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HOW PRINCIPALS LEARN TO BE TECHNOLOGY LEADERS: A CRITICAL
INCIDENT QUALITATIVE STUDY

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OLD DOMINION UNIVERSITY
May 2020

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ABSTRACT

HOW PRINCIPALS LEARN TO BE TECHNOLOGY LEADERS: A CRITICAL INCIDENT QUALITATIVE STUDY

Leon R. Edwards II
Old Dominion University, 2020
Committee Chair: Dr. Karen L. Sanzo

The purpose of this study is to investigate how principals learn to be technology leaders by examining the different ways principals learn and exploring the skills principals perceive are needed. The study also examines what principals do differently to develop a successful technology integration (or not). Using the critical incident method, 18 principals were interviewed from across the state. The in-depth interviews were transcribed for all participants interviewed and then analyzed using coding and theming with the aid of memos. From this, three predominant categories emerged: learning, skills, and challenges.

The findings from the study reveal that principals learn primarily through three different methods, with the most important one being professional development. Professional development is through face-to-face or online learning using their professional learning networks to guide them in developing the needed knowledge. The principals also learn by talking with others and learning on their own. The three areas the principals use to learn are their experiences, initiative, and reflection, which align with the common areas found in adult learning. The skills principals use to be technology leaders were found to be consistent with the skills described in the ISTE framework for educational leaders. Furthermore, principals face certain challenges while trying to be technology leaders and to integrate technology. Lastly, principals distinguished what they did differently for a technology integration to be successful (or not).

The study concludes that principals can learn to be technology leaders, by using the right tools and by developing the necessary skills to be successful. The findings revealed the need for professional development on technological tools to be purposeful and fit the different needs of principals and teachers. For a technology integration to be successful, the professional development should not be a one-time meeting, but ongoing in order to provide continuous support and guidance for principals and teachers. Also, districts should make principals aware of the skills listed by ISTE for principals to be technology leaders. For some, knowing the skills needed will help them transform into technology leaders, allowing them to guide teachers to understand what they need to do in the classroom to be successful.

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INTRODUCTION

The role of the principal has changed throughout the history of education, but one constant is that every principal needs to take time to learn how to be an effective leader. Principals are leaders in instruction, and they are responsible for visiting classrooms and providing feedback to their teachers to help them become better teachers. Principals are also expected to be leaders in management because they handle master schedules and building affairs. Recently, they have been expected to be technology leaders as well. Technology has always been a major component of the educational system, but over the past few years it has played a larger role in education. Technology integration is meant to be implemented in a cross-curricular manner (Flanagan & Jacobsen, 2003), and beyond the teacher knowing how to do this, the principal must learn as well. A principal is expected to take on many roles and be effective in all of them, and now they need to learn to be something new—a technology leader.

Technology Leadership

Responsibility for leading in technology is larger than just allowing teachers to use technology in the building. Sincar (2013) states that “technology leadership represents all activities about the technology in school, including organizational decisions, policies, and implementation of technology within the boundaries of the school” (p. 1273). It also has been noted that for administrators (i.e. principals) to integrate technology well, purchasing of equipment, having a vision, and providing professional development for staff are essential to effective integration (Anderson & Dexter, 2005; Dawson & Rakes, 2003; Flanagan & Jacobsen, 2003). In their study, Flanagan and Jacobsen (2003) listed the principal’s role responsibilities and goals as they relate to the process of integrating technology, which include being a leader of learning, leader of student entitlement, a leader of capacity building, a leader of community, and

a leader of resource management. Also, Anderson and Dexter (2005) developed a technology leadership model that included technology leadership indicators such as technology committee, school technology budget, district support, principal e-mail, school principal's days (on technology), grants, and intellectual property policies.

Rationale

There is still a need in the research to understand the evolving role, competencies, and dispositions towards technology and learning that principals require in order to be effective technology leaders and how they are best developed and supported in practice (Flanagan & Jacobsen, 2003). How principals are being trained and the types of training they are receiving play a part in technology integration. The aspect of the training that is provided to administrators is also an area where research is still needed (Dawson & Rakes, 2003; Leonard & Leonard, 2006). McLeod and Richardson (2011) also note that more research needs to be done in the area of preservice leadership training with technology and technology integration. All these areas that need more research are dealing with principals and their learning. Professional development and principal preparedness require direct learning from the individuals on topics or skills. Since experience also has an impact, understanding the role of a technology leader is developed through these different methods.

Purpose of Study

This study seeks to learn the ways principals have learned to be effective technology leaders, the skills it takes to be a technology leader, and what it takes to have a successful technology integration. Professional development and different forms of training are given to principals on instructional technology but transferring the learning into practice is still something

that many principals are grappling with. The purpose of this study is to identify ways in which a principal can learn to be an effective technology leader.

Research Questions

The study seeks to answer the following research questions:

1. How do principals learn what is needed to be a technology leader?
2. What are the perceived skills needed to be a technology leader?

Definition of Terms

For the purposes of this study, the terms principal, school leader, and administrator are used interchangeably to refer to the leading individual(s) of the school charged with making school-level decisions. Other terms used are:

ICT:	Information and Communication Technology
ISTE:	International Society for Technology in Education
PLN:	A professional learning network is a social tie with multiple people and resources through virtual communities of practice that contribute to individual learning (Carter & Nugent, 2011).
Professional development (PD):	Activities that focus on supporting principals as they acquire or refine practices related to the full spectrum of instructional leadership duties and expectations held for principals, refine key skills such as capacity building, and lead the principal into personal renewal (Zepeda, Parylo, & Bengtson, 2014).

Technology leadership: Okeke (2019) defined technology leadership as the skills and behaviors needed by school leaders to create and sustain support for ICT use and integration in schools. These skills are the ability to articulate clear vision statements for ICT use: planning for effective ICT integration in schools, organizing staff development programs for staff; providing support for technology infrastructure in schools, evaluating the outcome of ICT usage in schools, and researching on recent technology advancements.

LITERATURE REVIEW

Overview

The purpose of this literature review is to provide a thorough understanding of how principals learn. It will do this through the lens of adult learning theory and what is currently known about technology leadership in education. The first section in the literature review will discuss the current state of technology leadership and why it is important to understand its current status. The second section will look at the challenges that principals face as they try to implement technology. The third section will focus on how principals currently learn in the field of education. The fourth and final section will discuss theories relevant to adult learning, which is the framework of the study.

Current State of Technology Leadership and Why It Is Important

It is important to understand the way in which principals, who have many responsibilities, develop their leadership skills in the field of technology leadership. This section will focus on where technology leadership is today for principals by focusing on the International Society for Technology in Education (ISTE) standards, which define a baseline of skills that help principals be effective technology leaders. This section will then break down what is known about how leaders learn technology leadership in the K–12 setting.

Where is Technology Leadership Right Now?

There is an expectation that principals will be instructional leaders in their buildings, but with the large influx of technology there is also an expectation that they will know how to implement technology to support instruction (Samancioglu, Baglibel, Kalman, & Sincar, 2015; Thanimalai & Raman, 2018). School principals and their behaviors constitute one of the important factors in the process of understanding that technology can be used to support and

enhance instruction and engage students. Without it, teachers' attempts to use technology to support the curriculum will be ineffective (Flanagan & Jacobsen, 2003; Samancioglu et al., 2015). Teachers and students will integrate technology more successfully when they see administrators act as technology leaders in the building (Brockmeier, Sermon, & Hope, 2005; Waxman, Boriack, Lee, & MacNeil, 2013). Part of being a technology leader, therefore, is to know how and when to use technology as part of instruction. Also, it is important to provide guidance and support to teachers when they are unclear of how to use technology to engage students in the instruction.

A study conducted by Waxman et al. (2013) sampled 311 principals from a large metropolitan area in the southwest of the United States to determine their perceptions of the major functions of technology in their schools. The researchers found that the principals believed there were six major functions for technology: communication; instruction; data sharing and management; a resource; administrative task; and student learning. They were also able to determine that the number of years of experience and gender of the principal influenced the principal's perception of technology implementation in the school.

Technology has become an essential component in almost every part of education. Thannimalai and Raman (2018) state that principals are required to act as technology leaders and teachers as facilitators in order to provide the skills and knowledge for 21st century education; this means principals are expected to know how to use technology. Also, Machado & Chung (2015) follows that principals must become familiar with technology hardware as well as integration pedagogy in order to fulfill meaningful leadership roles. Over the years there has been an increasing expectation that school administrators will assume leadership responsibilities in areas they are unfamiliar with, but they have received very little training to do this effectively

(Flanagan & Jacobsen, 2003; McLeod & Richardson, 2013; Samancioglu et al., 2015). The lack of training can lead to principals feeling inadequate in their position, and this lack of confidence in how to support teachers' needs can also hinder the implementation of technology in their schools. Just as teachers experience varying degrees of discomfort and fear as they use technology (Dawson & Rakes, 2003), so too do the principals who are expected to provide the support for those same teachers. Yet little research has been conducted in regard to how principals learn and their ability to provide effective technology integration (Dawson & Rakes, 2003) and school technology leadership (McLeod & Richardson, 2011).

There are many individuals going through educational leadership programs, and they are learning law and theory of leadership, but many are completing these programs without knowing how to be effective technology leaders. Knowing how to develop a great technology integration program at a school is something many aspiring administrators have not learned as part of their coursework. Aspiring principals learn how to coach teachers, plan the proper professional development for them, and use data to spot student needs (Gill, 2012), but they are missing a major component: technology leadership and integration. Although the ISTE has developed a baseline for the skills required, there is still no structured way to describe what it takes to be a technology leader, and so many principals are coming out of programs having to find their own way. As the knowledge they need to receive to be effective is lacking at this time, it is little wonder that not all programs are running smoothly.

Leonard and Leonard (2006) studied 214 principals in 149 schools in 12 school districts in North Louisiana from the perspectives of how computer-related technology was being used and their leadership in technology integration. The study revealed that 87 percent of the principals studied desired more training in supervision of technology and how to be effective

instructional leaders in integrating technology into the teaching and learning process. A large minority, 44 percent, indicated they were not sufficiently familiar with various technologies or qualified to lead technology integration in their schools. Open-ended questions answered by the principals revealed that they felt the need to become more familiar with methods of instructional technology and information on emerging technology. Overall, the study's findings showed that the principals felt ill-prepared to assume the role of technology leader.

What Skills Are Needed?

The ISTE has created five essential skills that are needed for administrators to be successful with technology leadership and integration in their buildings. The skills are a suggested framework to help administrators provide creative and innovative learning environments for their teachers and students. The standards were created in 2002, revamped in 2009, and most recently redone in 2018 to meet the needs of the current educational system and requirements for administrators in K–12 buildings. The five standards as determined by ISTE in the Standards for Educational Leaders (International Society for Technology in Education, 2018) are:

1. **Equity and Citizenship Advocate:** Leaders use technology to increase equity, inclusion, and digital citizenship practices.
2. **Visionary Planner:** Leaders engage others in establishing a vision, strategic plan, and ongoing evaluation cycle for transforming learning with technology.
3. **Empowering Leader:** Leaders create a culture where teachers and learners are empowered to use technology in innovative ways to enrich teaching and learning.
4. **Systems Designer:** Leaders build teams and systems to implement, sustain, and continually improve the use of technology to support learning.

5. Connected Learner: Leaders model and promote continuous professional learning for themselves and others.

Equity and Citizenship Advocate

The ISTE states that educational leaders should:

- ensure all students have skilled teachers who actively use technology to meet student learning needs;
- ensure all students have access to the technology and connectivity necessary to participate in authentic and engaging learning opportunities;
- model digital citizenship by critically evaluating online resources, engaging in civil discourse online, and using digital tools to contribute to positive social change;
- cultivate responsible online behavior, including the safe, ethical, and legal use of technology.

Equity and citizenship are important components for principals to develop as a skill, but there is a divide amongst schools and districts when it comes to equity and technology (Flanagan & Jacobsen, 2003; Sincar, 2013). A skill that principals must develop is knowing how to provide the appropriate instructional technology and technical services for their teachers and students. It is important for a principal to hire teachers that have the skills, knowledge, and desire to provide technology-infused lessons for students, and provide the necessary equipment for teachers and students to be successful. Also, the principal should provide leadership in appropriate uses of technology by modeling for all students and staff, which promotes proper digital citizenship.

Visionary Planner

The ISTE states that educational leaders should:

- engage education stakeholders in developing and adopting a shared vision for using technology to improve student success, informed by the learning sciences;
- build on the shared vision by collaboratively creating a strategic plan that articulates how technology will be used to enhance learning;
- evaluate progress on the strategic plan, make course corrections, measure impact, and scale effective approaches for using technology to transform learning;
- communicate effectively with stakeholders to gather input on the plan, celebrate successes, and engage in a continuous improvement cycle;
- share lessons learned, best practices, challenges, and the impact of technology learning with other education leaders who want to learn from this work.

Administrators develop a vision for how technology will be used in the building and how they will share this vision and incorporate it into the life of the school. Anderson and Dexter (2005) state that a shared vision for technology should be developed and communicated to ensure that the resources, coordination, and climate are in place to realize it.

Empowering Leader

The ISTE states that educational leaders should:

- empower educators to exercise professional agency, build teacher leadership skills, and pursue personalized professional learning;
- build the confidence and competency of educators to put the ISTE Standards for Education Leaders into practice;
- inspire a culture of innovation and collaboration that allows the time and space to explore and experiment with digital tools;

- support educators in using technology to advance learning that meets the diverse learning, cultural, and social-emotional needs of individual students;
- develop learning assessments that provide a personalized, actionable view of student progress in real time.

It is important for the administrator to have the skills to promote further learning with technology for their teachers as well as participate in their own professional development. The principal does not always have to be tech savvy but should show a strong interest in what teachers are learning and teaching with technology (Wang, 2010).

Systems Designer

The ISTE states that educational leaders should:

- lead teams to collaboratively establish robust infrastructure and systems needed to implement the strategic plan;
- ensure that resources for supporting the effective use of technology for learning are sufficient and scalable to meet future demand;
- protect privacy and security by ensuring that students and staff observe effective privacy and data management policies;
- establish partnerships that support the strategic vision, achieve learning priorities, and improve operations.

The development of a solid technology infrastructure provides schools with the ability to build on their technology in the future. It is important for an administrator to understand how building a solid technology infrastructure will benefit their teachers and students over time. Creating a vision and looking to where the school and education is going in the future will help

drive the decisions that need to be made. Pedagogy has a larger effect on how good technology is integrated, but the infrastructure does play a role in what is needed to meet the needs of the teachers (Anderson & Dexter, 2005).

Connected Learner

The ISTE states that educational leaders should:

- set goals to remain current on emerging technologies for learning, innovations in pedagogy, and advancements in the learning sciences;
- participate regularly in online professional learning networks to learn with and mentor other professionals collaboratively;
- use technology to regularly engage in reflective practices that support personal and professional growth;
- develop the skills needed to lead and navigate change, advance systems, and promote a mindset of continuous improvement for how technology can improve learning.

When principals stay connected to what is going on in current technology and instructional technology, they develop the skill to know what options they have when purchasing equipment, and they notice when technology is being used effectively in the classroom.

Networking with other professionals through online networks and professional developments builds the knowledge base for principals and improves their ability to integrate technology.

As principals grow in their positions, they can develop strategies and skills to improve instruction with technology. Principals create an understanding of how technology can improve instructional practices and build a repertoire of strategies for supporting teachers' efforts to use technology in the classroom (Waxman et al., 2013). They encourage teachers to try to use

technology when it is relevant and will add more to instruction. Support is given to teachers so they can develop ideas for how to make the lesson more effective by possibly using technology, but also to know when to inform teachers that technology may not be the best mode of delivery. If principals truly support teachers as they attempt to implement the technology, then the appropriate knowledge and skills by those principals can be developed (Dawson & Rakes, 2003). Some principals may lack the knowledge and expertise with the types of effective teaching needed for meaningful technology integration and require an increased level of technological fluency (Brown & Jacobsen, 2016). It is important for the principal to discern when technology will help to make a difference and when it will not. Requiring teachers to use technology just for the sake of it is not effective.

When becoming a principal, it is understood that a person is an instructional leader and disciplinarian, but not all principals see themselves as technology leaders. Often, they are required to assume leadership responsibilities in unfamiliar fields in which they have received little training (Flanagan & Jacobsen, 2003). Technology has infused so rapidly and heavily in education that principals need to stay abreast of new impactful technologies that can be used. It is important for them to think about what their role as a technology leader in their school is. When they understand their role, it can have a positive effect on the instruction.

What is Known about How Leaders Learn Technology Leadership?

To help with technology integration and its influence on instruction, principals should have timely and effective professional development that will provide them with the ability to assist teachers. It is best to have professional development that is directed at using technology for assessment and data collection, at understanding how students are using technology today, and at how to integrate technology into the teaching and learning process (Brockmeier, Pate, & Leech,

2010). At the end of professional development, principals will understand how the technology can be used in their school and know how to gain resources to further help them and their teachers. Many principals, however, state that after professional development they do not receive the needed resources and guidance to fully integrate a specific technology into their building (Brockmeier et al., 2005). They still have questions, which can bring uncertainty on how best to answer their teachers' questions. The use of feedback and follow-up on how the principals are implementing the technology and what might be a better way to go about the integration should be provided. In other words, professional development sessions need to be both relevant and practical.

Current professional development for principals is not providing the knowledge the principals need when it comes to instructional technology. Training that teaches principals the methods and procedures required to integrate technology into the curriculum is more effective than training that just teaches basic technological tools (Dawson & Rakes, 2003). Often, training focuses strictly on software and how to use it, not on how to lead others to use it. According to Waxman et al. (2013), if districts were to provide more funding and training opportunities for principals to attend technology training, this could possibly improve technology leadership and better implement technology in schools. Instead, many principals attend training feeling uncomfortable about what they have to learn, so when the training is not truly meeting the needs of these learners they are not focused or engaged enough to apply it better in their schools.

Dawson and Rakes (2003) studied the influence principals' technology training has on the integration of technology into schools. They used 398 principals as the sample from 1104 principals surveyed through the Internet on national association websites and from the Web66 International School Web Registry. Findings from the study determined that the more technology

training principals received, the more technology was integrated into their schools. The study also showed that the amount and types of technology training received by principals influenced the levels of integration in the schools. Also, there was a significant difference between principals who received basic technological tools and application training and those who received training that focused on integrating technology into the curriculum. Lastly, schools whose principals received 13–25 hours of training on technology usage and integration showed a higher implementation of technology compared with schools whose principals had received less.

Challenges Principals Face as They Try to Implement Technology

For many principals, the process of developing technology leadership skills is not easy. They face challenges that can slow down technology integration in their buildings. The emphasis of this section is on the different challenges that are faced by principals as they try to integrate technology in their schools.

Lack of Training

The lack of training in the use of technology for school principals has been documented as a challenge in the research for decades. Training is a key factor for principals, as well as teachers, so the implementation of technology is about more than just knowing software. It is also about how it will be used in instruction (Dawson & Rakes, 2003; Flanagan & Jacobsen, 2003; Sincar, 2013). Dawson and Rakes (2003) state that principals need training that focuses on integrating technology into the curriculum, and not just on using basic applications. Additionally, Flanagan and Jacobsen (2003) found that principals need to find professional development courses for their teachers that focus on technology integration and design, and not on computer applications alone. Also, Sincar's (2013) research found that principals needed training on both administration and education, but many were unable to find it on their own.

Although districts offer professional development to their administrators, many administrators still feel inadequate in guiding teachers in their pedagogy when it comes to using technology as part of the instruction. Even with training, principals often lack the technological expertise and knowledge that is needed for a meaningful integration (Brown & Jacobsen, 2016) and lack the requisite pedagogical vision and experience to guide teachers (Flanagan & Jacobsen, 2003). Often the training is just teaching the administrators how to use the hardware or software; they are not shown how to bring the technology into the classroom or how to provide support for their teachers. Also, for administrators who are still not using technology often, the lack of quality in the training and continuous education regarding integration causes a problem that leads to unsuccessful integration of the different programs (Ramirez, Jr., 2011). To redress this, Baylor and Ritchie (2002) note that districts can assist by providing inservice training that meets the needs of the faculty, which will promote continued growth within the school and outside the normal school boundaries.

As principals' experience with technology varies depending on the number of years they have been in an administrative role, and their age and gender, districts can provide the training that is needed to satisfy these different types of personnel. For all administrators, the training should provide strategies and procedures that will help them become better technology leaders in their schools (Dawson & Rakes, 2003). Leonard and Leonard (2006) found that administrators often believed that their training was insufficient in providing them with a chance to develop the skill of implementing technology for the purpose of student learning. Often districts purchase equipment for schools believing they are moving them into the forefront of technology within education, but they neglect to allocate the appropriate funding for all staff to receive the training that is needed to successfully use the equipment (Overlay, Mollette, & Vasu, 2011).

Resistance

Teachers can show resistance to using technology in their classrooms, for different reasons. Some have been teaching for years and believe what they have been doing is fine and there is no need to make any changes. Schools with veteran teachers do not like to see change and the younger teachers and administrators are “pulling them along” to stay on board with the changes (Richardson & McLeod, 2011). They are stubborn and resist the opportunity to make changes to their instruction, regardless of the benefits it may provide to their students. Baylor and Ritchie (2002) ascertained that when teachers are open to change, they are more willing to integrate technology into the classroom. Teachers tend to resist when they do not see the relevance.

Some teachers believe they do not currently have enough knowledge of using technology and they do not have time for professional development or planning to gain that knowledge (Akbaba-Altun & Gurer, 2008), so they resist making the change out of fear of failure. Teachers who do have a predisposition or willingness to try new instructional innovations are thwarted by not receiving the appropriate professional development that will make them feel confident with the new technology (Baylor & Ritchie, 2002). It can be embarrassing for them to make a mistake or feel uncertainty in front of students, so they do not try to make changes to their instruction.

Resistance by teachers is also caused by principals who do not have a clear vision of what they want or a plan to integrate technology (Wang, 2010). It is important for principals to have a shared view of the usefulness of a new technology and the conditions for how the technology will be integrated into everyday practice (Claro, Nussbaum, Lopez, & Contardo, 2017). When teachers believe administrators have a vision, and it is clear what the expectations are, they are less likely to resist the changes being made and they feel more comfortable with doing what is

asked, especially when the focus is on student engagement and learning (Levin & Schrum, 2014).

Resources

Lack of funding from the district, state, or federal level can cause a resources challenge for principals. Sincar (2013) found that some districts do not allow donations from parents, even though the need to purchase technology may be there and the parents want to provide more for their child's school. When a school or district can secure alternative sources of funding, it stimulates the development of innovative approaches and allows principals to provide the needed resources for their schools (Thomas & Knezek, 1991). If such gifts, or alternative funding, are unable to be accepted by principals, this can prevent a school from having more technology and other resources for their students. Not having the proper funding leads schools to have outdated software and hardware and this causes a problem for the principals and teachers (Leonard & Leonard, 2006). Proper funding for technology involves more than just purchasing the equipment or buying software; the technology also needs to be maintained. With the lack of funding, many areas become ineffective, and the needed resources are not available to staff.

School systems should provide funding opportunities for principals to attend professional development courses focused on technology (Waxman et al., 2013), but principals should also want to use resources to develop their teachers and provide professional development and other resources for them. Dawson and Rakes (2003) share that often principals do not want to fund professional development for their teachers, or claim they lack the time or resources to fully implement processes like introducing technology into the curriculum.

Also, even when there are resources available to fund technology endeavors, the human resources needed to maintain the infrastructure (Richardson & McLeod, 2011), provide training

to staff (Sincar, 2013), and provide coaching to aid in implementation are often forgotten. A study conducted by Richardson and McLeod (2011) found that the technology may become available through funding, such as grants, but when it is time to maintain the technology and upgrade the infrastructure the personnel needed to do this are non-existent. When this happens, the technology will not be utilized, and the purpose of integration becomes null and void.

Principals are also facing the resources challenge of not having technological facilities available. In some cases, the principals may not know about the resource, or they do not have the requisite skills to effectively manage the resource (Sincar, 2013; Wang, 2010). In a study by Wang (2010), a principal was provided with the necessary technology for the teachers, but did not know how to manage who was allowed to use the facility. Because the technology was purchased through a grant, the team that was developed believed they had full rights to the facility. The remaining teachers wanted to use the facility as well, so this caused strife amongst the staff. While the principal did manage the use of the facility well enough for everyone, support was not provided to the technology coordinator, so the program eventually fell through.

Equity and Poverty

Some principals from poorer schools have named equity as one of the challenges they are facing with technology leadership. Flanagan and Jacobsen (2003) state there is still a digital divide between schools. Some schools are provided more technology and funding than other schools, which makes it difficult for a principal who does not have adequate funding to allocate their funds. It was also found that students who live in poverty are less likely to have computers in the home, which is then compounded by the frequency in which the lower socio-economic areas do not have the technology needed for the students and staff to keep up with other schools and districts (Flanagan & Jacobsen, 2003).

Part of a study by Richardson and McLeod (2011) discussed the issues some schools face in regard to poverty. Nine schools were in the study and each principal discussed how poverty or isolation had affected the school in terms of technology. Some of the schools were so old that when the air conditioner was turned on in the building it would cause a brown out. The building was not properly wired for computers and the different levels of technology that would require the use of electricity. The principals also said that accessibility to the Internet, due to their location, was a major concern.

How Principals Currently Learn in the Field of Education

One major way in which adult learning is facilitated is through the use of professional development where many organizations provide training for principals (Peterson, 2002). Professional development can be defined as activities that focus on supporting principals as they acquire or refine practices related to the full spectrum of instructional leadership duties and expectations held for principals, refine key skills such as capacity building, and lead the principal into personal renewal (Zepeda et al., 2014). The purpose of professional development is to enhance the effectiveness of the principal and also to impart knowledge or refine their skills (Zepeda et al., 2014). Peterson (2002) argues that professional development typically uses a variety of forms for learning, such as experiential learning, newer information technologies, small-group work, simulation, videotapes, role-playing, case studies, and action research. Professional development practices that are typically utilized are mentoring, or training sessions and demonstrations centered on a particular area or need (Zepeda et al., 2014).

Mentoring is one of the most common forms of professional development for principals, and it has been found to be very beneficial for novice principals (Peterson, 2002; Zepeda et al.,

2014). To make mentoring a more positive tool, it is coupled with the use of a portfolio or journal, which allows growth to be measured (Zepeda et al., 2014).

Theories relevant to adult learning

As adults learn in various ways, an understanding of different theories around adult learning will assist in framing this study. First, I present a general synthesis of four separate learning theories that help us understand how adults learn. Grounding the study, these four theories are andragogy, self-directed learning, transformational learning, and experiential learning. I will then draw salient connective themes across the theories to better anchor the framing for the study.

Andragogy

The term used to define adult learning is “andragogy,” which Knowles (1973) defined as “the art and science of teaching adults” (Kiely, Sandmann, & Truluck, 2004).

Adult learning became an important topic in education in the early 70s with the publication of Malcolm Knowles two seminal books *The Modern Practice of Adult Education* (1970), and *The Adult Learner* (1973) (Smith, 2002). It was felt that it was important to determine the way adults learn beyond what had been done with children and pedagogy. In his work, Knowles (1973) reported that adult learners had nine major characteristics: control of their learning; immediate utility; focus on issues that concern them; test their learning as they go; anticipate how they will use their learning; expect performance improvement; maximize available resources; require collaborative, respectful, mutual, and informal climate; and rely on information that is appropriate and developmentally placed (Zepeda et al., 2014).

There are six characteristics of adult learners in the andragogical model (Kenner & Weinermann, 2011; Kiely et al., 2004; Knowles, 1973; Smith, 2002; Zepeda et al., 2014). The

first is the need to know. Adults only need to know what they must learn to pass or be promoted, and adult learners need to know why they need to learn something before they began trying to learn (Kiely et al., 2004; Woodard, 2007). It is an important expectation of adults that the information they are learning is relevant to their daily life and goals, and this keeps them engaged and focused on the learning.

The second characteristic is self-direction. As a person goes from child to adult they move from dependent to more responsible, self-directed, and independent. When a person develops self-concept, they develop a deep psychological need to be seen by others and treated by others as being capable of self-direction (Knowles, 1973). Adults are self-directed when their learning is optimized and their experiences are recognized and utilized in their learning process (Chen, 2014).

The third characteristic is experience because adults have more experience to draw from, and their experiences have an impact on how they learn (Knowles, 1973). The fourth characteristic is readiness to learn because adults' development and real-life responsibilities and situations build their readiness to learn (Knowles, 1973). The fifth characteristic is orientation to learning because it is life-centered and they are motivated to devote their energy to learning something when they perceive it will help them perform tasks or deal with problems they will confront in their daily life (Knowles, 1973). Lastly, adults are motivated to learn intrinsically, especially when they see the benefits it will bring by allowing them to grow and develop the knowledge to succeed (Knowles, 1973).

Self-Directed Learning

The process of self-directed learning (SDL) has been studied for many years, and through those years there have been numerous definitions. One of the most well-known definitions was

created by Malcom Knowles, who defined SDL as occurring whenever individuals take the initiative for analysis, with or without the help of others, to diagnose their learning needs, formulate their learning goals, identify how to achieve those goals, and reflect on their achievement (Merriam & Bierema, 2014; Piskurich, 1993). As an adult develops their learning they move through the process defined by SDL. Self-directed learners also evaluate their learning to determine what might be hindering their learning and adjust accordingly (Merriam & Bierema, 2014). Smith (2002) isolates three reasons for self-directed learning. The first is that self-directed learners are people that take the initiative in learning more things, and learn better than do people who just listen to the teacher and are passively waiting to be taught. The second is that self-directed learners are more in tune with the natural processes of psychological development. The third is that many new developments in education put a heavy emphasis on the learners to take the initiative in their own learning.

Rothwell (2008) states that “individuals can be trained to be more self-directed, and their skills as self-directed learners can be developed” (p. 64). He defines skills for self-directed learners and traits self-directed learners should display as part of their process of learning. SDL can be defined as a personal attribute (a person can be self-directed and autonomous in their learning), or as a process (a way of organizing instruction) (Merriam & Bierema, 2014). As a personal attribute, SDL refers to an individual’s predisposition toward this type of learning, and their comfort with autonomy in the learning process (Merriam & Bierema, 2014). When SDL is used as a process, it is an approach to learning that is controlled by the learner (Merriam & Bierema, 2014).

Transformational Learning

Transformational or transformative learning is grounded in human communication where learning is understood as the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience in order to guide future action, and is the process of effecting change in a frame of reference (Mezirow, 1997; Taylor, 2008). Mezirow (1997) explains that:

Adults have acquired a coherent body of experience—associations, concepts, values, feelings, conditioned responses—frames of reference that define their life world. Frames of reference are the structures of assumptions through which we understand our experiences. They selectively shape and delimit expectations, perceptions, cognition, and feelings. They set our “line of action.” Once set, we automatically move from one specific activity (mental or behavioral) to another. We have a strong tendency to reject ideas that fail to fit our preconceptions, labeling those ideas as unworthy of consideration—aberrations, nonsense, irrelevant, weird, or mistaken. When circumstances permit, transformative learners move toward a frame of reference that is more inclusive, discriminating, self-reflective, and integrative of experience (p. 5).

Mezirow identifies “a disorienting dilemma” as the first step in a 10-step process that is brought about when a significant event in one's life, or an accumulation of experiences or events, come together to foster a transformation (Merriam & Bierema, 2014). The process involves transforming frames of reference through critical reflection of assumptions, validating contested beliefs through discourse, being inclusive, discriminating, open, emotionally able to change, taking action on one's reflective insight, and critically assessing it (Chen, 2014; Mezirow, 1997).

As the adult reflects on their learning, Mezirow clarifies these reflections three different ways: content reflection—what we perceive; process reflection—how we perform; and premise reflection—going deeper and asking why (Merriam & Bierema, 2014).

Experiential Learning

Experiential learning (EL) has its origination with many theorists, but some say it was founded by Carl Rogers who believed that the most important learning is applied, coming from experience (Rothwell, 2008). Knowles discussed as part of his andragogy process that as adults mature they accumulate a growing reservoir of experience that becomes an increasing resource as part of their learning (Smith, 2002). A major theorist in EL is David Kolb (1984), who defined EL as the “process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it” (p. 41). Kolb’s EL model portrays two dialectically related modes of grasping experience: concrete experience (CE) and abstract conceptualization (AC), and two dialectically related modes of transforming experience, reflective observation (RO) and active experimentation (AE) (Kolb, D. A., 1984). Experiential learning is a process of constructing knowledge that involves a creative tension among the four learning modes that is responsive to contextual demands (Kolb & Kolb, 2012). The idea of the model is that as a person learns, they will engage in each part of the process in a cyclical fashion (Merriam & Bierema, 2014).

After the development of Kolb’s EL model, Peter Jarvis (2006) published his model, which was more complex. It comprised nine routes or types of learning. The first three routes are labeled “nonlearning” where the learner either believes they already know, decides to not take the opportunity to learn, or just rejects the opportunity to learn (Merriam & Bierema, 2014). The next three positions are labeled “learning”, but they are non-reflective learning, like basic skills

and memorization or things that go on at a preconscious level (Merriam & Bierema, 2014). The last three are labeled “reflective learning” where the learner can contemplate an experience, think about the experience, and confirm or develop more of the experience, and lastly agree or disagree with what they have experienced (Merriam & Bierema, 2014). Jarvis’ model was more complex for one reason—because he believed Kolb’s model was simplistic, a view that has been debated over the years (Merriam & Bierema, 2014).

Tennant and Pogson (1995) explain experiential learning not so much as a process as Jarvis (2006) does, but as the different ways experience can be acknowledged as resources for learning. They proposed four levels or ways experience can be thought of in terms of incorporating experience into instruction. The first is prior experience, where our past experiences can be called up, reflected upon, and linked to new learning (Merriam & Bierema, 2014). The second is current experience, and this is where learning activities are connected to an adult’s current experiences as a family member, community member, or worker (Merriam & Bierema, 2014). New experience is the third level, and that is creating experiences through instructional techniques such as simulations, role-playing, internships, or practicums that provide a base for new learning to occur (Merriam & Bierema, 2014). The fourth is learning from experience, by which they mean the critical examination of prior experience (Merriam & Bierema, 2014).

Fenwick (2000) looks at experiential learning through a more philosophical lens, describing five possible ways to conceptualize experiential learning, each of which draws on a different theoretical paradigm (Merriam & Bierema, 2014). The first perspective is based on constructivist theory, which employs the fact that learning is the construction of meaning through engaging in and reflecting upon experience (Fenwick, 2000; Merriam & Bierema, 2014). The

second perspective is situative, where knowing or learning occurs in doing or in practice (Fenwick, 2000; Merriam & Bierema, 2014). The third perspective is psychoanalytic and involves getting in touch with unconscious desires and fears (Fenwick, 2000; Merriam & Bierema, 2014). The fourth perspective is critical cultural in which dominant norms of experience are critically questioned and resisted (Fenwick, 2000; Merriam & Bierema, 2014). The fifth perspective is ecological and is lodged in complexity theory, where the focus is on the relationships binding humans and non-humans (Fenwick, 2000; Merriam & Bierema, 2014).

Synthesis of Theories

Many of the theories explained above have experience as one of their components (Knowles, 1973; Kolb D. A., 1984; Merriam & Bierema, 2014; Mezirow, 1997). It is important for an adult to have an experience to help the information they are learning stay in their mind, which makes it become knowledge (Kolb, D. A., 1984). The experiences an adult had previously also frame what they desire to learn in the future, or the experiences relate to what the adults are learning now so it makes more sense to them.

The second common thread in many of the theories is that the adult learner will take the initiative with their own learning (Knowles, 1970; Merriam & Bierema, 2014; Rothwell, 2008). The adult learner desires to want to learn new information because this will build their knowledge of a particular field, which will in turn help them in their career or life event. Adult learners take responsibility for making decisions about their goals and efforts. Rothwell (2008) states, “learners have the stamina and fortitude, both cognitively and personally, to take responsibility for their own learning and assertively pursue what is needed to help them solve problems they face or goals they seek to achieve” (p. 64).

Lastly, reflection is a concept that is noted in many of the theories described earlier (Kolb & Kolb, 2012; Merriam & Bierema, 2014; Mezirow, 1997; Piskurich, 1993). As the adult learner gains knowledge, they reflect on what they have learned and how what they have learned will help them in the future. When the learner is able to think about their learning it provides more of a concrete thought for them for their future endeavors with learning. They are able to develop from these thoughts where they might further set goals to achieve what they need in life. Adults need to know that what they are learning will make an impact on their life, so they need the time to reflect on when this will happen.

Table 2.1 shows the areas of commonalities between the theories are experience, initiative, and reflection. They will help to guide the study because these are major components of more than one adult learning theory. As principals become leaders, these three factors will be utilized to help them become better leaders, and in particular better leaders when it comes to technology integration. The experiences they have will guide them in their learning to develop a relationship between what they know already and what they are currently learning. These experiences will either strengthen them or make it harder for them to learn. As they feel more comfortable in what they are expected to learn, they will take the initiative to learn more and do their best to implement a particular technology into their building. They will be motivated to learn more, to use the technology themselves, and also to show others how to use the technology effectively. Lastly, the principal will reflect on what they have learned and how they have been utilizing the technology. They will also see how their knowledge is spreading to others in their building to include teachers and students.

Table 2.1

Adult Learning Theories

Androgogy	Self-Directed Learning	Transformational Learning	Experiential Learning
<ul style="list-style-type: none"> • Adults need to know • Self-concept • Experience • Readiness to learn • Orientation to learning (life-centered) • Motivation 	<ul style="list-style-type: none"> • Take the initiative to learn more things • In tune with their processes • Sets goals and how to achieve them 	<ul style="list-style-type: none"> • Frames of reference define adult's world • Assumptions to form experiences • Reflection, forms, thoughts 	<ul style="list-style-type: none"> • Experiences form the transformation in learning • Reflective learning • Reflecting on experience • Learning in practice • Relationships between people
Commonalities within processes			
Experience (Androgogy, Experiential Learning, and Transformational Learning)			
Initiative (Androgogy and Self-Directed Learning)			
Reflection (Self-Directed Learning, Experiential Learning, and Transformational Learning)			

RESEARCH DESIGN AND METHODOLOGY

Overview

The role of the principal as a technology leader is important to the development and implementation of a technology-rich school. The ISTE has established a beginning framework of what a principal should know to be able to lead and integrate technology effectively, but how the principal learns in order to achieve these skills needs to be defined further. The goal is to describe how a principal learns to be an effective technology leader. The research design will answer the following questions:

1. How do administrators learn what is needed to be a technology leader?
2. What are the perceived skills needed to be a technology leader?

Research Design

A qualitative methods study informed by the critical incident technique was chosen to understand how principals learn to be effective technology leaders. Creswell (1994) states that a:

chief reason for conducting a qualitative study is that the study is exploratory; not much has been written about the topic or population being studied, and the researcher seeks to listen to informants and to build a picture based on their ideas. (p. 21)

In this study, I tried to understand how principals learn to be effective technology leaders, forming my understanding from the principals I interviewed. My questions constructed a reality from the responses given by the principals I spoke with in the study. Creswell (1994) establishes that “the focus of qualitative research is on participants’ perceptions and experiences, and the way they make sense of their lives” (p. 162).

Flanagan (1954) states, “the critical incident technique consists of a set of procedures for collecting direct observations of human behavior in such a way as to facilitate their potential usefulness in solving practical problems and developing broad psychological principles” (p. 327). Hughes (2007) notes that a “detailed analysis of critical incidents enables researchers to identify similarities, differences, and patterns and to seek insight into how and why people engage in the activity” (p. 49). The critical incident technique has five major steps: (1) ascertaining the general aims of the activity being studied; (2) making plans and setting specifications; (3) collecting the data; (4) analyzing the data; and (5) interpreting the data and reporting the results (Butterfield, Borgen, Amundson, & Maglio, 2005; Byrne, 2001; Flanagan, 1954; Hughes, 2007).

The first step was to set the aim for the study, which is to determine what makes a principal a technology leader. This aim defines the main purpose for the study, and determines the direction I took when planning and evaluating the study. As noted by Flanagan (1954), “In its simplest form, the functional description of an activity specifies precisely what it is necessary to do and not to do if participation in the activity is to be judged successful or effective” (p. 336). Allowing principals to distinguish through their experiences what types of skills are needed to be effective or not as a technology leader is what I tried to conclude from the study.

Participant Selection

Participants were selected from school districts in the mid-Atlantic region. Snowball sampling was used to get a full range of participants coming from the elementary level across the state. Snowball sampling is a procedure where researchers access participants through contact information that is provided by other participants (Noy, 2008). Principals were selected from nearby districts, and part of the interview process was to request names of other principals also

on the elementary level that play a role in technology to request their participation in the study. The criteria for participants were that they were currently a principal and they were involved with technology integration in their building by making school-wide decisions on implementation.

This study involved interviewing 18 principals from 10 different districts across the state. Half of the interviews were conducted over the phone, and the other half were done face-to-face. The years as principal ranged from two to eight years. Table 3.1 lists the principals interviewed; districts are broken down by numbering one through ten. The table also shows if the principal was interviewed over the phone or face-to-face, and the number of years each of them has been a principal.

Table 3.1

Participant Demographics

Participant and Interview Information			
Participant	District	Location of Interview	Years as Principal
Mrs. Anderson	1	Phone	5
Mrs. Boyd	3	Phone	5
Mr. Chambers	4	Face-to-face	4
Mr. Delk	5	Face-to-face	4
Mrs. Erickson	10	Phone	8
Mr. Franks	6	Face-to-face	4
Mrs. Granger	7	Phone	3
Mrs. Hines	8	Phone	5
Mr. Irwin	9	Phone	4
Mrs. Jones	8	Phone	3
Mr. Kent	2	Face-to-face	7
Mr. Lawson	2	Phone	4
Mrs. Michaels	1	Face-to-face	3
Mrs. Newsome	5	Face-to-face	2
Mr. Oakes	1	Face-to-face	5
Mrs. Peterson	1	Face-to-face	2
Mrs. Quash	1	Phone	2
Mrs. Randolph	2	Face-to-face	3

Data Collection

Data were collected using in-depth semi-structured interviews to determine how a principal learns to be a technology-integration leader. By interviewing the principals, historical information could be gathered of how they have learned to be technology leaders, and to understand how training has affected their technology leadership; the interviews also provided me with the opportunity to have control over questioning (Creswell, 1994). The data needed to be objective to validate what the principals asserted it took to be a technology leader (or not) (Byrne, 2001).

Interviews

A semi-structured interview format was used with the selected participants. This interview format allowed me to follow the standard questions with more tailored questions to get clarification or probe more during the interview (Leedy & Ormrod, 2016), and to elicit more views and opinions from the principals (Creswell & Creswell, 2017). Interviews lasted up to an hour, which gave me enough time and information to understand each principal's reasoning. Interviews were conducted at mutually agreed locations to provide security and comfort for the interviewee. Half of the interviews were conducted on the phone, and the other half were conducted in person at the school of each principal. Interview questions were developed to determine how the administrators learned to be successful technology leaders, and what skills they used to be a technology leader. During questioning the principals were also asked to describe successful and unsuccessful technology integrations they had implemented in their schools. Questions were open-ended to leave room for more discussion of the topics and to get further understanding of the participants' answers. All interviews were recorded, and notes were taken during the interviews (Creswell & Creswell, 2017). The interviews were transcribed using

the online software Temi. Each interview was thoroughly read over and edited after the transcript was created. The interviews were double checked with the recordings to determine the reliability and validity of the transcriptions before data analysis began. The transcripts were also sent to all principals for their review as well to be sure of accuracy.

Data Analysis

All interviews were listened to and the transcripts were read to check for accuracy. Interviews were coded using Quirkos software to look for themes amongst the different respondents. Initial coding was used to analyze the collected data and to identify any emerging themes. I first coded line for line each transcript to develop categories from the principals statements. From the initial coding there were thirteen different categories which arose which I then further narrowed down by looking at each particular category. With in each category I simplified the statements to develop the themes which were used in the study. During data analysis the data were organized categorically, reviewed repeatedly, and continually coded (Creswell, 1994). Development of themes and coding was further analyzed with three outside participants. The themes were discussed and questioned to be sure there was development of all information gained from the interviews. While going through the data I looked for the a priori codes of initiative, experience, and reflection as major categories to arise from the interviews, presented in Adult Learning Theory. The skills listed by ISTE for principals to be technology leaders were also used as a priori codes to see if the principals' responses differed from what ISTE suggests. While these are major categories in the study, certain information that was also looked for were the themes listed from studies illustrated in the literature review. Although relevant themes were looked for, I still wanted to see if there were any other themes that come out of the interviews.

Starks and Trinidad (2007) described a systematic process for coding data from a phenomenological inquiry “in which specific statements are analyzed and categorized into clusters of meaning that represent the phenomenon of interest” (p. 1375). Manning (2017) states that, “In vivo coding is a form of qualitative data analysis that places emphasis on the actual spoken words of participants” (p. 1). Codes were developed for major themes that arose from the interviews, but within those codes, sub-codes were developed as well to further understand how a principal learns, the skills needed, and the success of technology integration. Field notes were used to coincide with the transcribed interviews to gain an understanding of the principals’ feelings based on the themes that emerged.

Confidentiality

To maintain confidentiality, all identifying features relating to districts, schools, and participants were redacted, and pseudonyms were given. No identifying information was used in the reporting of the research. Any defining characteristics to school districts or schools were removed to maintain the security of the information given by participants. All information was stored on a hard drive and deleted at the end of the research. Printed documents were stored in a locked filing cabinet during use, and shredded at the end of the research.

FINDINGS

Introduction

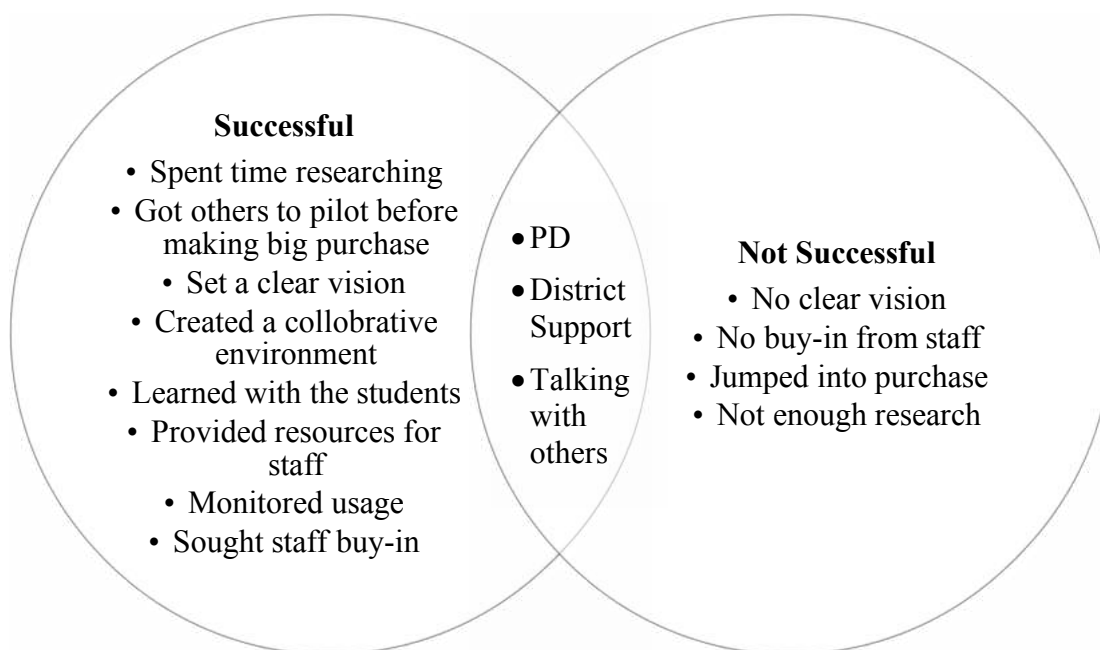
The purpose of this study is to determine how principals learn to be technology leaders and what skills they need to be that kind of leader. This chapter will focus on the data from the interviews with the 18 principals, and the themes that emerged from those discussions. Two research questions guided the analysis of the interview responses:

1. How do principals learn what is needed to be a technology leader?
2. What are the perceived skills needed to be a technology leader?

Throughout the explanation of the findings, critical incident theory is infused into the discussion to describe the differences between a successful or not successful technology integration for a technology leader.

Figure 4.1 will be referred to during the discussion of the findings because it shows the attributes that were found to describe a successful or unsuccessful technology integration. From the figure it is seen that there are commonalities shared by both. The first set of findings relates to what it takes to learn to be a technology leader. The second set of findings relates to the perceived skills needed to be a technology leader, including the perceived challenges that principals face.

Figure 4.1

Successful vs. Not Successful Technology Integration

The principals interviewed revealed they had three main ways in which they learned to be technology leaders—professional development, learning from others, and learning on their own; as well as another method that unfortunately proved not helpful—preparation programs. The principals desired the preparation programs to offer guidance on how to be a technology leader but found they did not do so. This is an important finding, because being a technology leader is becoming a role for principals. The principals are wanting the programs to show them how to be a technology leader once they are running their own schools, and the programs are letting them down. The principals in the study also used experience, initiative, and reflection to guide their learning process, as defined in the learning theories discussed in Chapter II.

Lastly, the skills needed to be a technology leader were separated according to the themes developed by ISTE: equity and citizenship, visionary planner, empowering leader, systems designer, and connected learner. It was found that the principals were following the same skills

defined by ISTE without knowing about the ISTE framework. It was also found that the principals faced certain challenges in their position—namely, inadequate resources, teacher resistance, lack of training for teachers and administrators, inequity/poverty, and shortage of time.

Learning

As noted above, the principals identified attending professional development, learning from others, and learning on their own as the main ways to become a technology leader. They also made reference to the preparation programs not preparing them to be technology leaders. Learning experiences were factored into becoming technology leaders. Other areas that influenced their learning was the initiative they took to learn and reflecting on their learning and the different situations where they used technology or where they wanted their teachers to use technology. This section will describe the findings from the study on how the principals learned to be technology leaders.

Professional Development

A question asked of all the principals was: “What would be the most effective way to make sure a principal acquires the needed knowledge to be an effective technology leader?” This question was often followed with: “How do you learn best?” All principals stated they learned best by attending professional development courses, and half of the principals stated they learned best when they were part of a professional development course that allowed them to be hands-on with technology. Mrs. Hines explained hands-on learning in this manner, “I like to live through it and see it.” When given the opportunity to truly experience the technology, the principals felt more equipped to help and support their teachers. They had time to investigate the uses of the technology, and how it would play a part in the school through instruction, student use, and their

own use. It was stressed often that it was important to be able to manipulate technology while in training and not just to sit and listen. The principals found it important as part of their learning to be hands-on with technology, and to know how it would benefit the students and teachers. Mrs. Boyd explained:

So, I think some of the ways you learn is professional development. Just sitting down and being hands-on and just being with that piece of software, for example, might be able to help you with some of the needs of your school or learning about a technological tool that you might be able to use.

Mrs. Boyd said she used professional development to better support her teachers with technology, and she appreciated the opportunity to be hands-on with her learning. She understood the benefit of effective professional development in her learning and could see how it would then transfer to benefitting her school as well.

Districts often have monthly administrator meetings, which sometimes offer professional development with technology as part of the meetings. Six of the principals commented that they did have technology training at times as part of their district administrator meetings. Mrs. Randolph explained, “I think PD, like a lot of times we [principals] do monthly professional development, you know, do stuff that brings it [technology] in.” Each district has monthly meetings for their principals, but the principals found it beneficial as part of those meetings to learn about technology that is being used, or will be used, in their building. The principals wanted the opportunity to know how to implement the technology in their buildings, how they could use it, and how to provide feedback to teachers on the technologies used.

Sometimes the principals also attended professional development during the summer to learn more about technology and how to use it. Mrs. Anderson stated, “Well we have the (technology) training available that we can attend over the summer and throughout the year.”

Many principals used the summer as an opportunity to learn more since they often did not have the time during the school year to leave the building for training. Mrs. Anderson said she used the summer technology training sessions offered by her district to expand her knowledge of technology, and to see how it could be deployed in her building. This, she said, was her chance to learn more about something that would support her teachers or herself.

One principal pointed out that when professional development for administrators in the use of technology was provided, there was no recognition of the fact that not all the principals were at the same level. Districts, this principal said, should differentiate the training in the same way teachers differentiate their student instruction. The differentiation should start with potential educational leaders so they will be prepared for administration and being a technology leader, and be for current administrators so they are aware of how to use the technology and how the teachers and students are also using the technology.

Mr. Franks said:

You need to provide support for potential instructional leaders to say, look, this may be a strength area for you, so we're going to provide you with some other opportunities for enrichment. This is a weakness for these other folks who are potential instructional leaders. We're going to provide them with some more robust explanations on what these tools are and how they can be used effectively in the classroom.

After speaking with the principals, it became clear that professional development is an essential way in which they learn. Whether the professional development is being provided by the district or they have researched it and attended on their own, they all saw it as an important way for them to learn. This accords with the research previously mentioned. It is best to have professional development directed at using technology for assessment and data collection, at understanding how students are using technology today, and at how to integrate technology into the teaching and learning process (Brockmeier, Pate, & Leech, 2010). Understanding how to integrate technology into the teaching and learning process is an area most of the principals regarded as extremely important.

Figure 4.1 shows that professional development that meets the needs of the teachers and provides ongoing support was found to be beneficial for teachers and led to successful implementation. The principals expressed that when the professional development was focused on proper implementation, and not just on the tool, the teachers would implement the technology effectively in the classroom. Also, consistent and ongoing feedback and support helped implementation to be successful. When the professional development was just on a tool and not on how to use it in the classroom or did not provide extra support after the initial training, it was not successful. Some principals stated they did not provide continued support for a tool, and so the tool was not used effectively, which led to negative implementation. Mr. Irwin gave the reason he believed one of his implementations was not successful:

We really should have given more PD to our teachers on the potential use of these, this equipment as far as what it can do. I don't know that they were given as much professional development as we could have ordered to have it be more successful.

This shows that just providing professional development for the teachers on how to use a tool does not guarantee that the tool will be successfully used in the classroom.

Learn from Others

Six of the principals stated that they also learned best by learning from others. The principals were not afraid to ask for help to learn something new. Having guidance from others helped them to learn more, and showed a collaborative spirit among teachers, staff, students, and other administrators. While there was an expectation that they would serve in many roles, the reality was that they could not possibly know it all; hence, they were comfortable about getting the information they needed from others. Mrs. Michaels stated, “I think just talking to each other and learning from each other within the building and reaching out to the new babies that come in.” Mrs. Michaels understood that learning from others provided her with more knowledge than just relying on what she could find out on her own. She encouraged this attitude for herself and her staff, urging them to learn from each other and take advantage of the knowledge they could gain from someone else.

Mrs. Peterson mentioned, “I like the process of learning collaboratively and learning from people.” Mrs. Peterson further substantiated the idea of learning from others and the benefit it provided to her learning. She understood how essential collaboration was to her learning and said that collaboration extended to other principals within her district, principals in other locales, and her staff. Many of the principals said they learned from social media and had developed their own professional learning networks to extend their learning beyond what was given by their district. The principals appreciated being able to learn from others across the country.

All the principals commented that they had learned from their ITRT (Instructional Technology Resource Teacher) or Network Engineer. These personnel were essential to their

learning new technology, learning how to use the technology currently in their building, and to guiding the purchasing of technology for their schools. Mrs. Hines remarked, “I did work closely with my instructional technology coach. She is informed and collaborative with her colleagues across the county.”

Using the instructional technology coach allowed Mrs. Hines to utilize the knowledge of not just that one person, but the knowledge of others in the district. The instructional technology coach gave her the opportunity to learn content that would benefit not just her, but also her school. Mr. Chambers also expressed how he learned from his instructional technology coach:

My role as the technology leader is, I'm supposed to be the leader of it, but I must admit that I solely depend on my ITC to help me with it. I do rely on her heavily when it comes to technology as far as doing a staff presentation, or even if I'm going into a classroom I ask her questions about something I saw in the observation. I will go to her to kind of follow up with how the technology was supposed to be used.

Mr. Chambers said it was an essential part of his learning to learn from others and he did not believe he should be expected to know it all. The expectation of maintaining so many roles in the building and being able to balance them all can be daunting, so being able to learn from others is an important skill. The knowledge he gained from these different personnel allowed those people to also have a leadership role in the building.

Figure 4.1 shows the reasons technology integration worked for principals. Many of the principals believed their programs were successful with technology when they had spent time to research and learn more about what to purchase or expect for their staff and students to use. The principals spent time asking people who were more familiar with technology to learn more and

to find out what the good choices were when purchasing technology. Mrs. Michaels commented on how she used her ITRT and network engineer:

I did sit down with them [ITRT and network engineer] a lot more and we looked for what apps are good for what, how do we upload them, how do we sync all the iPads?

Mrs. Michaels learned and worked collaboratively with her different technology personnel before purchasing tools or deciding on a tool. By doing this she could be sure she was providing the best for her staff, and she was aware of how it would benefit her students and teachers.

Mrs. Hines also said she worked closely with her technology coach before making decisions about different technologies she was thinking of purchasing.

Mrs. Jones mimicked the same remarks of how she utilized her technology personnel to help her learn to make technology purchases for her school:

What my ITC, instructional technology coach, and the TSPEC did was then contact central office and see exactly the proposals of companies we work with here in the county or have relationships with here in the county.

Mrs. Jones relied on the knowledge provided by her technology personnel to offer the information needed before making purchases. She did not want to jump into a purchase, so if the county had a relationship or proposal given by a company she used that information to inform the decisions made respecting technology for her school.

A commonality whether a technology integration had been successful or not is also talking with others, as shown in Figure 4.1. This could be talking with the leadership team, personnel from central office, or in-house technology people. The level of conversation and

collaboration that occurred between the principal and others made a difference to whether a technology integration was successful or not. When the principal consistently and openly shared ideas with their leadership team and allowed them to pilot a technology, the integration tended to be more successful. Also, when they talked with their ITRT, network engineer, or central office technology people to get guidance, the integration tended to be successful. These conversations were continual and not just a one-off effort to gain their thoughts. The principal absorbed what was being said before deciding.

When it was not successful, the principal might have had a conversation with someone, but the decision to purchase something without doing more research was eventually made. The principal may have also talked with their leadership team but not heeded the advice regarding a purchase, so the buy-in with the teachers to use a technology was not there. Unfortunately, sometimes central office purchased a technology before talking to schools. This purchase now had no buy-in from the teachers and sometimes the principals, because they were being forced to use something and had not been asked if it was even needed.

Learn on Their Own

Twelve of the principals stated that they spent time learning on their own about the different technologies they might want to use in their buildings. The principals took time to read about emergent technologies, and what was new in educational technology. They were willing to spend time investing in a new technology either hands on or through talking to other resources to find out more. Some of the principals mentioned that Google or YouTube videos were used when they were unsure of how to do something. The principals tried to learn how to fix things on their own, or how to learn more about the technologies that were being used. Mrs. Granger stated, "It's like I learn so many things about Excel just by looking at YouTube," and Mrs.

Randolph said, “I did it all on my own and then every time I got stuck, I Google it, figure out how to fix it.” Both principals see the benefit of using the Internet to provide them with the knowledge about technology use. This allows the principals time to research on their own when they need to find out more, or when there is a need for an immediate answer and no time to ask someone else.

Due to the lack of time for principals, it is often important for them to want to learn on their own, and use the time allotted to extend their knowledge of different things. Mrs. Erickson said, “I am constantly self-learning.” She was increasing her knowledge of not just technology, but different items that affected her career. She spent time learning technology not only because she understood the need for it in her building, but also because of its constant use in education. Mrs. Boyd also stated the same idea when she said, “So anything that I do now I learned it myself.” She relied on what she learned on her own to build her knowledge of technology and the different tools that were used in her building. She also did her research so she could make the best decisions for her school regarding technology.

Understanding what is going on with technology in education is important, so some of the principals said they spent time learning more about these developments. Mr. Oakes mentioned, “I was curious. So, I stayed abreast, up to date with kind of what were the trends.” His desire to understand more kept him researching the trends in technology. This way he could make decisions about what he might want for his school or develop the right questions to ask of his technology personnel. His curiosity is innate because he mentioned in the interview that he has a natural curiosity about technology.

Although the principals pointed out that they learned from others and professional development, most said they also spent time learning on their own. The ability to learn from

videos has allowed the principals to choose when they learn without the constraints of attending a session out of the building and missing much-needed time in the classroom. The use of tools such as Twitter has provided the opportunity for the principals to utilize their professional learning networks to find material on new technologies, leadership, and other pertinent information. The principals are no longer limited to sitting in front of someone, which takes time, and time is a valuable commodity.

Preparation Programs

While all the principals had completed leadership courses in graduate administration programs, there was no indication these programs provided training on leading technology integration. The principals mentioned having to do projects where technology was used for presentation purposes, but not for them to know about budgeting or finding effective software and hardware, or how to build the resources needed to support technology in their buildings. The principals had to learn on their own how to support their schools as a technology leader. Mr. Chambers commented, “Going through my educational leadership program I did not have that experience.” A similar comment was made by Mrs. Quash, “None of my programs really focused on technology.” The graduate administration programs are not providing the technology leadership skills that are needed for future administrators.

Mrs. Newsome had this to say about her education to become an educational leader, and whether it prepared her to be a technology leader:

I did an EDS and a doctorate, but none of them were focused on technology.

None of my last two more recent degrees were focused on classroom instruction with the use of technology.

Mrs. Newsome did not receive instruction on technology leadership as part of her programs. As a result, she said she felt she was not strong with leading with technology, so support during her learning would have been beneficial. Her remarks were consistent with the other principals who stated that they had not received instruction on how to lead with technology. Mr. Franks further explained his experience with understanding technology during his education to be an educational leader:

There weren't any particular courses. I would say probably the coursework that I had in graduate school gave us experiences in an online environment, but it wasn't like we were trained on technological tools.

Mr. Frank's statements echo others that the extent of technology during their graduate administration programs was taking classes online or doing presentations for their classes. Instruction was not given as part of a class on how to lead with technology.

Four of the principals said they believed graduate administration programs should have a technology leadership component. A sentiment of some of the principals was that, while an entire class might not be needed to be created to learn about how to lead with technology, it should be a component in part of the instruction for future leaders. Mrs. Hines stated, "The leadership programs where we get our licensure, there is definitely room for some. It doesn't need to be a separate course necessarily, but it should definitely be infused in the program somehow." While some of the principals, such as Mrs. Hines, did not see the need for a separate course, other principals believed there should be a separate course in leading with technology, understanding instructional technology for a leader, or knowing about finding emerging technologies. Mr. Lawson commented, "I think it should be a course on the latest technology in education, and to use it in our presentations, or in our group work." Mr. Franks noted:

I think that colleges and universities probably would benefit most from differentiating their pathways and seeing where needs arise from use of technology, because there are some people who take to it very quickly.

The principals expressed the need for guidance and instruction with technology as part of their graduate administration programs. Digital technology is becoming more and more a part of education, so principals should be aware of how to make the purchases that are needed for their schools, or to learn how to collaborate with others to develop programs in their schools with technology that will benefit their staff and students.

Learning Theories

The a priori codes of experience, initiative, and reflection were developed from the research on Adult Learning Theory, and the appearance of these codes was looked for in the principal interviews. Initiative and experience were very relevant when speaking with the principals about their learning, but reflection on their learning was not as significant. There are different components to adult learning, but these areas were the ones mentioned in the multiple learning theories that were previously discussed.

Experience

Professional development was the most apparent form of learning which provided experiences for many of the principals. Professional development provided the experience because the principals could be hands-on with technologies, which allowed them to then bring that knowledge to their building. By fully immersing themselves in the learning, the principals could convey the information to their teachers. Some principals noted they had previous principals who played a role in them becoming proficient in the classroom as a teacher, which gave them the desire to lead with technology as a principal. Mrs. Newsome stated, “Well, I think

that I, so I've had good principals and I've had not so good principals and you learn from both of those.” Many principals stated that their desire to learn more about instructional technology as a teacher is something that they still have as a principal. Some key phrases that were used to define their experiences were: “hands on”, “feel it”, “see it”, and “touch it.” Mrs. Hines stated, “But my favorite way to learn is to, is to see and touch something, to see and actually just to live with it and experience it and be in contact with it.” Mrs. Jones commented, “I best learn by just doing, and giving people the opportunity to teach me.” As mentioned previously, Andragogy, Experiential Learning, and Transformational Learning attribute experience as a quality in adult learners.

Mrs. Hines commented how their experiences helped them with their learning of technology:

Because you do sort of, you have to, you have to see, you can see someone else use it. They have to talk about how it can be used. You have to be in that space where you can be vulnerable and ask your questions. Practice a little bit with it, and then you feel at least somewhat competent to come back and bring it back to your staff and sound somewhat intelligent about it.

Mrs. Hines said that the more time she had to work with a technology, the more confident she was at bringing it to her staff. When she had the opportunity to be hands-on, it built her knowledge and skills of the tool, and she was able to understand how it would work in her teachers' classrooms. Mr. Irwin further explained how his experiences have played a part in his learning to be a technology leader:

Well I think that, um, it's through more of my failures. I believe that it makes me a technology leader because a good one can say to them, hey, look, I get it.

I understand that this is new and this is hard, and let me tell you how I screwed this up and then let me tell you what I had to do and how last time it took me, I was like, no, I don't have to learn this and I'll just do it this way. Trying to reject the technology and then finally coming to the end. If I did it the way people said at the beginning and then embraced it, then I'd just be rolling along right now.

Failure is an essential part of Mr. Irwin's experience of learning with technology. He uses failure, and how he has grown from that failure, to help his teachers be comfortable with making mistakes and growing from them, not letting those failures stop them from trying again. From his own failures, he can explain to his teachers how to master that particular technology, and what changes his teachers can make to become successful.

Initiative

Most of the principals stated they learned best by taking the initiative with their own learning. The principals would read technology books/articles, blogs, websites, listen to podcasts, and use social media such as Twitter to learn about new and emergent technologies. Mrs. Michaels noted, "You have to be immersed in the work, you learn as you go." She found time in her schedule to be sure to learn more and not stay stagnant in what she already knew. Mrs. Newsome stated, "I just, I immersed myself in learning, growing and doing better." The principals would learn a technology on their own, then model for their teachers how to use the technology in their classrooms. As previously noted, Andragogy and Self-directed Learning both attribute initiative as a quality in an adult learner. Mrs. Granger explains how she takes the initiative with her learning, "You definitely need to have an open mind, and you have to want to take the initiative to do it because it's not going to drop in your lap."

This comment made by Mrs. Granger expresses the desire she has to learn on her own and take the needed steps to be successful as a technology leader. She takes the initiative to learn what she can, or she knows where to go to find out what is needed, and she does not wait for others to show her the direction she needs to go. Mr. Oakes also expressed how he took the initiative to learn more about technology:

All the daily grind of trying to do your tasks. So, I think when you have some of those free moments that's when I took a lot of my technology to the next level and kind of tried to get immersed in some of those trends for technology.

Mr. Oakes said he used what free time he might have to further learn about technology so he could provide the best guidance to his school. He wanted to exceed with technology in his school, so he took the necessary steps to achieve this goal.

Reflection

Two principals specifically mentioned being reflective as part of their learning when it comes to technology. Mr. Chambers stated, "You definitely have to be reflective on the work that takes place within the building when it comes to technology. So, reflective, open-minded, and the need to want to be innovative enough to try something different." Reflecting on his learning of technology is what Mr. Chambers describes as a needed skill to be a technology leader. He said he analyzed the technology purchases made and the difference, if any, they were making in the building. Mrs. Erickson mentioned how she reflected on her learning:

I think there is just a lot of good that can come at being reflective. Even after you utilize the technology, be a reflective practitioner. What worked with it, what didn't work, what would you do differently? What was successful about it? How did kids feel about it? You know, like what are those self-assessments

as far as we're making that up. Did you utilize it, and did they appreciate it, could they get onto it?

Again, Mrs. Erickson further explained the importance of reflecting as part of being a technology leader. The questions they ask themselves to help with their reflection are an important part of their learning.

Some of the principals suggested reflection by making comments about looking at what is being done in the classroom and seeing how it can be improved or if it is making a positive impact on instruction. Mrs. Hines commented on how she looked at usage data for her purchases to see if a technology was a useful tool or not:

For example, first grade wanted to try a math intervention program. It is not cheap at all, one of the priciest ones out there, but it has strong reviews. So, they tried this year, but I was not overwhelmed with the usage of it compared to what was spent. So, we had that discussion and decided that we needed to consider a different type of computer software that would offer the functions that they were using.

The principal's reflection was not on their learning, but the impact of a tool or technology. She was looking for validation that her purchase or use of a tool met the needs of her school, or that the purchase was truly beneficial and having a positive impact on the students' learning.

Skills

A priori codes were also used to analyze the skills principals perceive are needed to be a technology leader. They were developed from the framework described by ISTE. The five areas from ISTE's framework for what they perceive to be the skills needed for administrators to be

successful with technology leadership and integration are: equity and citizenship advocate, visionary planner, empowering leader, systems designer, and connected learner. These were used as a priori codes while developing the findings for the study. Although ISTE has published this suggested framework, not all administrators are familiar with them. Only two principals mentioned ISTE during the interviews and were aware there was a framework. What was found was that the principals were following this framework without knowing its relevance.

Equity and Citizenship Advocate

Leaders using technology to increase equity, inclusion, and digital citizenship practices is how ISTE (2018) defines an equity and citizenship advocate. Two of the principals mentioned trying to purchase technology for their buildings to maintain equity in comparison to other schools in their district. The principals work for different districts but are located in the same regional area of the state. The principals expressed how the budget was different for each school in their districts, and that some PTAs were more active in affluent schools, so the less affluent schools did not have as much. The principals must be creative with their budget to get what is needed for their schools and strive to give their students as close to the same resources as the more affluent schools. Mrs. Boyd explained how she deals with equity for their school:

So, we have what every school has, which is the bare minimum. We have Smartboards, laptop carts, which means multiple grade levels use them, and we have one-to-one on our fifth and sixth grade. Those laptops are old Dell laptops that are outdated. So, we use them when we can for what we can.

Mrs. Boyd is not afforded the same technology as other schools in her district but uses what she has for the betterment of her students. Mrs. Jones, who comes from a neighboring district, explained how she handled maintaining equity for her school:

How are we willing to build a globally competent student, but you don't have the same equitable type of resources? So, it became a mission and within my first two years, kindergarten and first grade, fourth and fifth grade had theirs [Chromebooks]. Then, last year, second grade got theirs, and now we have third [getting theirs] this year.

Although Mrs. Jones did not have the resources like other schools in her district she made it a point to provide her students with what they needed to be successful.

Visionary Planner

Leaders engaging others in establishing a vision, strategic plan, and ongoing evaluation cycle for transforming learning with technology is the definition ISTE (2018) gives of a visionary planner. The first thing the principals mentioned was to know how to find the people that could help with their vision and to follow it through. Mr. Kent stated:

So, I was lucky he had been creative on just begging people and I know people and I called a connection downtown and explained. So I've been strategic on who I know and where I can get things. I knew that I needed somebody in my building that was going to be really effective with technology and even above and beyond.

The principals said they believed they must communicate their ideas and expectations regarding the use of technology. They must communicate with others to get input on strategies and tools that would benefit the school. Six principals mentioned communicating their vision to their staff so that their goals were clear. Mrs. Hines explained how her vision for technology was shared with her staff:

So, when I got to the school there were two desktop computer labs and that was about the extent of the technology. So, I immediately set a goal for one-to-one technology schoolwide and I asked the staff to give me three years to do that.

She set a goal for her school and shared that vision with her staff. She also made it clear with her staff that she was trying to do this for the benefit of the students. Mrs. Hines additionally stated, “I was intentional about tracking uses, so I don't waste it.” By keeping track of technology usage to gather input on future purchases of technology allowed the principal to know if a software/hardware was not being utilized and how to make changes in the future for purchasing reasons, also to create a larger impact on teaching and learning.

Mrs. Randolph worked with the staff to develop a SMART (specific, measurable, achievable, realistic, and timely) goal in regard to communicating with parents, and she used technology as her communication tool. She said, “We did a SMART goal with our parent communication, so our goal was to communicate at least three times a week via class Dojo.”

Her vision of having better communication with parents was shared with the staff; then they worked together to develop a goal that would be achievable. Mrs. Randolph wanted to use a communication app as the main means of communication with parents, and she worked with the staff to achieve this. It was imperative for Mrs. Randolph to share her desired goal, and have staff buy-in for implementation and support to achieve this goal.

Figure 4.1 illustrates that principals were successful with technology integration when they set a clear vision with others to develop what they wanted in their school. Principals also did research to help develop a vision of technology they were thinking of using in their building. Mrs. Jones said she sat down with technology personnel to describe her vision of one-to-one, and

to see what could be done to provide this benefit to her students. Her vision was clear, and she made sure to speak to the people that could help achieve her goal. She said:

I sat down and met with two of those gentlemen [ITRT and network engineer] and shared what my desires were as far as one-to-one; not to replace books, textbooks and things like that, but we need to have, they [students] need to have access to the world, right?

Mrs. Jones set the vision for what she wanted in her one-to-one program. She researched the benefits of certain tools and made comparisons between different types of laptops. She used technology personnel to further develop this vision and provide guidance on the benefits of the different laptops. By starting with a clear vision, the one-to-one program has been successful.

Monitoring the usage of the technology was also found to be important for successful technology integration. ISTE (2018) states an educational leader evaluates progress on the strategic plan, makes course corrections, measures impact, and scales effective approaches for using technology to transform learning. By monitoring usage, the principals can see if the technology helps instruction, and it allows them to find out from there why something seems to be working or not. The principals did not just purchase a technology and not go back to see how it was being used. Mr. Oakes explained how he monitored technology integration:

And then so we take the emotional piece out of it. Now I can see exactly what's going on performance wise with this particular group and then start to compare it with other buildings, compare it with the district, and then why are we not getting to certain points.

He used data to monitor the usage of a technology and used the data to compare with others in the district. It was important for him to know the effectiveness of the technology he had

spent time researching, purchasing, and training his teachers to use. He was interested in knowing if the technology was truly having a positive impact on teaching and learning.

Empowering Leader

ISTE (2018) describes an empowering leader as one who creates a culture where teachers and learners are empowered to use technology in innovative ways to enrich teaching and learning. Five principals stated how they used their leadership teams to institute technology integration in their buildings and help in modeling effective ways to use the technology as part of instruction. The principals also used their teams to get ideas for how technology could benefit staff and students. Mrs. Michaels stated, “I think relying on your teacher leaders to help support you in any initiative.” Mrs. Peterson also commented, “I think you have to be open to what people’s natural gifts are and what their ideas are.” It is important to put people in leadership roles and empower them with the ability to try new things. Mrs. Newsome noted, “You got to make sure that the staff are feeling empowered and know that you're supporting them, whether or not they're successful in that transition.”

Figure 4.1 shows principals were successful with technology integration when they had others to pilot technology tools or programs before making big purchases. The principals utilized their leadership teams, which were made up of teachers in their building, to get an idea of what the teachers believed would be beneficial for the school. If a product was purchased, the principals would also use the leadership team, or find others in the building, to pilot the technology. Purchases were not made without doing the relevant research and testing needed to be sure it would be useful in their school. Mr. Lawson commented that he used others to pilot tools before making big technology purchases for his school:

I'll always start with a small core group of teachers and get them excited about it, then in hopes of it I ask them to present in a faculty meeting or something like that. I've now sparked the interest of a few more teachers who want to go into their classroom and see what they're doing, to see what technologies they use, and they've got to build a network like that.

Mr. Lawson allows others to show the technology and the benefits in order to grab the attention of teachers in the building. He understands that when a teacher sees another teacher describing how to use a tool, and explaining its benefits, it produces a larger buy-in for the tool. This also grows leadership in those teachers that are presenting. The teachers who become the leaders in the use of that tool may grow in other areas, leading them to become administrators as well.

Mrs. Michaels described how she used the input of her leadership team to make decisions on her technology purchases:

We [ITRT and principal] created sample lesson plans for what it could look like, then sold it to the leadership team, got feedback from them. They started playing with it and they're like, yeah, we like it.

The leadership team could see actual plans developed for using the tool so it could be implemented immediately into the classroom. The teachers were also given time to experience the tool for themselves in their classroom so feedback could be given to the principal on the tool's benefit or not. By allowing the leadership team to have input, the principal is growing the teachers as leaders, but also building the foundation needed for the technology integration to be successful. The leadership team can spread the benefits to their teams and build the desire for the technology.

Figure 4.1 also clarifies that principals were successful with technology integration when an environment was created where the staff were willing to share and collaborate with each other. Mr. Delk described how he developed an environment for his teachers where they could feel safe to share their ideas and feel good about taking a risk with technology as part of their instruction. He said it was good to create, “a risk-taking environment where teachers feel safe enough to share information, and to admit they have deficits.”

The teachers share during their team meetings how they use a technology, and express where they are having challenges or doing well. Mr. Delk allows the teachers time to collaborate and provide assistance to each other on the tool. One staff member might emerge as a leader for one technology, and another emerge as a leader for another. By providing a safe space to collaborate they are building leaders and growing the use of the technology.

Systems Designer

The ISTE (2018) says a technology leader builds teams and systems to implement, sustain, and continually improve the use of technology to support learning. Three principals described how they sought out the people that were willing to help and give the support needed to achieve the goal. Mr. Kent stated, “You just kind of have to seek your own support and you have to know who to call and help.” A principal cannot be expected to know how to do everything on their own, so it is important for them to know whom to call when something is needed in their building in respect to technology. The main goal is to have engaging teaching and learning in the building, so resources to achieve this are vital.

Mrs. Jones mentioned, “So I go out, I talk to different business owners.” She said she can get extra resources and support for her school by receiving help from others outside the school district, which allows her to achieve the support that is needed to help learning. Mrs. Randolph

also utilizes outside resources to help in getting items that are needed for her school. “We have a partnership with two churches, so church one and church two come and help out with the staff.” It is important for both principals to have resources provided by outside businesses and organizations so they can provide needed resources for their school. Equity is something both these principals feel is needed. To help to achieve this equity, they seek assistance from other sources to build their technology programs.

Connected Learner

Lastly, the ISTE (2018) describes a connected learner as a leader who models and promotes continuous professional learning for themselves and others. All the principals interviewed believed professional development was essential in their learning, and felt it was equally important for their teachers to attend professional development courses that would build technology skills and foster continuous learning. The principals provided these courses themselves, or they brought in personnel that would train their staff on the needed technology tool. Being open-minded was the most frequent response principals made to the question about what skills a principal needed to be a technology leader. All the principals believed a willingness to do more with technology for the benefit of staff and students was a necessary skill. The principals also believed in professional development for themselves and for their teachers. They did not want to be left behind in the knowledge learned and what was new, so they were willing to learn and allow their teachers to learn how to be successful with technology. Mrs. Boyd mentioned how she had an open mind:

I think you have to be open-minded and flexible in your thinking and be willing to acknowledge what some of the barriers might be and then how you can get around it.

Acknowledging what she does not know but determining how to build on the knowledge she does have helped Mrs. Boyd succeed. She said she maintained an open mind on learning technology and did what she could to achieve her goals.

Mr. Irwin also spoke of the vital importance of a principal having an open mind:

I think you need to be open. I think you must be willing to change. I think you must be savvy enough to build on other technologies that you've learned to be like, all right, well I'm not going to be afraid of this because I could do this. I also think you need to know who to talk to when you do not know.

Knowing whom to talk to helps Mr. Irwin develop his technology skills and become a technology leader. He understands questions must be asked and is willing to change when things are not going as intended. Adjustments can be made if it does not work out as planned the first time. Mrs. Jones gave her rationale on being open-minded, which she saw as a necessary skill for a technology leader:

I just think you need to be open with it. I think you need to have the skill of communicating with others about what you're learning. But that whole flexibility being, humble about it because it is new and just be open.

Mr. Chambers said he was willing to make changes in order to be innovative in the decisions he made regarding technology in the building. Mr. Chambers stated, "I think you have to be innovative enough to want to make a change and have things look a little different." Mr. Lawson said, "I think you have to be innovative because I think you have to think outside the box a lot with the technology." Being innovative is done by staying connected with online learning and professional development for the principal and for the teachers.

A principal must learn collaboratively with their teachers in professional development to understand how to use the tool, and what to look for in the classroom for usage. Also, the principal should attend to their own professional development to continue to learn and grow. The professional development could be face-to-face, or it could be done through other mediums such as social networks. Many of the principals interviewed believed that building a professional network to grow and learn was important.

Mrs. Boyd said her professional development was broken up to meet the needs of her teachers and was not just general training. The training courses are specific about providing the needed benefit for her teachers and students. Other principals stated how they provided professional development in technology for their teachers. Mrs. Peterson said, “You have to be willing to put in that professional development time for the teachers.” She acknowledged the need for professional development for her teachers, and not to just give them items, but provide the training and resources they need to be successful. Mrs. Hines also said she was, “willing to try things, to learn, to learn things first, and to model technology for my teachers so that they can be encouraged to try it with their students.”

Learning what their teachers are expected to learn, and then modelling effective practices for the teachers, builds teachers’ support for that tool. Also, attending training with the teachers so they see the principal is learning alongside them supports the teachers. Mrs. Michaels explained, “I’ll sit in on some of the training with the teachers just because I must become a learner too.” Mrs. Michaels understood she needed to learn what the teachers were learning to provide assistance to the teachers when needed, and also to know what to look for when she was in the classroom.

Figure 4.1 illustrates that principals found that technology integration went well when they provided professional development for their staff on a device the teachers were going to begin using in the building. Depending on what type of technology was being learned, professional development would show how to use the device and how to implement the use of that technology in the classroom. Also, when offering professional development, it was tiered to meet the individual needs of the teachers, so they were receiving instruction that was best for them at that level; it was not just one type of professional development for all teachers. Mrs. Boyd described how she trained her staff by using a tiered method so that teachers could receive the training that was best for them:

I just say, okay, we're offering these three sessions. They [teachers] like beginning, intermediate, and advanced. Either I or my technology person [do the training]. If you're in at the beginning, then you get the deeper learning outcomes, and the same thing for intermediate and advanced for more advanced topics. Kind of gives the option to choose professional development that best meets current learning style.

Principals found technology integration did not go well when there was not a follow-up on professional development for staff. Sometimes the technology was not used effectively or not used at all. Also, the quality of the professional development was not high, so the staff left the session still not knowing how to use the technology. Sometimes issues arose because the administrator had no clue how to use the technology, which meant they were not sure of how to support their staff. Mrs. Michaels commented about the implementation of a tool used in her building:

I think one of the things, the initial implementation of it is supported by a professional development opportunity, but beyond like the, hey, we've got this, this is how wonderful it is, these are the things you can do now, go do, there's not necessarily the follow-up with different things.

Figure 4.1 shows there is a commonality of professional development for both successful and unsuccessful technology integration. Mr. Lawson spoke about the mistake he made with one piece of technology, which he believed was the reason he did not do well in implementing it, in comparison to how he implemented two others. With the latter, he was open about how to use the device and modelled it for his teachers during faculty meetings. This is the opposite of what he did with technologies that did not go well. He said:

I don't talk about the Bibliotech projector, but I talked about the Chromebooks every time we were together about some type of feature ... I also feel as though, if I'm being honest with you, I've done more for professional development, for the Chromebooks than I did for the regular laptops. I felt like it was a new initiative and so when we decided to order the Chromebooks I had the IT guys set up a PD plan, like every time we were together introducing the teachers to another feature of the Chromebook. ... with the old laptops, I just assumed that people knew how to use the laptops. We got the Chromebooks. I did do more professional development with the Chromebook.

Mr. Lawson provided more professional development for his teachers on the Chromebook because of his belief they did not know how to use it, and he worked with IT to develop a solid plan so teachers would feel comfortable. He took for granted that teachers knew how to use regular laptops and they were not used like the Chromebooks. This shows

professional development is a component of both successful and unsuccessful technology integration, but it is how it is done that makes the difference. The support and professional development plan are both significantly better when the integration is successful.

Three principals were clear they used social media as a large part of their own professional development. The principals said they took advantage of the articles that were shared regarding technology and other leadership skills. Mrs. Newsome stated, “So to me, Twitter has been an incredible source of professional development that I’ve been able to reach across boundary lines with different administrators.” Through social media the principals can speak with many other administrators and build a professional learning network where they can share and learn. Mr. Lawson noted, “Then I get my daily professional development from Twitter and I get ideas from Twitter all the time.”

Another area where technology integration was successful, as shown by Figure 4.1, is principals taking the time to learn with the kids in order to familiarize themselves with the technology. This also gave the students an opportunity to work with the principal and see that they were learning together. Mr. Kent stated, “So I take the coding class with my kids because I want to learn how to do that as well because I felt like, again, as I’ve shared, I’m not strong in it [technology].” When the students see the principal working on the same problems and using the same tools, they feel motivated to learn more and be engaged with the technology. Mr. Kent has found this has been beneficial for his program. Other principals also stated they learned alongside their students to promote a technology they had implemented within their school, which helped with a successful integration.

Providing the needed resources for staff to become better with a technology is also shown to be a part of having a successful technology integration. If this were to include more training

by other staff or district-level personnel, the principal could take the time to help the teachers learn more and become skilled with the technology. Mrs. Erickson described how she provided resources for her teachers so they could become better at using technology. She also talked about being sure to provide what was needed for teachers with the budget she was given. She said:

... providing them with more focused time, observing from the classroom, providing them with mentors, examples using vicarious experiences. So, sharing with them articles, case studies, having them to reflect about, some studies that show that technology is better for kids ... So I was able to, with a limited budget, support the teachers, making sure that they had what they needed to be able to continue instruction using technology.

For Mrs. Erickson, supporting the teachers with the resources they needed to be successful and confident with a technology was an essential part of her role. For the technology integration to work she made sure, to the best of her ability, to provide her teachers with what they needed to be successful. This was also mentioned by other principals when they found their technology integrations were successful. The principals provided the resources needed for their staff, which developed their effectiveness with the tool.

Challenges

The principals were asked questions about the challenges they faced in being a technology leader, and how these challenges affected integration. There were five areas that kept getting mentioned during the interviews. The first was resources, which was broken down into three categories: network/infrastructure, resources that were there but not being used, and the budget. The remaining areas that brought challenges to the principals were resistance by staff, lack of training (for administrators and teachers), inequity/poverty, and not having enough time.

As the principals discussed the challenges they faced, it also became evident that the challenges, and how to overcome them, played a role in whether a technology integration was successful.

Resources

Resources and support provided by the district were given in Figure 4.1 as being a commonality for a successful or unsuccessful technology integration, but the level of support is what makes the difference between a technology integration being successful or not. When it was successful, central office personnel were there to offer guidance to the principal and to the school for training or resources that were needed. Principals mentioned they could talk with their ITRT to share ideas and learn before making purchases, or they could talk with a central-level network or instructional technology people to receive guidance. When it was not successful, these supports were not there or were minimal.

Network/Infrastructure Issues

For seven of the principals there were issues regarding the network or the infrastructure of their building. In some cases, it was because the district was in a rural county that did not have the needed resources to allow proper networking for the school district. Mr. Irwin explained:

I'm in a very rural community that doesn't have broadband throughout the county. So, the teachers cannot be like [using technology devices] we have a test coming up on Wednesday. It's Monday you might want to review these things. So, you know, here you go, don't forget about it. I can't do that here.

Other times it has been that the school needed to be upgraded to the appropriate amount of WiFi and networking bandwidth so that all the staff and students in the building could have the ability to access the Internet. Mrs. Newsome stated, "When our school went one-to-one, we had very spotty reception." As many schools are changing to one-to-one, the challenge of having

enough bandwidth to support the devices is something that must be continually managed. Mr. Franks commented on the challenges he had with infrastructure:

It could be something as simple as electrical infrastructure not supporting the new technology. The collaboration that is needed between facilities, between the network services, between the teachers and the technology facilitators, those things are all areas that are challenges that can get in the way.

Beyond just the connection being upgraded, districts also must manage the updates on hardware. Mr. Chambers mentioned, “a lot of us have had issues to where we've had to get our hard drives replaced at least three times over the past three to four years.” The necessity of frequent updates and upgrades makes it challenging for principals to keep their resources up to date and beneficial to them. Mrs. Randolph stated, “I've had to redo every smart board since I've been here.” Interactive whiteboards have become an essential tool in the classroom, but they must be updated from time to time.

Resources There, Just Not Used

Mrs. Boyd described how teachers may apply for a grant with the intention of using a particular technology, but once it comes into the building it is not used as described, or stops being used at all. This can happen in schools because, while the teacher knows what they want to do with the new technology, if the district does not support updates the technology can end up not being used. Mrs. Boyd said:

A year and a half ago one of my teachers wrote a grant, and the grant was to provide a whole grade level of kindles ... but those kindles have been sitting because they are out of date, so no one uses them. You use them for books, but you can't use them to upload learning software and things like that.

As well, often a resource is not used because it does not fit the needs of the school. Mr. Lawson commented, “I know there is the benefit to the board, but we are not using it, just kind of going through the motions with the technology.” Three principals stated that a resource may be given but not used because it is too similar to a resource the teachers are already using. Mr. Irwin stated, “I just felt like I didn't see the point of it because we already had something else that was doing something similar.” When a district purchases software without consulting principals it may be a tool that is comparable to what the principals have already purchased for their teachers. When this happens, the teachers are comfortable using the familiar software, so they do not change to what has been purchased by the district. The district may not have thoroughly researched differences in software, so teachers are going to stick with what is familiar.

Budget to Purchase Resources

All the principals mentioned the desire for more technology in their buildings, but they continually got hit with the budget and their allotment for items. The principals must know how to manage the funds given to them to make the wanted purchases. Mrs. Randolph commented, “It is expensive to try to update them after three years, but a lot of it's just, it's money, it's money.” This causes dilemmas when the principals must choose between technology for the school or other needed items. Purchasing technology is expensive, so the principals must think about what tool will get them the most value for their money. All the principals are willing to buy tools for their schools, but they are sure to do the research to determine what will be best. The desire of the principals is not to make a purchase because others have bought a particular technology, but to be sure the purchase will benefit the students. The principals must keep in mind other necessities they may have for their school. Mrs. Quash explained the challenges she had with the budget:

Our budgets are so limited. We don't really have the money. Since my school is so small, we don't have the funding to purchase technology, no type of programs or any of that.

Having a small budget made it difficult for Mrs. Quash to provide the technological resources she wanted for her school. She also mentioned she was not strong with technology, so knowing what to purchase with the funds she had was also a struggle for her.

Mr. Franks explained how managing the budget was a challenge when he had to replace older technology:

Finances and money are another challenge because after you go in and you outfit all your buildings with these smart boards, there's a shelf life for those projectors and things.

Mr. Franks said he knew the purchase had to be made, but he also was concerned that some components might not last as long as needed. Managing the budget to account for needed updates and equipment parts must be thought about as well, which is problematic for some.

Resistance

Figure 4.1 displays that an unclear vision and staff buy-in are causes for an unsuccessful technology integration. When the vision is not clear, teachers are found to resist the technology because they are unsure of how to use it, so they are not using it appropriately for the students. For example, this could be something such as doing a worksheet on the computer instead of on paper. Regardless of the method of completing the worksheet and turning it in, the student is just completing a worksheet. The skill in this case is just the same; it is not truly an effective use of the technology. Also, staff may not see the point of the purchased software, so it does not get used as planned. When the teachers are unsure of how to use a given technology it may be used

in a way the teachers believe it can be used, but unfortunately it may not be the correct use of the technology.

All the principals mentioned some level of resistance to change occurred when trying to implement a new technology. Some experienced more resistance than others, but it was consistent that with a new technology change can be hard for teachers, and they can be afraid of change. In some cases, the teachers have been using worksheets and the chalkboard for years, so the change to using technology is dramatic for them. Mrs. Anderson described, "Some people are strictly paper and pencil. They are afraid of change and they have a hard time understanding how technology can help these students throughout the day in the classroom." The staff may be hesitant to work with a new technology because of the uncomfortable feeling of using something new and unknown. Mrs. Boyd commented, "The staff has been a little hesitant because it's scary. If they are not comfortable with it and not familiar with it, it creates a lot of hesitation." Mrs. Michaels echoed the same sentiment that staff may be hesitant to use technology if they are scared or if it does not work the first time. Once the teachers have tried it and it hasn't worked, they may not use it again. Mrs. Michaels stated:

I think you get a little frazzled the first time something goes wrong from a teacher standpoint, especially the more veteran teachers that aren't familiar with technology or as familiar, let me put it that way. So, they get frazzled and then they're timid and they don't want to ever try it again.

Resistance to trying new technologies can be caused by fear of failure, so it becomes a challenge for principals to develop successful technology integration.

Many of the principals mentioned that teachers were frustrated when having to work with a new technology, or one they were unfamiliar with. This frustration can be a cause of teacher

resistance to trying new technologies. Mr. Oakes stated, “Ultimately, I think it caused some frustration from staff.” Mrs. Granger also mentioned, “I think more than anything, the pushback that I get is them actually being scared of how to use it and knowing how to use it.” Fear causes resistance, which in turn makes it a struggle for a principal to be a technology leader.

A common term used by the principals was “buy-in” when referring to reluctance from the teachers and getting them to try a new technology. It is important for the principals to have the buy-in from teachers for a technology integration to be successful. Mrs. Michaels described teacher buy-in as “not necessarily for technology but for doing something different with technology.”

The more comfortable the teachers are with a technology the more willing they are to try something new and use a new tool. A strategy many of the principals used to promote teacher buy-in was to be sure to talk with the leadership team first before making a purchase that would impact on the way a teacher taught. The principals understood the level of work their teachers dealt with daily, so the goal was not to add something else to their workload. Mrs. Granger spoke of the importance of teacher buy-in:

It is definitely teacher buy-in and having the available technology to be able to carry out what it is you want to carry out. If you do not have the buy-in, I believe ... how you present things and transparency will help to give you teacher buy-in.

The presentation of something new to staff can influence whether the teachers will try it or not. Mrs. Granger said she had to be strategic about how she introduced a new technology to her staff or there would be resistance.

Lack of Training

Six principals talked about how there was a need for more training, or training that fitted the needs of them as administrators. If the principals receive training, they said, it is the same sort of training the teachers receive, so it does not always reflect how a principal might use or understand the technology. Mr. Chambers stated:

It is never anything extensive, to be honest with you. It's half-day training, two-hour training at best. It is not anything where it is like an all-day type of training or follow-up training. It is kind of like a one and done.

Professional development may be provided by a district, but it does not always meet the needs of the teachers or administrators. The training may cover the surface of a topic but does not dive deeply into how a technology may be used in the classroom. Effective feedback from training may not be given as well, so teachers and administrators are unaware of whether the technology is being used most effectively. Mrs. Michaels commented, "Beyond the initial PD of how to administer it, there has been no support on what to do with it."

Two principals said they believed that training should be differentiated for the teachers and for the administrators, so it is truly meeting their needs. Training typically has been designed to meet the level of one type of learner, but there are so many different levels of learners in professional development. Mr. Delk spoke of the importance of "incorporating, training, providing professional development that meets the needs of people at different levels." In some training courses, there may be principals or teachers who are not comfortable with technology so there may be a need for more individual or slower-paced guidance tool. Others learn rapidly and are comfortable, so the pace can move quicker, and the principals can learn more tools and strategies for how the technology can be used in their buildings. Mr. Oakes said, "We try to

target who we're going to provide that support for, and you just have to be able to differentiate that support. So, that's a barrier I think every building has.”

Providing the needed support through professional development can be difficult when the staff is made up of so many people. Mr. Oakes said he tried to give the support that would meet the needs of all his staff.

Principals found technology integration to not be effective when the teachers were left to decide how they would use a technology. Figure 4.1 indicates that the lack of effective professional development is one of the factors that can cause an unsuccessful technology integration. Training needs to be provided to the teachers on effective implementation in the classroom, not just in regard to the tool itself. Correct implementation is important for proper use of the technology, and for it to be used to best engage the students and add impact to instruction.

Mrs. Erickson stressed the importance of proper implementation:

I think the other challenge is not allowing our new generation of teachers to use the technology as an electronic babysitter, to make the technology a source for input and not just output.

Not all teachers have the same level of comfort or skill with trying a new technology, so when training is given it does not always meet the needs of many of the teachers. Differentiation should be used in technology training in the same way it is used in the classroom. Often, too, training covers the basics of a tool without going into how to implement it in the classroom. Also, training may not be at a level where all teachers can grasp the concept, so the tool ends up not being used in the classroom.

Equity and Poverty

Four principals from poorer schools spoke of equity being a challenge for them in being a technology leader. Not all schools in a district are provided with the same resources, nor do they have the same budget to work with. Less affluent schools may have a smaller budget because more affluent schools usually have very active PTAs that provide more money. The extra money allows the principal to purchase more resources that are needed for staff and students. Less affluent schools might not have a strong PTA, so the support for the school is not as much, which leaves the school financially with less. Mrs. Boyd explains how she has issues with equity at her school:

In my district, technology, for example, is not equitable, which means it's not like all schools have one-to-one. It is based on your economic status. With a lack of the most up-to-date and recent technology, I feel like I have not been successful simply because we do not have what other schools might have.

Not having what other schools in her district have has created a challenge for Mrs. Boyd. She has been at other schools in the district that have more resources because the school is located in a more affluent area. Unequal technology and budgetary resources can hinder what a principal is trying to do for their school. Mrs. Jones remarked on the issue of equity in her district, "So, you wonder why our kids are underperforming because they are not given the same opportunity, technology wise."

Mr. Kent spoke of the financial struggles he had to keep up with more privileged schools. His school was lacking in technology because it was not Title I when he first became principal of the school. He witnessed other schools that were Title I in his district where the principals were able to purchase extra resources for the school. Mr. Kent stated, "There is not a lot of equity as

far as financials go.” Once the school did become Title I, he was able to purchase more resources and hire more staff for the school, but even within Title I he saw things were not equitable for every school. He said:

So, just to financials, just be able to afford anything. When I first got to my school we did not have much, we had just one laptop cart, whereas a Title I school would have a laptop cart for every classroom.

In Mr. Kent’s case, the inequity comes from his school having good academic scores but being in a low-income area in comparison to others.

For example, another school, which I know [has] my population, we trend higher academically, but for the most part, as far as Title I and the low-income numbers and things, we are pretty close, yet they have at least double, if not triple the Title 1 money that I have.

Mr. Kent has seen inequity toward his school when it was both a Title I school and not, and this causes a challenge for him to purchase the technology he would like to provide for his school. He makes adjustments and finds partners in the community to help him build his technology resources, but he would be capable of doing more with more funding.

Time for Administrators

Three of the principals felt they did not have the time to learn what was needed, or to research what was available regarding technology. The day-to-day schedule for a principal has them in classrooms doing observations, running or attending meetings, dealing with discipline, and the many other things that may happen in a day. Mrs. Randolph mentioned she previously had time to do research on technology because of her position as an ITRT, but now as principal she spends any learning time on reading leadership articles or things about instruction. She

stated, “There are certain things that I'm not as great at now because of time. You know, like before I would sit down and read like a technology magazine. Now everything I read is about administration, PD leadership, and data.” Her role has changed, which has also changed the main focus of her personal growth, but the desire to learn more about technology is still there.

Time is an important commodity for principals, which was mentioned by all the principals interviewed. Mrs. Peterson said, “Feeling like time, you know, everything always feels like one more thing.” With the responsibilities she has, adding learning more about technology can seem impossible. Mr. Irwin exclaimed that time was “probably the most precious commodity” he had as an administrator.

All the principals saw time as a major challenge for them as technology leaders, since they were expected to fulfill a plethora of other duties and roles in their building.

Chapter Summary

The purpose of this study was to understand how a principal learns to be a technology leader, and the skills they need to be such a leader. Through the interviews with the principals, many concepts arose to aid in helping to answer these questions. Three ways the principals learn came out of this study, which answered the first research question. The most prominent way is through professional development, which is focused on technology integration and leadership. The second way is to learn from others because the principals know they cannot know everything so they must rely on others to help them learn. A third way is by learning on their own because time to learn is a big factor for principals. What also came out of the study is that principals did not learn how to lead with technology in their graduate administration programs and this is an area that they would like to see become better for future administrators.

What also is relevant from the study is that the principals depend on their experiences to help them learn. They take experiences from working under other principals that were both good and bad as technology leaders and use those experiences to guide them on how to lead with technology. Also, the experiences received from professional development are taken back to the building and employed. The principals also take the initiative to learn more about technology to become technology leaders. They do not just rely on what the district gives them to learn but look for ways to become better on their own.

The second research question was answered when the principals defined the skills used to be technology leaders. The skills they mentioned were synonymous with the skills listed by the ISTE in its Standards for Educational Leaders. In most cases, the principals were not aware of the ISTE skills, but were exhibiting those attributes, nonetheless. The skills the ISTE describes could be identified in the principals' accounts as they discussed the skills needed to be a technology leader. Also, as the principals expressed their skills, they also discussed the challenges they faced in trying to be a technology leader. Many of the challenges faced match what was discussed previously. The principals faced challenges with resources, teacher resistance, equity/poverty, and time, the last mentioned being a new finding.

DISCUSSION AND CONCLUSION

Overview

The focus of the study was to understand how principals learn to be technology leaders, and what skills they believe are needed to become such a leader. This was done by interviewing 18 principals from rural and urban districts across the state. Two research questions guided this study:

1. How do principals learn what is needed to be a technology leader?
2. What are the perceived skills needed to be a technology leader?

A review of the literature was done on adult learning theories, skills for an administrator, challenges, and principal learning. The findings from the study will be discussed in this chapter, as well as future research and some closing remarks.

Limitations of the Study

A limitation to this study is that the research was conducted in one state in the mid-Atlantic region of the country. Examining the same issues in different parts of the country might reveal other relevant factors. Another limitation is the types of districts where the different principals worked. Most worked in urban districts, with only one principal working in a rural district. The opportunity to speak with more principals spanning a larger representation of different types of districts may have resulted in dissimilar findings. Interviewing more principals from different types of districts may result in more findings that are similar for rural districts that are not seen in urban districts or suburban districts.

Summary of the Findings

Chapter IV discussed the different areas that were developed from the interviews with the principals. The findings fall under three categories: learning, skills, and challenges. There were five findings in the study: four ways of learning; experience, initiative, and reflection; matches ISTE skills; consistent challenges; and rely on leadership skills. The findings are broken into these categories, and they also address what it takes for a principal to have a successful or not technology integration.

Learning

The first category is learning, which has two findings. The first finding is that the principals have four ways they learn: professional development, on their own, learning from others, and preparation programs. Graduate administration programs, however, did not help the principals learn. It was found that the principals would like the programs to provide them with more assistance in preparing to be administrators. The second finding is that the principals learn through experience, initiative, and reflection, which are components of adult learning theory. These two findings help answer the first research question: *How do administrators learn what is needed to be a technology leader?*

Of the four ways the principals stated they learned, professional development came out as key, which is consistent with findings in various studies (Brockmeier et al., 2010; Brockmeier et al., 2005; Cho, 2016; Dawson & Rakes, 2003). Other important ways were learning from others, learning on their own through social media, journals, or other resources (Cho, 2016; Trust, Carpenter, & Krutka, 2018). Graduate administration programs were of lesser value.

Finding 1: Four Ways of Learning

Professional development. Professional development was an essential way in which the principals learned best to be technology leaders. All the principals revealed they had learned best from the professional development provided by their districts. Also, as the principals discussed situations where technology integration was successful, it emerged that professional development, for both them and their teachers, was a major part of why it was effective. Machado (2015) argues that the most effective professional development is one that is ongoing and learner-centered. When the principals stated technology integration did not go well, it was found that professional development had not been provided, or if it had, it had not met the needs of the staff or themselves. Brockmeier et al. (2010) state it is best to have professional development directed at using technology for assessment and data collection, at understanding how students are using technology today, and at how to integrate technology into the teaching and learning process. The principals echoed this same sentiment, especially regarding the integration of technology in the teaching and learning process. Professional development is needed for teachers and administrators to be successful when integrating technology.

Many of the principals utilized social media as a means of their own personal learning and professional development. Cho (2016) says principals find Twitter to be timely and convenient, which is consistent with the principals interviewed for this study. Time is a major factor for them, so it is beneficial for the principals to use social media like Twitter to learn more about technology and about leadership. The principals can learn when it suits them and not be constricted by time to receive their professional development. Also, through social media the principals can develop professional learning networks (PLN) that allows them to learn from people all over the world. This agrees with statements made by Trust, Carpenter, & Krutka,

(2018), such as: “by cultivating PLNs that expanded beyond their local school contexts, instructional leaders were able to discover and develop new ideas, perspectives, mindsets, strategies, and professional knowledge” (p. 147).

Learn from others. Many of the principals expressed they also learned best when they learned from others. They said it was important not to be afraid to talk to other people who had more experience, as they could learn how to use a technology effectively, or what would be best to buy for their school. In various studies (Davidson and Olson, 2003; Dexter et al., 2016; Devolder, Vanderlinde, va Braak, and Tondeur, 2010), the utilization of a technology specialist is essential for technology integration and providing support for principals. As well, the study found that the person the principal spoke with was a technology specialist either from their school or directly through central administration. The principals also relied on learning from the network engineer in their building, primarily for what equipment would be best to purchase since the network engineer is familiar with networking and issues that may arise if the wrong technology were to be purchased. It was consistent that principals needed to be humble and ask for help when needed. When technology integration was successful in their different schools, the principals had relied on help from others when making decisions; they had not solely relied on their own knowledge.

Learn on their own. Many of the principals expressed that one way they learned best was by learning on their own. The principals learned about new technologies by reading journals and researching websites. They took the initiative to learn more, not waiting to be told how to do things regarding technology. A characteristic of successful integrations was that the principals had taken the time beforehand to research what they needed to learn. They asked questions of different people to see if the technology would work, and what other options might be out there.

They also were hands-on with the technology so they knew what the teachers would have to work with.

Preparation programs. All the principals stated that their preparation programs to be leaders had not prepared them to be technology leaders. Many of the principals said they wished some information had been given to them on how to lead with technology as part of their preparation programs. A full course in technology leadership may not be necessary, but knowing how to make costly purchases, do the research, and integrate the purchased technology into instruction would be beneficial.

Finding 2: Experience, Initiative, and Reflection

The second finding is that the principals learn through experience, initiative, and reflection, which are components of adult learning theory. The adult learning theories of andragogy, experiential learning, self-directed learning, and transformational learning have been previously discussed.

The three areas of experience, initiative, and reflection were found to be common to all four theories. These three areas came out as part of the interviews with the principals, which further substantiates how the principals learn to be technology leaders. As stated earlier, one way principals learn is by taking the initiative to learn on their own. Research finds that adult learners take the initiative to learn information that will be beneficial to them in their career or life (Knowles, 1970; Merriam & Bierema, 2014; Rothwell, 2008; Smith, 2002). Many of the principals interviewed stated they learned on their own by doing research, reading journals or articles, and asking people to offer them assistance in learning.

Many of the principals also stated that their personal experience played a part in how they learned, and how they led with technology. Experience was found to be important for an adult to

have because the information they learned would stay in their mind and become knowledge (Knowles, 1973; Kolb D. A., 1984; Merriam & Bierema, 2014; Mezirow, 1997). Their experience had an effect on the decisions they made. Some principals said they had learned to lead with technology based on working under principals that were also leaders in technology. Others stated they saw how their previous principals did not lead with technology, so they were doing the opposite of that because they understood the benefits technology could bring to the classroom. The principals also understood that students were very technologically savvy, so the use of technology in the classroom was essential also for that reason.

Lastly, reflection was discussed by a few of the principals. Reflecting on their practice to become a better technology leader accords with one of the attributes of an adult learner, as described in the research (Kolb & Kolb, 2012; Merriam & Bierema, 2014; Mezirow, 1997; Piskurich, 1993). The principals spent time visiting classrooms to observe technology being used when a tool had been introduced to the staff. This was done to see if the technology purchased was being used by the staff and students, and whether the tool was beneficial to teaching and learning. The principals reflected on technology by looking at specific data to see if there was an increase in scores on assessments because a tool was being used. Reflection, as described in Chapter II, focuses on the adult learner reflecting on their learning (Kolb & Kolb, 2012; Merriam & Bierema, 2014; Mezirow, 1997; Piskurich, 1993), but in most cases the principals were reflecting on usage of a technology not on their own learning of how to use a specific technology.

Skills

The ISTE created five essential skills that are needed for administrators to be successful with technology leadership and the integration of technology in their buildings. The principals

interviewed described what skills they believed were needed to be an effective technology leader, and these turned out to reflect the ISTE list. Often the principals were just describing situations while answering questions, but their descriptions matched the skills described by ISTE. They were not all aware of the different skills that are regarded by the ISTE as essential, but they were still following these same skills to be technology leaders.

Finding 3: Matches ISTE Skills

The third finding is that the principals utilize the skills as described by the ISTE to be technology leaders. The principals interviewed used the defined skills without being aware that the ISTE had listed the skills to be a technology leader. Using these skills to be technology integrators is intuitive for principals.

Equity and citizenship advocate. The principals ensure the teachers are using technology in the classroom by doing observations and making sure the teachers have had the training needed to be technologically savvy in the classroom and meet the needs of the students. Many of the principals have grown their schools to be one-to-one, if the district did not provide the devices to be used. Research says there is a divide in equity amongst schools and districts when it comes to technology (Flanagan & Jacobsen, 2003; Sincar, 2013), so if the district did not provide the needed resources the principal budgeted over time to allow all students to have a device to use in school and at home. The ISTE (2018) states that the educational leader ensures all students have access to the technology and connectivity necessary to participate in authentic and engaging learning opportunities. The principals that found inequity within their district made sure to set goals for their school with technology that provided the same tools and resources received by more affluent schools in their district.

Visionary planner. The principals knew how to find the people who could help them with their vision and follow it through; and they knew what they were looking for had to be communicated to staff, along with their expectations for the use of technology. According to Larson, Miller, & Ribble (2010), principals should strive to create and implement a shared vision that integrates technology with all aspects of learning and teaching. The principals communicated with others to develop a vision and acquire input on strategies and tools that would benefit the school. All the principals interviewed used their leadership team to get ideas of technologies that could be beneficial, but also to share their ideas and receive feedback and thoughts from their team. The ISTE (2018) says an educational leader communicates effectively with stakeholders to gather input on the plan, celebrate successes, and engage in a continuous improvement cycle. The principal is the leader, but their team is used to help guide what technology resources would be best for their school. Anderson and Dexter (2005) state that a shared vision for technology should be developed and communicated to ensure that the resources, coordination, and climate are in place to realize it. This is how their leadership team is used because they found that when integration was not effective the time had not been taken to share with the team. This is important for leadership because the teachers will offer support to get the rest of the staff to follow through with the vision.

Empowering leader. The principals learn from others and develop teacher leaders to help guide what technology is needed for the school. The ISTE (2018) states an educational leader inspires a culture of innovation and collaboration that allows the time and space to explore and experiment with digital tools. When technology integration was effective, it was found that the principal had employed teachers in the building to share their knowledge with others and then used them to help promote their shared vision. This allows the teachers to be leaders in the

building on that tool, and the principal is inspiring a culture of collaboration and innovation. The principals also show support for the teachers when they are trying something new or using a tool that engages students in their learning. The principal does not always have to be tech savvy, but they can always show a strong interest in what their teachers are learning and teaching with technology (Wang, 2010).

Systems designer. The principals seek out people who are willing to help and give support that is needed to achieve their goal for technology integration in their building. The ISTE (2018) states that the educational leader establishes partnerships that support the strategic vision, achieve learning priorities, and improve operations. The utilization of outside businesses by the principals was needed to receive resources that may not be available from their district or their current budget. They also build a team that will support their vision and enhance technology usage in the building. With the use of their leadership team the principals develop a strategic plan for technology implementation, and work to develop a plan that will meet the needs of the students through the years and not just immediately.

Connected learner. Being open-minded was the most frequent response principals gave to the question about the skills needed to be a technology leader. The ISTE (2018) says a principal should have a mindset of continuous improvement for how technology can improve learning. Having an open mind toward technology is a skill the principals see as extremely beneficial. The principals use professional development to further their learning, and for their teachers as well. It is understood by the principals that only through ongoing, consistent, leveled professional development opportunities can their teachers gain the skills and confidence needed to teach the new technologies (Larson et al., 2010). Professional development may be provided by the principal for their staff, they attend technology conferences with teachers, and they also

do their own learning through online professional development and research. Whenever technology integration has gone well, the principals have participated in the same training as their teachers so they can understand how the technology can be used in the classroom. They also learn how they should evaluate the use of the tool to ensure student engagement and proper use of the tool.

Challenges

The fourth finding is that the principals were consistent in identifying the challenges they faced in being technology leaders. The principals came from different backgrounds and different districts, but what was consistent is the types of challenges they faced to be technology leaders.

The challenges listed by the principals were resources (network/infrastructure and budget), resistance from teachers, equity/poverty, lack of training, and time paucity for administrators.

Finding 4: Consistent Challenges

Resources. The first area that challenged principals was resourcing. One principal whose district is in a rural area expressed large concerns with network and Internet issues. Leonard & Leonard (2006) and Sincar (2013) list inadequate technology infrastructure as a challenge for principals, and this was evident for this principal. The principals in urban districts also had infrastructure issues, but as the schools converted to one-to-one programs, the districts upgraded to support the needed WiFi. Without growth in infrastructure, the one-to-one programs would not have been successful for their schools.

All the principals expressed budgeting as a big resource that they struggled with. Since they are allotted only a set amount of money from the state or city, it can be hard to purchase items they feel are needed. Often, they want to utilize their budget on technology, but other items

in the building take precedence. Sincar (2013) and Wang (2010) found that funding and infrastructure resources were challenges for principals in their studies, and it was a consistent challenge with resources for the principals in this study.

Resistance. Resistance from teachers toward integration is a challenge faced by many principals (Dawson & Rakes, 2003; Richardson & McLeod, 2011; Sincar, 2013). This study revealed the same. Most of the principals said that when they had a difficulty, a significant part of it was because some teachers were resistant to change. Some principals stated they had teachers in their buildings who feared changing how they taught or the tools they used to teach. Also, the teachers were not comfortable with using new technology, so they would not try to use it in the classroom. Some teachers would try, but if it did not work correctly the first time, they would not try it again.

Lack of training. Professional development is offered to the principals by their districts, but they discussed that often the training does not meet their needs to be a technology leader, or the needs of their teachers. This accords with research that discusses the inadequate professional development received by teachers and administrators (Dexter, Richardson, & Nash, 2016; Flanagan and Jacobsen, 2003; and Sincar, 2013). The training they received might cover the use of a tool, but not how they could use it as a leader. For the principals interviewed, if a tool is for the teachers, they wanted to know what they should be looking for in the classroom for proper use and effectiveness. Often, they would receive professional development, but they would not receive any feedback, which left them unsure about whether the tools were being used correctly. These ideas were expressed by many of the principals, regardless of what type of district they worked in. It was articulated by principals in rural, suburban, and urban districts, so this is something districts need to look at as they provide professional development for their

administrators and teachers. The principals also wanted to receive training on tools the teachers were using so that they could be aware of what to look for in the classroom. Many of the principals stated their teachers got to go to training courses, but the principals themselves did not receive the training unless they took the time to attend the training on their own.

Equity and poverty. Another challenge faced by some of the principals was trying to be equitable in comparison to their counterparts in the same district. The way some districts are set up, there are inequities based on areas within the district, which means not all schools are receiving the same resources. This accords with Flanagan and Jacobsen (2003) and Sincar (2013), who found that school-based technologies are not distributed the same for all schools in a district. A few principals run their entire budget without much assistance from their district, so they have to make hard choices about what to purchase for their schools. Those principals who do not have a strong PTA or parent involvement cannot access extra funding or fundraising for items from that possible revenue stream. Richardson and McLeod (2011) and Sincar (2013) state schools can become isolated based on their socioeconomic status, which causes them to have fewer resources and more challenges. Inequity for some of the principals was shown from the physical location of their school in their district, which forced hard decisions about what technology to buy for their school. The principals were determined to grow their technology to become one-to-one schools, but it took time and determination to build those programs.

Time for administrators. Most of the principals stated they did not have the time to learn what they felt was needed. This is noted by Leonard and Leonard (2006), who state that principals feel they do not have the time to learn more about technology and to be trained on it sufficiently. The principals take whatever time they can to learn about new tools and find extra resources for them to lead with technology, but it is hard for them to take as much time as they

would like. Since the time is not always available, they rely on others in the building to learn and share information about new and upcoming technologies. One way principals try to find time to learn and research is by taking advantage of social media such as Twitter to grow their knowledge, because they can choose when to do this.

Leadership Skills

Lastly, the fifth finding is that the principals who believed they were not technology leaders nonetheless used their leadership skills to take the lead where technology was concerned.

Finding 5: Rely on Leadership Skills

One finding that arose after interviewing the principals was that not all the principals I spoke with considered themselves to be technology leaders, even though they understood the purpose and use of technology in today's schools. They admitted they were unsure of what technologies were out there or which would be best for their students and staff. Also, they admitted they were not the best at using the tools that the students and teachers use daily. The one thing they did have in common was that they would fall on their leadership skills to do the best for their school with technology by relying on others who were strong to take the lead. They were aware of their weakness, so they put people in place that were strong with technology, and they helped guide them in leading in such a manner.

One of the principals made sure that the people he hired and were on his leadership team were strong with technology so they could help to lead the way in school and make good recommendations for him to follow. Principals also utilized their district ITRT to help with professional development or give them ideas of what route to take with purchasing needed technological resources. These principals were advocates for asking for help and having an open

mind when it came to technology because they wanted what was best for their school regardless of what they believed their strengths might be with technology.

Implications

The findings from this study have implications for training principals in technology leadership and in developing the skills that are needed for the principals to be successful technology leaders. The research explored how principals learned to be technology leaders, what skills they needed, and the challenges they faced to be such a leader. The research also investigated the differences between a successful and unsuccessful technology integration. There are five findings that arose from the study. In this section, I discuss the implications for practice and the implications for research to aid in the development of principals' learning, skill development to be a technology leader, and having successful technology integration.

Implications for Practice

Learning opportunities provided to principals. A large portion of learning done by principals is through professional development, and it is imperative for districts to understand what types of professional development would be meaningful for principals. The study showed that providing professional development without proper feedback, or PD that did not meet the needs of the principals, would not be conducive to learning. A principal's time is a precious commodity, so making sure the professional development is beneficial is of extreme importance. Adults learn through their experiences, so providing professional development that will add to their knowledge of technology will aid them in becoming technology leaders. Effective professional development for principals and teachers is imperative for a successful technology integration in a school. Districts need to ensure that the professional development being provided will meet the needs of principals and teachers.

It was clearly expressed by the principals in the study professional development is the main way they learn to be a technology leader. Districts need to provide professional developments that meet the needs of the principals so they are learning and using the knowledge in their buildings. Feedback and continued guidance should be provided for the principals so they will have the support they need to be successful as a technology leader. A technology integration is successful when the professional development is consistent, meets the needs of the learners, provides feedback, and is more than just on the tool. The study showed these are known factors which develop a successful technology integration and aids in principal and teacher learning.

Principals that are successful learn from others as well as on their own through social media, PLNs, and doing their own research. The support provided by ITRTs, network engineers, and central office is important to help the principals be successful in leading with technology. These support systems are essential because they have the extended knowledge that a principal may not have, and these people are the experts in the technology field for their districts. The study's findings emphasized that for a principal to be successful the different technology personnel should play a part in developing a vision for technology and helping to sustain that vision. Also, when principals receive support from the technology personnel, the integration of technological tools is effective.

The availability of online resources helps principals learn at a time that suits them without the constraint of having to attend face-to-face professional development. The principals can dive deeper into the content they want to learn when they have ready access to online resources. Also, using PLNs provides a principal with an opportunity to network and learn from people outside of their district. The connections that can be developed to prominent people in the

field of technology leadership is easier, and the possibility to learn from them is also greater. A principal can find resources to read or to purchase by working within their PLN, which will bring this information back to their school.

Technological leadership skill development for principals. The ISTE has given a general framework to follow for principals to be a technology leader. The principals in the study followed these prescribed skills without knowing they were doing so in most cases. Districts need to help all principals to become technology leaders by ensuring they are aware of the skills listed by the ISTE. These skills are not an exhaustive list of how a technology leader should perform, but they do give guidance to a principal who is unsure of how to make their technology program better. For the principals in the study who perceived themselves as not being technology leaders, knowing about these skills might help them feel more comfortable with technology.

The principals provided equity for their students when they did not feel it was available to them. Developing a clear technology vision for the school matched what is stated in the literature. The principals developed a vision for their schools for technology and used the resources to attain the goals in that vision. Successful technology integration occurs when a clear vision is created and shared with the staff. The principals allowed their leadership teams to help in developing the vision, pilot new technologies, and have input into what to purchase for the school. The leadership teams were empowered by the principal to become a leader with technology in the building, but also it built support for the vision set by the principal. Understanding the importance of infrastructure was found in the literature, and the principal's actions in this skill matched what was stated. The principals understood the importance of appropriate WiFi and bandwidth so that the infrastructure of the building had what was needed to support programs such as one-to-one. If they did not know, they used their network engineers,

central office technology department, and ITRT to guide them in making the best decisions to provide those needed resources for their school. Lastly, the principals knew the importance of effective professional development for their teachers so their technology integration would be successful.

The skill all the principals stressed was to be open-minded and willing to ask for help. They understood they could not know it all, but that there are people around them who have the information they need. If there are not, then there are other resources such as searching the Internet and using their PLNs to find the needed information. They also understood that mistakes can happen on a first trial with a new technology, but that should not stop them from trying again. They learn from their errors and use those experiences to better their knowledge of the technology. The information learned from failing is now something they can share with their teachers. They can show them what *not* to do and encourage them to persevere.

Principals will benefit from knowing what it takes to be a technology leader. ISTE has clearly defined these within their framework, and districts need to provide this resource to principals. Some principals struggle with technology integration and leading with technology, so ISTE's framework is a valuable resource that can be used to give them the guidance they need to be successful.

Manage the challenges. The challenges faced by the principals is consistent with the research. The principals faced challenges with resources, which could be infrastructure or budgetary. Many infrastructure challenges are fixed by the districts so the principals' schools can be one-to-one, but in the rural area this is still a challenge. Also, the budget for principals in their respective districts causes challenges because not all schools have the same financial resources. Some principals had to be creative in providing their schools with the needed resources to be

successful with technology. There also was inequity in the budget, which was a challenge for some principals. Those principals with a smaller budget had to be creative by finding community partners for their schools so that the students would have the same technological advantages as some more affluent schools.

Resistance by teachers also was a challenge for the principals, which matches the literature as well. The resistance for the principals came from teachers who were just scared of change, or they believed the new technology would come and go, which can happen often in a school. The principals believed this could be alleviated by using professional development that trained the teachers on a tool and then showed them how it could be used effectively in the classroom. Also, if part of the professional development were ongoing, questions could be answered, and feedback given about the teacher's instruction. The principals also believed that if they had a vision for the tool and shared this with their staff they could build more of a buy-in from their teachers in the use of the tool.

Challenges are going to be faced by principals when they are integrating technology, but knowing how to face these challenges to limit the struggle is important. The challenges faced by principals with technology integration has been discussed in the literature, and it was further revealed from the study. Since these challenges are known, districts should help prepare principals to limit the amount of challenges they may face. Districts should work with principals to and develop strategies to limit resistance by teachers. Discuss the possible ways they can be successful so when the principals are faced with the challenge they are prepared to handle it.

Implications for Research

The findings from this study show there are areas where further research would be beneficial. First, a quantitative study could be done by measuring responses in different parts of

the country to see if principals learn to be technology leaders in the same way. There may be factors that affect their reasoning based on where their district is located. Similarly, there could be a study to see if more challenges are faced by principals in different parts of the country that affect their ability to lead with technology. Resources are a major challenge for the principals in the study, so more research could be done to see how resources affect technology leadership. There could also be a mixed-methods study to see if a principal's perception of themselves being a technology leader matches what their staff believe of them. The principals could be interviewed, then their staff surveyed to see if the two perceptions match or whether there is a difference in perception between the principal and their staff. Also, how are these perceptions affecting technology integration in a building? If the principal is unaware of how to lead effectively with technology, they may believe integration is successful, but the teachers who are using the technology daily may provide a different insight into how the technology is being used.

Concluding Thoughts

There is still opportunity to learn more about how principals learn to be technology leaders. With the growth of online learning and social media, these are possible ways to allow principals to learn without having to leave their office, since finding the time to attend formal sessions is a serious obstacle for many principals. Also, providing professional development that is meaningful for the principals is extremely important because they also admit to not having enough time, so if they attend a professional development course that takes time for them away from the building, it needs to guide their learning. Providing feedback on effective use of technology in the building, and what to look for on walkthroughs and observations would greatly improve support for teachers and confidence levels for principals who feel uncomfortable in their own knowledge of technology.

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APPENDIX. PRINCIPAL INTERVIEW PROTOCOL

1. Tell me about yourself and your background in education.
2. When you think of your job as a principal, what are some problems you have encountered with being a technology leader?
3. Can you tell me a specific personal example about a time you experienced this problem?
What is a possible solution?
4. When you think of your job as a principal, what are some successes you have encountered with being a technology leader?
5. Can you tell me a specific personal example about a time you experienced this type of success?
6. How has your education as an educational leader prepared you to work with technology?
 - a. Describe any training you have had in the use of technology.
 - b. How has this training helped you develop your skills as a technology leader?
7. What skills do you believe are needed to be a technology leader?
 - a. How did you learn those skills?
8. What do you believe is the hardest struggle of being a technology leader?
 - a. What obstacles exist that prevent implementation of instructional technology?
9. What would be the most effective way to make sure a principal acquires the needed training to be an effective technology leader?
10. How would you describe your role in technology leadership in your school?

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