems and create new ideas." Here, a shift was evident that now included specific tools and techniques that foster digital age learning.

Standard 2b details how an administrator should model and promote the frequent use of technology. A major change coded for Standard 2b was evident in Student 16's vision statement. In the pre-treatment vision statement, Student 16 provided vague phrases such as: "a technology leader within a school has an important responsibility" and "if school administrators do not take the steps necessary to increase the use of technology within a school, it will most likely not be done." Student 16's post-treatment vision statement demonstrated a more mature understanding of Standard 2b. In the final vision statement, Student 16 noted how "school leaders have a responsibility to be proficient with the different types of technology used within their school buildings."

A minor change in Standard 2b, for example, was found with Student 14. Prior to the course, this student wrote that the "school leader must create a digital culture by which they model frequent and effective use of technology." The student rephrased this concept to be more inclusive of the standard in the post-treatment vision statement by writing "whether it's learning how to use new software or a new technological device, school leaders must challenge themselves to learn and seek out new innovations, just as they challenge their faculty, staff, and students."

Table 2
Standard 2 Degree of Change

	2a	2b	2c	2d	2e
Minor Change	14	14	20	20	18
Percentage of Students	70%	70%	100%	100%	90%
Major Change	3	3	0	0	1
Percentage of Students	15%	15%	-	-	5%

Standard 3: Excellence in Professional Practice. The researchers found major changes under Standard 3a were experienced by 25% of the students in the study. This standard focuses on the need for the leader to allocate time, resources, and access to ensure professional growth in technology fluency and integration. Student 8 experienced a major change in vision under this standard. In the pre-treatment vision statement Student 8 stated, "as a current school leader, it was my first intention to introduce the staff to the infinite number of Internet resources that they were lacking in their daily instruction." Student 8's post-treatment statement however was better defined, more inclusive, and much more manageable. "It is a leader's role to ensure support for ongoing, timely professional development that focuses on teaching and learning and includes many opportunities to use technology in the classroom." This student went from understanding professional growth as being an introduction to Internet resources to ensuring a focus on teaching and learning through the integration of technology as an instructional tool in the classroom.

Another example of a major change for Standard 3a was found with Student 19. In the pre-treatment vision statement, Student 19 wrote that, "professional development and growth are keys to having seamless technology integration." In the post-treatment vision statement, this student described specifics where the "next steps include planning for a technology boot camp for school leaders." This conceptual change models the difference of moving from a general idea of what should be done and shifting to a concrete understanding of what will be done.

Minor changes were found in 95% of the students for Standard 3c. This standard strand focuses on promoting and modeling effective communication among stakeholders. Student 8, for example, modeled a minor change in the understanding of this specific competency by initially writing that the "technology implemented will be relevant to all stakeholders and further develop the skills to produce 21st Century graduates." After participating in the course, Student 8 more clearly noted the collaboration inherent in this standard by adding that, "when leading a school it is integral to include all stakeholders in the decision making process." Table 3 details the shifts for Standard 3.

Table 3
Standard 3 Degree of Change

	3a	3b	3c	3d
Minor Change	15	18	19	14
Percentage of Students	75%	90%	95%	70%
Major Change	5	2	1	3
Percentage of Students	25%	10%	5%	15%

Standard 4: Systematic Improvement. As shown in Table 4, students demonstrated the most growth in Standard 4b. Here the researchers found that 30% of students experienced a major change, whereas 70% of students demonstrated a minor change. Standard 4b states that administrators should establish metrics, collect and analyze data, interpret results, and share findings to improve staff and student performance. Student 7 vaguely mentioned Standard 4b in the pre-treatment vision statement by writing that "data must have a voice, but the leader must subsequently support the creation of a systemic and sustainable vision and mission." This student's post-treatment vision statement demonstrated a major conceptualization difference. In the post-treatment vision statement, this student wrote, "research-based decisions should be the outcome of good data use and mining. It is the technology leader's responsibility to use the multiple resources, both physical and fiscal, wisely and the use of data and research should drive that momentum." Further, this student went on to write that, "research based decisions can only be made once the area of need is determined through data collection and analysis."

Another example of a major conceptual change under Standard 4b was demonstrated by Student 10. The pre-treatment vision statement included how the school technology leader must stress that the "comprehensive use of technology in the classroom should include areas of instruction, measurement of achievement or growth, data recording and analysis, and communication." The post-treatment vision statement detailed that "the school district should use technology as a data-driven decision-making tool affecting multiple educational areas, including smart budgeting." The idea of including data-driven decision-making as a tool for the administrator is a new concept, which was intentionally developed through the course.

A minor shift was found with Student 10 for Standard 4c. This standard states that an administrator should recruit and retain highly competent personnel who use technology creatively and effectively. Student 10 initially wrote that "the school system should support the integration of technology into curriculum, and provide the appropriate personnel to lead in instructional technology." After the course, the student refined this concept and wrote how "the school system should support the integration of technology into the curriculum, and provide the appropriate personnel to lead and *train new leaders* in instructional technology." This minor change shows that Student 10 was able to build from the original knowledge base and incorporate a better understanding of Standard 4c.

Table 4
Standard 4 Degree of Change

	4a	4b	4c	4d	4e
Minor Change	20	14	20	12	12
Percentage of Students	100%	70%	100%	60%	60%
Major Change	0	6	0	4	4
Percentage of Students	-	30%	-	20%	20%

Standard 5: Digital Citizenship. As shown in Table 5, 25% of the students in the study demonstrated a major shift in understanding for Standard 5b. Standard 5b states that an administrator should promote, model, and establish policies for safe, legal, and ethical uses of technology. Student 1 made no mention of any aspect of Standard 5b in the pre-treatment vision statement, but in the post-treatment statement this student wrote that "the implementation of this plan is dependent on supporting policies at the local and regional level." Student 20 showed a major conceptual change as well by detailing in the post-treatment vision statement that "it is important that I promote, model and establish policies for safe, legal, and ethical use of digital information and technology." In contrast, Student 20's pre-treatment vision statement noted that "the focus of these standards addresses the need for our students to demonstrate an understanding of the basic operations and concepts of technology as well as the ethical, cultural, and societal issues related to technology."

Student 4 experienced a minor change within Standard 5. In the original statement, this student wrote that "as a school community, we will become more globally aware through the implementation and understanding of technology." The post-treatment vision statement was expanded to be that "we will use technology to bridge the oceans and learn from our neighbors. Video calling, international collaboration, and shared presentations will allow the oceans to shrink and the bridge to be built." Here, Student 4 was able to be more specific and explicit about this NETS-A strand.

Table 5
Standard 5 Degree of Change

	5a	5b	5c	5d
Minor Change	18	15	17	18
Percentage of Students	90%	75%	85%	90%
Major Change	1	5	3	2
Percentage of Students	5%	25%	15%	10%

CONCLUSION

Since the intervention focused on activities centered on the NETS-A, the students should have naturally become more versed in these standards upon completion of the course. However this research did not aim to measure the effectiveness of the course. Rather this research focused on understanding qualitatively how students matured in their visions of school technology leadership and what actionable steps they will make when they lead

their own schools. Therefore no conclusions can be made about the effectiveness of such an intervention. We can make some conclusions however about the need to help school leaders create an actionable and manageable vision of school technology leadership.

This study indicates that shifts in school technology leadership visions occur when the content of the graduate course work is closely aligned with the NETS-A. By better understanding the standards and by engaging in activities that directly focus on the five standards, these 20 school leaders were able to better voice and more fully detail how they will lead a school based on a better knowledge of each strand of the NETS-A. This finding has direct implications on leadership preparation coursework. Since most programs lack a course dedicated to the topic of school technology leadership, it is vital that activities are woven into the required coursework that will enable these future school leaders to create visions that directly align with the internationally recognized NETS-A.

Those standards where major shifts were recorded offer a way forward for educational leadership programs across the country. These major shifts indicate those aspects of the standards that resonated most with these students. Thus, for those educational leadership programs that cannot offer a standalone school technology leadership course, but rather want to infuse this type of content into the existing coursework, these aspects of the standards might be more accessible and more valuable to pre-service leaders.

The larger takeaway is that if educational leadership programs want to develop 21st Century leaders who can lead technology-suffused schools, then professors in such programs cannot ignore the NETS-A. Mastering these standards is a vital element in this paradigm shift for pre-service leaders. Understanding how students think about vision setting as it pertains to school technology leadership informs programs and provides us all with context to link to our current content and program activities.

Schrum and Levin (2009) noted how "most school leaders have a vision for what they want their students to be like when they leave their schools and move on to further their education or enter the work world... that vision [rarely] includes an understanding of the role of technology in educating 21st-century students" (p. 6). This exploratory study indicates that when a course introduces content and concepts that shift school leaders paradigms, these leaders are better prepared to implement a technology leadership vision that takes into account the needs of diverse stakeholders.

Technology is not changing education as a matter of degrees requiring slight refinements. Rather, technological-suffused change is a seismic step that requires new lines of thought and expanded scopes of vision. By exploring how a school technology leadership vision morphs, adapts, and matures at the individual level, we are better able to understand how a vision without such interventions may impede progress in creating future ready, innovative learning environments.

Creighton (2003) noted, "because technology is so ubiquitous in our society and schools, effective leadership now must include leadership in technology" (p. 88). He further warned that, "without appropriate connection between leadership and technology implementation, potential exists for a *mishmash* of effects" (p. 87). Institutions of higher education that prepare school leaders would be remiss if they do not proactively focus on school technology leadership in their programs. The demands on school leaders today require that they become effective users, supporters, and planners of technology. Although the NETS-A provides guidance as to what this looks like, the onus is on

educational leadership preparation programs to create meaningful experiences that combine technology and leadership in ways that lead to mastery of these standards.

REFERENCES

Abelman, R., & Molina, A. D. (2006). Instituational vision and academic advising. *NACADA Journal, 26*(2), 5-12.

Afshari, M., Bakar, K. A., Luan, W. S., Samah, B. A., & Fooi, F. S. (2008). School leadership and information communication technology. *The Turkish Online Journal of Educational Technology, 7*(4), 1-10.

Anderson, R. E., & Dexter, S. L. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly*, *41*(1), 49-82.

Bass, B. M., Avolio, B. J., Jung, D. I., & Berson, Y. (2003). Predicting unit performance by assessing transformational and transactional leadership. *Journal of Applied Psychology, 88*(2), 207-218. doi: 10.1037/0021-9010.88.2.207

Bennett, H., & Everhart, N. (2003). Successful k-12 technology planning: Ten essential elements. *Teacher Librarian, 31*(1), 22-26.

Bonk, C. J. (2009). *The world is open: How web technology is revolutionizing education*. San Francisco, CA: Jossey-Bass.

Brooks-Young, S. (2009). *Making technology standards work for you* (2nd ed.). Eugene, WA: International Society for Technology in Education.

Christensen, C. M. (2008). *Disrupting class: How disruptive innovation will change the way the world learns*. New York, NY: McGraw-Hill.

Collins, A., & Halverson, R. (2009). *Rethinking education in the age of technology: The digital revolution and schooling in America*. New York, NY: Teachers College Press.

Creighton, T. (2003). *The principal as technology leader*. Thousand Oaks, CA: Corwin.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal, 38*(4), 813-834.

Davies, P. M. (2010). On school educational technology leadership. *Management in Education, 24*(2), 55-61. doi: 10.1177/0892020610363089

Dexter, S. L. (2011). School technology leadership: Artifacts in systems of practice. *Journal of School Leadership, 21*(2), 166-189.

Farmer, T. A. (2010). *Leading leadership preparation: 21st century designs*. Paper presented at the Louisiana Education Research Association, Lafayette, LA.

Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, *41*(2), 124-142.

Garland, V. E. (2009). Emerging technology trends and ethical practices for the school principal. *Journal of Educational Technology Systems, 38*(1), 39-50.

Gosmire, D., & Grady, M. L. (2007). A bumpy road: Principal as technology leader. *Principals*. *7*(6), 16-21.

Holland, L., & Moore-Steward, T. (2000). A different divide: Preparing tech-savvy leaders. *Leadership*, *30*(1), 8-10, 37-38.

International Society for Technology in Education. (2002). NETS for Administrators. Retrieved October 1, 2010, from http://www.iste.org/Libraries/PDFs/NETS_for_Administrators_2002_EN.sflb.ashx

International Society for Technology in Education. (2009). NETS for administrators 2009. Retrieved July 13, 2009, from http://www.iste.org/Content/NavigationMenu/NETS/ForAdministrators/2009Standards/NETS_for_Administrators_2009.htm

International Society for Technology in Education. (2011). NETS for Administrators. Retrieved February 1, 2012, from http://www.iste.org/Libraries/PDFs/NETS-A_Standards.sflb.ashx

Keengwe, J., Kidd, T., & Kyei-Blankson, L. (2003). Faculty and technology: Implications for faculty training and technology leadership. *Journal of Science Education and Technology, 18*(1), 23-28.

Kulik, J. A., Bangert, R. L., & Williams, G. W. (1983). Effects of computer-based teaching on secondary school students. *Journal of Educational Psychology, 75*(1), 19-26.

Lai, K. W., & Pratt, K. (2004). Information and communication technology (ICT) in secondary schools: The role of the computer coordinator. *British Journal of Educational Technology, 35*, 461-475.

Larson, L., Miller, T., & Ribble, M. (2010). 5 considerations for digital age leaders: What principals and district administrators need to know about tech integration today. *Learning & Leading with Technology, 37*(4), 12-15.

Leithwood, K., & Jantzi, D. (2005). *A review of transformational school literature research 1006-2005.* Paper presented at the American Educational Research Association, Montreal, QC.

Lemke, C. (1998). *Technology in American schools: Seven dimensions for gauging progress*. Santa Monica, CA: Milken Family Foundation.

Leonard, L. J., & Leonard, P. E. (2006). Leadership for technology integration: Computing the reality. *The Alberta Journal of Educational Research*, *52*(4), 212-224.

Levin, B., & Schrum, L. (2012). *Leading technology-rich schools*. New York, NY: Teachers College Press.

McLeod, S., Bathon, J., & Richardson, J. W. (2011). Studies of technology tool usage are not enough: A response to the articles in this special issue. *Journal of Research in Leadership in Education, 6*(5), 288-297.

McLeod, S., & Richardson, J. W. (2011). The dearth of technology coverage. *Journal of School Leadership, 21*(2), 216-240.

Means, B., & Olson, K. (1995). Technology's role in education reform: Findings from a national study of innovating schools. Retrieved March 12, 2005, from http://www.ed.gov/pubs/EdReformStudies/EdTech/

Michael, S. O. (1998). Best practices in information technology (IT) management: Insights from K-12 schools' technology audits. *International Journal of Educational Managment, 12*(6), 277-288.

Morrison, G., & Lowther, D. (2010). *Integrating computer technology into the classroom: Skills for the 21st century* (4th ed.). New York, NY: Pearson.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
Pekarsky, D. (1998). Vision and education. In H. Marantz (Ed.), *Judaism and education* (pp. 277-291). Beersheva, Israel: Ben-Gurion University of the Negeu Press.
Picciano, A. G. (2011). *Educational leadership and planning for technology* (5th ed.). Upper Saddle River, NJ: Pearson.
Reksten, L. E. (2000). *Using technology to increase student learning*. Thousand Oaks, CA: Corwin.
Richardson, J. W., & McLeod, S. (2011). Technology leadership in Native American Schools. *Journal of Research in Rural Education*, *26*(7), 1-14.
Richardson, W. (2010). *Blogs, wikis, podcasts, and other powerful web tools for classrooms*. Thousand Oaks, CA: Corwin.
Rivard, L. R. (2010*). Enhancing education through technology: Principal leadership for technology integration in schools*. (Doctoral dissertation). UMI Dissertation Publishing database.
Roblyer, M. D. (2003). Getting your NETS worth. *Learning & Leading with Technology, 30*(8), 6-13.
Rutkowski, D., Rutkowsk, L., & Sparks, J. (2011). Information and communications technologies support for 21st-century teaching: An international analysis. *Journal of School Leadership, 21*(2), 190-215.
Schrum, L. M., Galizio, L. M., & Ledesma, P. (2011). Educational leadership and technology integration: An investigation into preparation, experiences, and roles. *Journal of School Leadership, 21*(2), 241-261.
Schrum, L. M., & Levin, B. B. (2009). *Leading 21st century schools: Harnessing technology for engagement and achievement*. Thousand Oaks, CA: Corwin.
Vanderlinde, R., Dexter, S., & van Braak, J. (2012). School-based ICT policy plans in primary education: Elements, typologies and underlying processes. *British Journal of Educational Technology, 43*(3), 505-519.
Vanderlinde, R., & van Braak, J. (2010). The e-capacity of primary schools: Development of a conceptual model and scale construction from a school improvement perspective. *Computers & Education, 55*, 541-553.
Wells, C. (2010). *Smarter clicking: School technology policies that work!* Thousand Oaks, CA: Corwin.
Whitehead, B. M., Jensen, D., & Boschee, F. (2003). *Planning for technology: A guide for school administrators, technology coordinators, and curriculum leaders*. Thousand Oaks, CA: Corwin.