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Educational Leadership and Technology Integration: An Investigation Into Preparation, Experiences, and Roles

ABSTRACT: This research, looking through the lens of Fullan (1991) regarding the complexity of implementing school wide change, sought to explore preparation and requirements of new administrators with respect to the integration of technology by first gathering data regarding licensure and course requirements from state departments of education and educational institutions. Overall, most states and institutions do not require any formal preparation in understanding or implementing technology for instructional purposes, and likely their graduates are not prepared to implement technology systemically in their school. Given that these data were remarkably uniform and next researchers sought to gather experiences, training, and perspectives of technology-savvy administrators as to how they learned what they know and how they lead their schools in the 21st century. We learned that administrators do learn on their own, have a dedication to these changes, and promote their staff members' implementation through professional development, by modeling its use, and purposefully setting goals for their school.

The National Education Technology Plan (http://www.ed.gov/technology/netp-2010), released by the U.S. Department of Education in early 2010, recognizes a need to "strengthen leadership." Teachers' learning about technology integration typically comes at the time of preparation for licensure or as professional development. A great deal of funding has gone to prepare teacher candidates for their classroom use of technology, most recently through the federal Preparing Tomorrow's Teachers to Use Technology

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(1999–2004). A 2007 study found that 100% of institutions with teacher education programs for initial licensure reported teaching the use of Internet resources and communication tools for instruction in all or some teacher education programs and that more than 90% provide specific training on curricular integration, specific software, or digital content (Kleiner, Thomas, & Lewis, 2007). Furthermore, research has demonstrated that technology training for teachers does have an impact (Atkins & Vasu, 2000; Casey & Rakes, 2002; Ertmer, 2005; Wang, Ertmer, & Newby, 2004).

Unfortunately, it does not appear that the same level of effort has been given to prepare administrators in understanding the challenges they will face to support the effective use of educational technology in instructionally integrated ways and to provide them with the types of knowledge they may need to be effective change leaders in their schools (Holland & More-Steward, 2000). Equally problematic, no matter how much training teachers do receive, unless those teachers have the leadership of their administrator, they may be unable to successfully use that technology (National Center for Education Statistics, 2000). This research sought to investigate precisely what is required of new administrators during their licensure preparation, as well as to understand the perspectives of experienced tech-savvy administrators regarding how they learned what they know and how they lead their schools in the 21st century.

LITERATURE REVIEW

In 2001, a collaborative created *Technology Standards for School Administrators* (Collaborative for Technology Standards for School Administrators, 2001) to promote the idea that specific skills, knowledge, and practice were required for administrators to be ready to support the appropriate use of technology in a school. This collaborative included the National Association of Secondary School Principals, the National Association of Elementary School Principals, the American Association of School Administrators, the National School Board Association, the North Central Regional Educational Laboratory, the International Society for Technology in Education, two state departments of education, two universities, and other interested parties. They recommended six areas of knowledge and skill for school leaders—namely, visionary leadership, learning and teaching, professional practice, support and improvement, assessment and evaluation, and promoting ethical and social use. These statements became the International Society for Technology in Education National Educational Technology Standards for Administrators, which have been

subsequently adopted or adapted by most states. They were updated in 2009 to reflect the increasingly pervasive role of technology in society and work and the need to prepared students for these realities of the 21st century. The widespread participation on and adoption of these standards notwithstanding, there is no research to date on how state requirements and institutions organize preparing future school leaders to lead technology in their schools. The field of educational leadership has also not examined the larger context of existing school leaders' preparedness to promote appropriate instructional use of technology or grasp what they may require to lead true 21st-century schools.

Research does tell us that technology leadership matters for promoting teachers' uses of technology (Anderson & Dexter, 2005)—more so, in fact, than technology expenditures or infrastructure—and that administrators must understand what is involved in this process of leading their schools' or districts' technology integration to be successful (Dawson & Rakes, 2003). Ritchie (1996) offered several variables that affect the implementation of educational technology for classroom use. He determined that lack of administrative support is the most important of these and that, without it, the other variables will be negatively affected. Stegall's study (1998) found that leadership of the principal was a common thread in technology integration success. In addition, a more recent study conducted by Stuart, Mills, and Remus (2009) suggested that school administrators need to be increasingly involved in the ICT (information and communication technologies) projects in their schools because their involvement improves their ICT skills and provides opportunities to model technology use to others.

Dawson and Rakes (2003) addressed the need for administrators to take part in technology training and model its use, and they found that many principals were uninformed and uninvolved in the technology role of their schools. They concluded from their research of 400 principals that there is a relationship between the technology training that principals receive and the level of technology integration in their schools; however, as principals become leaders of technology and knowledgeable of its benefits, their teachers receive more support for integration. Testerman, Flowers, and Algozzine (2002) recommended, "If educational leaders continue to demonstrate developmental lags in their knowledge and technology competence, the expected benefits of innovative technology practices will likely be unrealized" (p. 60). Whale (2003) had 346 Michigan principals rate themselves, and they rated "highest on enforcement of acceptable use policies and in being advocates for high-quality technology services. The findings suggest the need for professional development for current principals" (n.p.). Furthermore, Williams (2008) stated if schools want to

close the "cultural gap between their digital immigrant teachers and digital native students, then decisions taken by school leaders must be not only well informed, but enterprising" (p. 223). All of this suggests a need for technology leadership knowledge and skills that go way beyond the basics of learning to operate technology.

In the 21st century, administrators need to know how technology can promote learning, be appropriately situated as both a topic of and a support to the curriculum, and support whole-school improvement. Murphy (2001) suggested that "the problem with educational leadership preparation programs today is that they are driven by neither education nor leadership" (p. 14). He decried that most preparation programs focus exclusively on management issues and academic disciplines, such as sociology and psychology, ending with an almost complete lack of topics in education. He stated, "One would expect preparation programs to promote an understanding of our best knowledge about learning, knowledge of curriculum standards, and knowledge of whole school improvement, for example" (p. 14). Jones (2001) believed that states must adopt standards for leadership preparation that emphasize the school's core functions. New leadership standards must shift away from the traditional preoccupation with school management and put the highest priority on results for students. Hess and Kelly (2007) surveyed 56 programs and analyzed course syllabi; they concluded that fewer than 5% included instruction on managing school improvement via data, technology, or empirical research and that 11% of the course weeks dealt with instructional issues such as curriculum development, pedagogy, classroom management, and learning theory.

The purpose of this research was to first investigate the current status of administrator preparation to understand how individuals may or may not learn to provide the leadership necessary for facilitating teachers' use of technology in creating student curricular engagement and achievement and improving the school conditions necessary for teachers' integration. To provide a comparative context, we also sought out current technology-savvy administrators and asked them about their experiences, training, and practices. The following questions guided the research:

What are the specific state requirements regarding leadership licensure preparation in each of the 50 U.S. states, with respect to technology coursework?

What is the current status of "technology integration courses" in leadership licensure preparation programs in major institutions in the 50 U.S. states?

What do current technology-savvy administrators report about their preparation, experience, and practice in supporting, assisting, and promoting use of technology for integration into curricular activities?

PHASE 1: SCAN OF STATE PREPARATION REQUIREMENTS AND REPRESENTATIVE LICENSURE PROGRAMS

METHODS

The research team gathered information on the first research question through web investigations of pertinent documents (Weber, 1990) from the departments of education for all 50 states. Specifically, we identified the correct licensure/certification office for each state and analyzed the stated requirements for earning the required approval to serve as a building-level administrator.

To answer the second question, we identified the land grant and other administrator preparation institutions in each state. We focused on those institutions who had all successfully gone through a type of approval process in which the program of study is approved by the state's department of education and on those with the largest education populations. Ultimately, we were able to collect programmatic and course information on 137 educational leadership programs. The average number of institutions varied from two to four per state, depending on the size of the state and the total number of institutions in that state. In each case, we downloaded the programs of study for school administrator license (with or without additional master's degree). For each program, we categorized information about the required core and elective courses of study of the administrator certification program. If a technology course was identified, the course description was analyzed for types of technology being taught. Data were analyzed with simple description and thematic coding for trends in the types of topics and courses offered.

RESULTS

After a review of the 50 state licensure/certification websites, we found that all states except 2 are not explicitly requiring that administrators demonstrate knowledge of technology use, promotion, or integration in order to earn their initial licensure; however, even these 2 states have vague requirements: Michigan requires that leaders be aware of technology

for teaching and learning, and New Mexico requests that applicants use technology and data.

The states typically follow the model used for educator licensure; that is, they allow specific institutions to prepare and recommend administrators for licensure or credentials. Thus, it is possible for institutions to require technology preparation even where states do not. We found that more than 92% of these authorized institutions had no required course that mentions technology in any way. A small number of institutions (approximately 7%) offer or require one course with a title that includes "data," but upon deeper examination (we examined syllabi whenever possible), most appear to focus on data-driven decision making, supporting school management, arranging schedules, analyzing test results, or fostering school improvement. A few institutions offered elective courses that involved technology integration to enhance instruction or improve student achievement. One institution declared that its administrator candidates need to be "aware of technology for teaching and learning."

Thus, the answer to our first two questions was relatively disappointing; 48 of the 50 states require no technology preparation of their future school leaders. At the required preparation level, only a minority of prospective leaders may have received coursework to assist them regarding the thoughtful integration of technology into instructional practice to enhance student learning. Syllabi, where present, do not suggest that this instruction was framed in terms of transformative leadership supporting reculturing.

PHASE 2: ADMINISTRATORS' PERSPECTIVES

METHODS

As a contrast to inquiring into state requirements and their leadership programs' programs of preparation, we investigated experienced current technology leaders' explanations of their preparation to lead technology and the important skills, knowledge, and practices they use in their building on a regular basis. An online questionnaire (posted on SurveyMonkey; see appendix) was developed to identify the skills, knowledge, training, and experiences that administrators had regarding instructional uses of technology and their interactions with their teachers regarding the implementation in their schools. Their responses to open-ended questions represent respondents' perspectives on their preparation for being an administrator, their roles in schools, their efforts to support technology

integration and use, and their ideas about the issues and challenges of technology implementation.

To answer the third research question, a purposeful sample was drawn from members of a special interest group sponsored by the International Society for Technology in Education for administrators, members of the Classroom 2.0 Ning educator group, and targeted administrators who were identified through their blogs about their use educational technology. The goal was to identify technology-savvy administrators to gather information on their personal experiences and activities.

Permission was obtained by approaching the organizations and requesting invitations that we posted and sent out to members of these groups. Data from the survey provided descriptive statistical information regarding participants' years as administrators, job descriptions, and ages. Each researcher then independently analyzed the open-ended questions' results to determine a coding scheme and emergent themes (Merriam, 1998). Following the independent analysis, the researchers worked toward consensus through discussion, seeking interrater agreement.

RESULTS

In all, 48 administrators (principals, assistant principals, superintendents, central office administrators) responded to our call for participation. In addition, 98 technology-specific administrator and teacher leaders (central office technology leaders, school-based technology coordinators) responded to the survey. While their perspectives and data were not the initial intention of this study, these data were deemed as being important in terms of providing insight into their world but also as a way to compare and contrast their perspectives with those of the school-based administrators. Those data are reported separately. In addition, 16 others responded to the survey. These individuals were professors, students, or others, and the data from these respondents were not included in these results.

Table 1 provides an overview of the demographic information of our respondents. As can be seen, administrators who responded were primarily

Table 1. Demographic Information of Respondents

Respondents	Women	Men	Years		
			30–39	*40–49*	*> 50*
School-based administrators	33	15	3	22	23
Technology coordinators or directors	56	42	28	22	48

women (33 of 48) and were balanced in age (40–49 years, n = 22; 50 and older, n = 23). Technology administrators were also primarily women (56 of 98), and a majority were older than 50 years (n = 48) with some ranging in age from 30 to 39 (n = 28) and a smaller number between 40 and 49 years (n = 22).

How did these individuals learn what they know about technology? School leaders were asked to provide information regarding how they learn about using technology for education activities. School-based administrators reported learning about technology on their own, during their teacher preparation programs, by using technology as a classroom teacher, and for managerial or clerical tasks. Many also noted that professional development activities offered by their school systems have increased their interest in technology. One principal stated that he learned about technology "in [his] teaching through professional development opportunities and exploring on [his] own." This was reiterated by an elementary school principal who described his experiences as "through reading literature, attending conferences, as well as using the equipment that is housed in our school." In contrast, many of the survey participants who were leaders in technology within their school district noted that they learned about using technology from their university coursework, most typically in an educational technology master's or doctoral program.

Next, survey participants were asked to describe the role of technology in their school leader preparation programs. A majority of school-based administrators as well as respondents in the district technology director role stated that they had had no specific instructional technology course; however, a small number of participants did report that technology was emphasized within their classes with regard to student assessment practices and data-driven decision making. One assistant principal stated, "In my administrative coursework there was one class that was titled Educational Technology. The class had little to do with application; it was more focused on data-driven decision making." This was further emphasized by a middle school principal who remarked, "Very little practical technology was taught. Most was connected to research and testing." In contrast, approximately 10% of the school-based administrators mentioned learning about the uses of technology through integrated requirements throughout their graduate learning program. "In my coursework, there was an understanding to use technology whenever possible, i.e., presentation software, databases, spreadsheets, and word processing," explained one school principal. A chief school administrator stated, "The use of technology was integrated into the [administrative] program. Instructors used it for class presentations, assignments were submitted electronically, and my research

was done primarily online." Finally, approximately 5% of the school- or district-based administrators reported learning about technology as part of a doctoral program or continued advanced studies. "In my doctoral work, the role of technology was split with emphasis on technology integration into teaching, learning, and as a critical component of data-driven decision making," explained an associate superintendent.

How do these individuals use technology in their current roles? The administrators described many professional uses of technology in their everyday lives—communication, data analysis, professional uses (reports, spreadsheets, etc.), student management—and in their professional development for teachers. One said,

> I blog weekly as a model and a handful of teachers are becoming more regular in their postings as they find a purpose and an audience. Some members of my Leadership Team are beginning to produce [the] podcasts of students as they explore the possibilities of this new technology.

Another reported, "I use technology for typical office applications, organizing information, teacher appraisals, analyzing data, and for data driven decision making." And one stated,

> As a building principal I use technology for communication in the form of email, blogs, and presentations. I just finished converting my "State of the School Address" to a podcast that will be placed on our school website. Additionally, I use technology to help my staff understand the vision of using technology as both a teaching and learning tool. Just one example is for the last two years during the "Welcome Back Breakfast" in August I show a motivational movie that I created.

Others' answers focused on tracking students and data about them, as well as tracking the use of technology and surveying stakeholders. Several administrators described ways that they model technology use, such as one who commented, "Lead faculty meetings with a SMART Board. Use a blog to send out my weekly newsletter, participate in an online blog about a professional book the staff is reading, post weekly announcements to our SharePoint site."

As central office administrators, technology directors and coordinators reported using technology primarily for productivity and administrative applications, such as e-mail, word processing, data analysis, budgeting, presentations, and publications. They also reported integrating technology into staff development, curriculum, and problem-solving efforts for technology implementation (e.g., interactive white board implementation). One said,

> I am the director of technologies and part of the work I do includes working with teachers to infuse technology with learning. This includes the use

of laptops, smart boards, digital cameras, digital video cameras, and video conferencing. The focus of this work is to support inquiry based learning and focus on the learning, not the technology.

Another technology director reported, "I am working on upgrading e-mail, encouraging more video conferencing, and employing more technology tools in the classrooms." And a coordinator of instructional technology stated using technology for "curricular integration, formative and summative assessments, small group work, internet safety, email, virtual workspaces, video conferencing, and RSS feed readers."

Other technology directors described using technology in their current roles as assisting with professional development. One said, "As director of technology, I supervise staff development for teachers, administrators, and clerical staff." Another explained, "[I] work with teachers on technology integration, plan staff developments, and make tech-related decisions for our district." Another stated, "Essentially, I provide professional development to teachers and administrators on technology integration in the classroom."

School-based technology coordinators and resource specialists reported using technology for instructional purposes, such as helping teachers access resources and integrate new software or platforms such as blogs, wikis, and podcasts. Others reported using technology with online learning, video conferences, and webinars. As one technology specialist remarked,

> I use it continually—I look at what the teachers are teaching and I look at the curriculum—how it could all of it be delivered more effectively? Is there a tech tool that would help the teachers and or learners?

How do these respondents encourage the use of technology by educators? In analysis of the responses to this question, the answers from both groups were similar and therefore organized by categories from the total participant pool. In general, the responses to this question fall into two main groups. Some of the respondents' districts or other organizational/ institutional structures take a systemic approach in which the purchase, use, and support for technology are integrated into all aspects of activity. These include statements such as "competencies that all new teachers to the school must complete within their first 3 years," "All new staff go through a Tech Boot Camp," and "Each of our teachers is required to have 6 hours of technology training every year."

Some offer professional development for all educators in a "one size fits all" approach or in which teachers can pick and choose what they want to learn. Individuals reported traditional daylong professional development workshops, summer boot camps, demonstration models, "just in time"

training as requested, and other inventive models. One administrator reported, "This year, my teachers will choose two [standards] and focus on those. Their evaluation will depend on their achievement/growth in the identified standards." Another commented, "All educational community members at our school (teachers, [administrators], counselors, nurses) are given a laptop upon arrival at our school. They are supported from day one with professional development and online resources for learning how to use the machine."

Other responses indicated a much more individual approach in which one person appears to be a driving force in the development and promotion of technology use in curricular activities. One respondent described "March Tech Madness," in which special sessions are offered throughout the month of March to coincide with the basketball tournament. Others support technology integration by encouragement or making professional development available all the time.

A few discussed ways that they promote demonstration of various technology uses. For example, one stated,

> Three years ago when I made integration mandatory I set aside time at one staff meeting a month for the teachers to share what they were doing. This "positive peer pressure" did two things. One it helped the teachers learn of different techniques and programs to use, and it held them accountable to their colleagues.

Many respondents described ways that they try to model the technology use. One administrator commented,

> I encourage our educators by *using* it, every day in every way. Our district focuses on the 4 Rs—relationships, rigor, relevance, and results. For us, a key to relevance is student engagement, but first the adults must be engaged.

Another stated, "At the conclusion [of each faculty meeting], one of the teachers presents a 5-minute tech tip [teacher chosen at previous meeting] and shares the tool with everyone else."

Administrators and technology directors/coordinators' responses indicated a shared sense of the importance or value of the technology. One said, "I encourage teachers to use technology only when it makes sense. Teachers who use technology simply for technology's sake do all of us a disservice." Another commented, "We strongly encourage use of technology as a means to differentiate instruction and to increase student motivation."

A small number of respondents did mention changes in their budgets in the current economic downturn and the need to scale back their spending; others talked about using Enhancing Education Through Technology federal funds to continue their professional development and technology

purchases. Many did mention going after grant funds to support their use of technology.

What do these individuals see as the uses of technology over the next 5 years? Many administrators believe that technology's role in education will continue to expand within the next 5 years as technology becomes more prevalent in all school operations—from management functions to instruction and assessment to community partnerships. One administrator commented that "technology is the pen and pencil and the library of the future." Many believe that one-to-one computing would be common and that every classroom would have interactive white boards.

These administrators also believe that technology will increase the learning opportunities for both students and educators. They noted the increase of virtual schools and that hybrid classes have the potential to offer a wider variety of opportunities for students. Teachers will also be able to benefit from more options for online professional development. Moreover, these administrators have concluded that technology will continue to facilitate assessment; thus, they expect that there will be an increase in data-driven decision making, which will provide more information and provide pathways to enhance differentiation.

The school-based administrators indicated that the potential of technology would bring new challenges for administrators to understand the technology, become role models, and develop a vision. We "cannot inspire teachers if [we] are not technologically savvy," remarked one administrator. Another commented, "Administrators must have a vision of technology use, model this vision in the professional practice, and develop teacher leaders who take a lead role in implementing said technology vision." In addition to understanding how to use technology, some administrators commented on the importance of school leaders being able to understanding the instructional applications and the need for more research. One administrator remarked, "We need to discover what value we add to learning for students and then be thoughtful about how the use of technology fits with the process."

Many administrators noted the challenge of their being able to provide adequate funding to sustain usage and address possible digital inequity. Others also noted the importance of working with their information technology departments to maximize the instructional benefits of technology. Many administrators also stressed the need for student training in Internet safety, copyright, and privacy issues.

According to the administrators, the next 5 years will be one of tremendous potential and challenge. As one administrator commented, "if done right technology will become invisible in the classroom, as it will be the

standard tool for learning content and communicating what the student has learned."

As one might expect, the respondents who are technology directors believe that the growth of technology in schools and classrooms will continue in the next 5 years. They cited examples such as one-to-one computing, interactive white boards in every classroom, handheld devices, online classes for teachers and students, and an increased online presence for classrooms that will maximize access and opportunities for learning. There will be an increase of teachers using technology to create more "teacher created" content, such as podcasts and videos, and more opportunities for students to use technology to demonstrate their learning. Others identified the increase in the use of blogs, wikis, and podcasts in the classroom. Many remarked that technology would become "seamless" in the classroom and part of the everyday routines. Others emphasized the transformative potential of technology for student learning and the importance for educators to be prepared for those changes.

Many technology directors also noted the challenges from technology's expanding role—specifically, the need for administrators to understand its potential to articulate a vision for the school, provide staff development opportunities and support for all teachers, and become models for teachers to follow. The technology directors also worry about the financial challenges for continued funding needed to maintain and expand the infrastructure and issues of equal access. One technology specialist commented,

> In the past 10 years, my job has evolved from teaching users how to double click to teaching them how to get the best use of data available in the data warehouse, to how to create fully integrated lessons. We've gone from "Why do I have to do that on a computer?" to "What do you mean I can only have two student computers in my room?"

The technology directors also expressed the importance of collaborating with information technology departments to establish proactive and instructionally appropriate procedures for Internet filtering and students' use of technology.

DISCUSSION

The data gathered in this study suggest that individual states are not demanding their current or future administrators have expertise in understanding or promoting the instructional uses of technology. This seems evident by examining the requirements for state credentials or licenses, and it was also clear in the exploration of representative institutions of

administrator preparation in each state. Such requirements should expand past data-driven decision making, which only gets at technology as a tool for one, albeit important, aspect of the role of technology in schools.

The role of technology in current building administrators' work gives us an idea of the additional direction that states and programs of preparation should consider. As the respondents described, they use technology in their jobs for communications, data analysis, and student management, as well as for productivity. They support and encourage teachers by establishing technology competency requirements and assisting teachers to meet them, offering a variety of courses and workshops, targeting specific in-service opportunities, even providing demonstration lessons. In addition, these individuals identify specific educational goals that teachers must meet (differentiated instruction, remediation, enrichment, assessment, motivation) and then suggest ways that technology might support those goals. Most important, these leaders expect that the uses of technology in the next 5 years will expand in many ways (one-to-one computing, online courses, assessment, access and equity). They uniformly stressed that the role of the school leader is essential in helping teachers establish a culture that values risk taking, promotes exploration, and celebrates innovation.

Ideas from these district- and school-based leaders about the changes that technology will bring to schools suggest that leadership of technology should be framed in terms of the literature of change. The call for leadership in the national technology plans, the National Educational Technology Standards for Administrators, and the research discussed here all imply the leadership knowledge and skill that have been discussed over the last 10 years as change leadership and, more recently, transformational leadership. Fullan (1991, 1993, 2001) provided one lens through which to examine the complexity of administrators' role in leading change and supporting teachers' use of educational technology. His notion of a complex, nonlinear, and difficult process included three stages: initiation or adoption, implementation, and continuation or institutionalization. It is important to recognize that the culture of most schools, in which individual teachers are free to choose from a range of teaching practices, must address a systemic effort to infuse technology into the school environment.

Fullan (1991) stated that "meaning fuels motivation; know-how feeds on itself to produce ongoing problem solving. Their opposites—confusion, overload, and low sense of efficacy—deplete energy at the very time that it is sorely needed" (p. 48). Fullan (1999) further maintained that in each of the three phases, the school leader has responsibilities, including ongoing pressure and support, links to instruction, early rewards for educators,

and raising the level of the innovation in terms of priorities. Additionally, Fullan suggested that it is important "to examine change efforts in terms of their theories of education, i.e., what pedagogical assumptions and associated components are essential to the model" (p. 20).

Similarly, Fullan (1993) introduced the idea of reculturing schools, in which all members of a school community work together to examine their practice, and stressed that this process is individual in nature. As Sergiovanni (2006) pointed out, the culture of a school is actually a negotiated product between school leadership and teachers within that school.

The complexity of changing the way that a school and its staff teach and learn is a monumental task. Fullan (2001) suggested that innovation is more likely to become embedded in practice if it is closely related to existing aims and it includes all levels of school practice. Leithwood and Jantzi (1990, 2000) showed that school principals who succeeded in their job have used a range of mechanisms to motivate and activate their staff to bring about changes in their school culture.

It is of interest that school-based administrators and technology coordinators see their communication and relationship with each other as an essential part of their respective roles. These two groups expressed similar comments about the uses of technology, ways of encouraging teacher use of the tools, and their visions of the future of technology in schools over the next few years. This level of reciprocity holds promise for change in teachers' practice and meaningful professional development if the school's administrator shares the leadership with his or her technology coordinator and with the teachers but is still willing to take the lead in initiating innovation (Clausen, Aquino, & Wideman, 2008).

This suggests that another preparation need for aspiring administrators is an understanding of how leadership is distributed among technology leaders who might play key roles. Recent empirical work suggests the importance of coordinated activity through the leadership practices among these leaders (Camburn, Rowan, & Taylor, 2003; Leithwood, & Mascall, 2008; Spillane, Camburn, & Pareja 2007). Spillane and Zuberi (2009) suggested considering the practice of leadership in terms of the ways in which individuals plan, interact, and even communicate with one another. Coburn (2001) suggested a more nuanced explanation of the way that principals shaped teachers' interaction related to policy, explaining that the substance of the interactions counted more than any particular leadership activity by the principal. Additionally, Hulpia and Devos (2010) suggested that teachers are more strongly committed to a school and its goals if their leaders are accessible, tackle problems efficiently, or empower teachers to participate.

LIMITATIONS

As with all efforts to examine complex human behavior, this research and
its results must be understood through the limitations in this study. First,
we had to rely on the types of information available on each state depart-
ment of education's website. Additionally, it was not always possible to
precisely determine what each state expected; most states authorize in-
stitutions to "prepare" future administrators, and the institutions did not
always make course descriptions readily available. Second, the syllabi and
explanations on the various university websites must be considered only
as good as the data found on them, which may or may not be accurate.
We may also not have found the best examples of leadership programs
from each state. Third, the respondents did not all meet the criteria of
being school leaders and administrators; furthermore, not everyone who
is an administrator and who responded completed a traditional licensure
program. These situations complicated the data collection. We did not
ask about individuals' geographic location, which may or may not have
had an impact on our analysis. Finally, the sample was purposeful; thus,
we can assume that those who responded have already self-identified as
technology-using administrators. As such, it would be interesting to gather
perspectives from those school leaders who do not consider themselves
technology-savvy administrators.

FUTURE RESEARCH QUESTIONS

This research was a first step in understanding the complex issues sur-
rounding school leaders' knowledge, skills, and interest in promoting the
instructional use of educational technology by themselves and by their
staff. It would be useful to investigate students' use of the tools, as well as
ways that school leaders evaluate or assess teacher and student implemen-
tation of technology-enhanced teaching and learning. And even though a
great deal of research has been conducted to examine this innovation from
teachers' perspectives, it might be helpful to understand what teachers
see as being needed from their school leaders to encourage, support, or
require them to use technology in curricular ways.

Given that many administrators with a high comfort level with tech-
nology have learned their skills on their own or outside their formal
training, it would be interesting to investigate how administrators with
lower levels of comfort with technology learn these skills for their own
professional use and how it may affect their ability to make decisions
regarding technology integration and staff development. It would also

be interesting to know if leaders without a strong understanding about technology experience any resulting impact on their ability to lead in other areas, as suggested by Dawson and Rakes (2003). If so, then who in the school or school system assumes that responsibility, and what are the implications? For example, many administrators commented on the importance of collaboration with information technology departments responsible for technology maintenance and infrastructure. Do administrators who are confident in their technology skills feel more empowered in negotiating issues such as network filtering and the complex issues of student privacy? It would be helpful to examine the relationship between technology leadership preparedness and experiences with technology infrastructure and instructional policies.

CONCLUSION

One purpose of this study was to examine of the educational technology requirements that are or are not explicitly stated for individuals to earn an administrative credential in the 50 states. Unfortunately, it appears that the states do not require school leaders to demonstrate knowledge or skills in leading schools to encourage technology and preparing 21st-century learners. It also sought to investigate the types of courses and other experiences that institutions expect in each of the 50 states before recommending prospective administrators for licensure. Because institutions must do whatever is required of them by their state's requirements, it appears that the absence of requirement in state regulations is echoed in educational leadership programs, as few require such skills or experiences. The good news is that despite these findings, many respondents have learned on their own and do see the use and support of technology as being important to their ability to effectively lead schools today. The question still remains, however, regarding what impact administrators who do not learn these skills may have on their teachers, students, and the larger educational community.

In light of the general ages of the respondents, it is encouraging that these school leaders have stayed current, improved their skills and experiences, and seen themselves as role models in their positions. They also expend effort and resources to improve their staffs' knowledge of current technologies.

Finally, the information gathered from the administrators provided insight into the ways that school leaders are accomplishing their goals with respect to supporting the effective use and curricular applications of

educational technology and encouraging their staff to stay current. This research project provides a glimpse into the country's administrators and where they see their future; moreover, it points out some ways to improve the preparation, readiness, and actions of all administrators in our schools.

APPENDIX: OPEN-ENDED QUESTIONNAIRE

1. How did you first learn about using technology for educational activities? (in your teaching, for example? Before that?)
2. Tell us about the role of technology in your administration coursework or program. For example, was technology integration a focus of one of your classes? Did use of technology focus on instructional application, or was the focus on data driven decision making?
3. What ways do you use technology in your position now?
4. In what ways do you encourage educators in your school to use technology?
5. Tell us about professional development in your school, specifically as it relates to technology.
6. What do you think the role of technology will be in education in the next 5 years? What will administrators need to do to insure this happens?
7. Tell us about your biggest success in implementing technology in your school.
8. Tell us about a time when things did not go well in using technology.
9. What else would you like us to know about your leadership of your school and technology?

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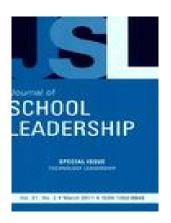
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