UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

TECHNOLOGY COMPETENCIES OF OKLAHOMA PRINCIPALS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF EDUCATION

By

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Norman, Oklahoma
2020

TECHNOLOGY COMPETENCIES OF OKLAHOMA PRINCIPALS

A DISSERTATION APPROVED FOR THE DEPARTMENT OF

EDUCATIONAL LEADERSHIP AND POLICY STUDIES

BY THE COMMITTEE CONSISTING OF

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Acknowledgements

Chokma! Chikashsha saya. Holhchifoat Kara. First, I would like to acknowledge the Chickasaw tribe for their support of education and without their financial assistance, I would not be in this profession or have attained this level of education. Chipilsala'cho

Second, I would like to thank the chair of my doctoral committee, Dr. Angela Urick. She has been a tireless supporter of my writing and continued to check in on me throughout the process of this dissertation. Her knowledge and expertise in statistics has been invaluable to the research I was able to do and she was available anytime I needed help. The graduate working group at CEDaR has also been a particular source of help to me during the final phases of my writing, Nahar, Stephanie, Casey, and Dorothy were available to answer any questions that I had and provided their individual expertise from IRB through my statistical analysis.

Next, I would like to thank the members of my committee, Dr. Theresa Cullen, Dr. Curt Adams, Dr. Jeffrey Maiden, and Dr. John Jones. Dr. Cullen has always lent her technology expertise and assistance when needed and has provided moral support along the way when I have seen her at professional development gatherings. Dr. Maiden, I'm no longer "Dr. Wannabe" I appreciate your help and encouragement anytime I needed it.

Finally, I would like to acknowledge my cohort from Putnam City. We started on a journey seven years ago and this work is a culmination of all the things that you helped me learn along the way. To those who came before me thank you for pushing/encouraging me to finish. Dr. Sunie Killam, Dr. Stephanie Hinton, Dr. Keely Frayser, Dr. Twylla Hester, Dr. Meridith Wronowski, Catherine Carnline, Courtney Keck, Ronald Grant, Wayne Balzar, and Dr. Melonie Hau. We are a group with such great potential and I can't wait to see the accomplishments of our cohort going forward.

Dedication

This dissertation is dedicated to every teacher, coach, administrator, mentor, and colleague I have had the opportunity to learn from and work with in my 17 year career. You are all truly the reason why I'm still working in education. The knowledge and encouragement that was poured into me by each of you is the reason that this paper exists. To my study group, Cathie aka "my school mom", Keely, Stephanie, and Courtney, you have all helped keep me on track and brought me to the finish line even when I felt like giving up or that I couldn't do it. You never let me fall without giving me a hand to get back up.

To my family, I appreciate your support through the long hours that I work and the number of games, events, and gatherings I missed because of homework or writing. I know my "Grams" would be so incredibly proud of "Little Kara" becoming a doctor. To my parents, Gary and Connie, I am eternally grateful for everything you have done to support me and I love you to the moon and back. To my siblings, Kely and Kortny I'm not sure who wins the betting pool but I'm still the first doctor in the house! To my nephews and niece, Koby, Bryson, and Juliana, I hope you know how much I love and care about you, someday I hope to see you all become what you are meant to be and know that the sky is the limit.

To my friends, the few who remain after 7 years of limited socializing. I would not be here without your support and friendship. Carla Young, you are next up to finish.

To my best friend, Dr. Ivana Beatty, you inspire me on a daily basis whether it's work or just being you. Getting to watch you finish your dissertation kept me moving towards the finish line. You have walked by my side through this journey for the majority of it and provided whatever the moment needed. Your encouragement and support have meant the world to me and I would never have made it this far without you. Thanks for keeping my feet on the ground!

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Abstract

This research seeks to describe the technology competencies of Oklahoma principals in K-12 schools. The survey instrument that was utilized for this research was the Principal's Technology Leadership Assessment. Technology leadership is a huge part of school leadership today and this research was conducted to give a snapshot of technology competencies in Oklahoma principals. This study also sought to find the impact that technology access for administrators and one-to-one devices had on the technology competencies of school leaders.

Keywords: technology competencies, administrators, principals, one-to-one technology, technology access, PTLA, k-12 schools, and Oklahoma

Chapter 1: Introduction

Large amounts of money are spent every year on education technology in public schools, (Dexter, Richardson, & Nash, 2017) devices are purchased, professional development and training for teachers is provided. The questions remain: do Oklahoma principals have the technology competencies required to lead technology implementation plans, what are those technology competencies, and what is the relationship between those competencies? Student learning takes place within schools either in the presence of technology or the absence of it. Ultimately, building principals are responsible for this task and all facets of implementation (Levin & Schrum, 2013). The importance of effective technology leadership becomes so much more important when technology is the central tool for delivering instruction and creating student learning artifacts. Increased investment in technology requires strong leadership but also consistent funding, training for teachers and technical support of the technology being integrated (Anderson & Dexter, 2005; Christensen et al., 2018; Dexter et al., 2017).

For many schools in Oklahoma, money to hire teaching staff has been prioritized over technology simply because funding cuts have required strict budgeting, which forced many to choose between staffing and technology. Even though technology has become widely available in schools because the cost has decreased, schools have to make considerations for technology spending and support based on their available federal, state, and local funding. This disparity is caused by several financial issues that exist in Oklahoma. Oklahoma does have some school districts that have purchased and currently use one to one technology, the problem is a matter of access and building leadership capacity for the technology. The problem is knowing the competencies that influence technology leadership of building principals in schools by looking at the relationship those competencies have with each other. Many states have been utilizing technology for students on an individual basis for well over 10 years, more specifically they started using technology in 2001 in some states (Stallard & Cocker, 2015). Oklahoma has only begun using one to one technology in schools since 2010 and has very little existing infrastructure. This shift in technology tools being used in schools requires a change in the skills focus for building principals from instructional and leadership competencies to one that adds technology competencies as well.

Beyond the learning of traditional skills and content, technology is part of the landscape in the 21st century in business and industry. Changing the narrative about technology is about moving to teach those 21st century skills that students need to possess in order to be successful in the world around them. Collins (2017) argues that schools are not teaching those skills to students in a productive way. The U.S. Department of Education, Office of Technology, has found these skills to be so important that they are discussed in both the National Education Technology Plan (NETP) and a separate Future Ready Schools initiative. Dependence on technology becomes stronger every year that the technology exists so the education system has to keep pace with supporting student, teacher, and leader competence with the technology in order to continue provide a viable curriculum and learning experience to the future workforce being trained in today's classrooms.

The challenges of implementing technology into learning are certainly worth noting with the current climate of accountability and limited budget constraints in Oklahoma. Money, being the first and foremost of these challenges. Schools are faced with the question of whether to spend their bond money on aging buildings, tornado shelters, and transportation or technology. When choosing between those options, safety of students and staff is the priority for many school districts. Technology brings little to the table when it is competing with safety in the eyes of many taxpayers and stakeholders. Even in districts where the choice may not be limited between bonds and general fund dollars, such as Title I schools, then the decision becomes a toss-up between hiring teachers or purchasing technology. Finally, if the state or federal government are not an option at all for districts seeking to fund technology, then the remaining funding source becomes state technology grants. The K-20 Center at the University of Oklahoma partners with Oklahoma Education Technology Trust to provide individual schools the opportunity to compete for funding technology every year ("Oklahoma Education Technology Trust," 2019).

Implementation of any school-wide technology requires careful planning, clear vision, and indicators of effectiveness (Brooks-Young, 2013; International Society for Technology in, 2000; ISTE, 2009). A planning process for the implementation of an overall framework and vision for learning is essential to the success of any technology implementation ("SETDA Resources," 2018). Leadership competence becomes critical to insuring the success of technology being implemented within a building when money is heavily invested for students and teachers to utilize the tools being provided.

Planning the overall utilization of technology within a building helps insure the technology aligns with other important pieces like the vision, instructional plan, support tools, culture, community and embedded professional development of the school's strategic planning process. Organizational change is required if the culture of the building is resistant to changing their instructional design from repetitive skill practice of the past to the personalized learning tasks of the present (Saettler, 2004). Collins and Halverson (2009) describe the problem accurately comparing the previous methods of instruction to riding a bike and the new methods of instruction to driving a rocket ship. The tools used in schools versus the tools used in the career world are getting further apart. All curriculum goals seek to allow some form of autonomy to both the teacher and the student to show they have achieved the learning objective. The goal of instruction seems to be having desired outcomes for students to demonstrate mastery of skills but with some degree of automation for the teacher to pre-assess and post-assess the skill mastery (Saettler, 2004). Today, the idea of personalized learning has become less of a daunting task because the technology provides a scaffold that can be redesigned in many different ways to produce the same learning outcome.

Problem Statement

The challenge for technology leadership competence becomes how to effectively implement the technology and best utilize the investment in the resource. Lehmann and Livingston call one to one technology “a disruptive technology – one that challenges the norm of traditional schooling” (p.76, 2012). They also discuss how the change in teaching style creates a need to make the technology both “necessary and invisible” (p. 77, 2012). This mindset also creates a need for each role player to fully invest in their job whether that is teacher or student, once that happens then it becomes more about the process than the technology or product (Lehmann & Livingston, 2012). At the same time, remaining true to the goal of providing deeply authentic learning tasks for students and support for teachers to create those tasks with the technology as a supplement to the learning task.

Principals serve a primary role in technology leadership competence in schools (McLeod, Bathon, & Richardson, 2011). Defining effective principal technology leadership becomes critical to the future of technology utilization because a significant monetary investment has been made in schools to purchase devices to individualize instruction. The principal’s job is to guide the teachers into a new pedagogy that allows them to focus on learning goals with students that prepare them to work in a world where the skills they need to master may not be defined yet.

Primarily, the role of the principal is to lead teachers in a way that the conversation becomes less about the technology and more about what they do with the technology (Lehmann & Livingston, 2012).

In closing, Rose (2014) sums it up very nicely in “Why School”,

> When will we stop this distracting and, in fact, expensive worship of the new technological system or device and settle into the less enthralling but more substantial recognition…any other wonder, from digital games to the most recent statistical procedure – will only be as useful as thinking about their use, the depth of learning we want to achieve, the kind of education we want to foster. (p. 159-160)

Policy Context

National Context

ESEA

Education technology has been a part of the national landscape since the passing of the first Elementary and Secondary Education Act (ESEA) in 1965. This legislation began the federal involvement in technology funding for schools beginning initially with schools that had high poverty populations ("Elementary and Secondary Education Act," 1965). This legislation has undergone many changes throughout the successive years and those changes have provided more opportunities for technology to become a consistent tool of the trade in education.

The revisions of ESEA have changed funding for students in poverty, at-risk students, minority students, and second language learners. The initial bill was revised in 1968 to provide help for students learning a second language and at-risk students (Olson, 1985). In 1970, it was again revised because schools were using it to supplant not supplement local funding. A 1978 revision brought schoolwide Title I, this allowed schools where 75% or more students are in poverty to spend that money on schoolwide programs not just on their students of poverty (Klein, 2015b). The creation of the US Department of Education in 1979 increased federal involvement in funding of schools. Title I, as it is currently known from the 1994 revision of ESEA, provides some funding for technology purchases and Title IV also provides some of that funding (Klein, 2015a). The No Child Left Behind Act in 2001 was the biggest re-write of the ESEA since it was initially passed in 1965 (Klein, 2015b).

The current legislation that provides guidance to states and school districts is the Every Student Succeeds Act (ESSA) of 2015. This legislation authorizes the US Department of Education to provide funding and resources for states in the area of educational technology ("Every Student Succeeds Act," 2015).

Nationally, schools receiving Title I funding on an annual basis are required to complete a schoolwide plan to insure that the goals of improving student outcomes are met ("Every Student Succeeds Act," 2015). The process of school improvement through use of federal dollars is an important planning tool for increasing learning outcomes for all students. There is no requirement today for technology to be interwoven throughout the school improvement plan for Title I schools. A small portion of funds for Title I can be spent on technology; however, it is still only a small component. There is no legal requirement in ESSA for states or school districts to complete a technology/learning strategic plan that could be followed or implemented for a multi-year process to increase the technology skills that students are leaving school being able to demonstrate("Every Student Succeeds Act," 2015).

E-Rate and U.S. Department of Education Guidance

The US Department of Education (USDE) also provides guidance with respect to the federal funds that are available to schools to spend on technology from the following ESSA legislation Title I, Title II, Title III, and Title IV. School districts also receive funding for technology from the Individuals with Disabilities Education Act (IDEA) and E-rate funding through the Federal Communications Commission (FCC). The FCC made some important changes in technology planning requirements for school districts in 2014 and the eligibility guidelines now are more inclusive for smaller school districts to increase their funding for technology infrastructure. The requirement for a three year technology plan for E-rate funding changed and now only requires an annual plan because of the frequent changes in technology ("E-Rate Eligibility," 2018).

School districts that receive federal E-Rate funding are required to complete paperwork annually in order to continue receiving discounted internet service ("E-Rate Eligibility," 2018). E-rate funding is only a small component of the technology picture, a school is required to have internet connectivity to support any technology implementation but that is almost a foregone conclusion for schools today. It might be required but it is certainly only a small piece of the technology pie when considering one to one technology in schools. The biggest drawback to E-rate funding is the amount of funding is based on the same formula as Title I free and reduced lunch qualifying students. According to Oklahoma State Department of Education records, 61.28 percent of enrolled students were eligible for free or reduced lunches in 2017-18 ("Oklahoma Education Fast Facts," 2019). The school districts in Oklahoma that do not receive this type of funding are completely dependent on local sources of funding for technology initiatives.

Nationally, schools receiving Title I funding on an annual basis are required to complete a schoolwide plan to insure that the goals of improving student outcomes are met ("E-Rate Eligibility," 2018). The process of school improvement through use of federal dollars is an important planning tool for increasing learning outcomes for all students.

School districts can look to several places nationally to help move their district from the traditional resources in schools that have been used in the past into the newer resources that are available through the use of digital tools in a national context. A number of resources from the State Education Technology Directors Association (SETDA) helps facilitate the processes that are increasingly necessary for schools to be successful implementing technology in today's educational environment ("SETDA Resources," 2018). This process is an important way to guide implementation and make sure that the goals of technology implementation are aligned with the goals of the school for student learning. Multiple initiatives exists through the USDE Office of Education Technology to insure schools have the tools to successfully fund and implement one-to-one technology initiatives including a Dear Colleague Letter, the National Education Technology Plan, and Future Ready Schools(Technology, 2016; Office of Education Technology, 2017; Office of Educational Technology, 2017).

The Dear Colleague Letter serves as direction for school leadership to identify sources of funding available through ESSA for funding technology through federal funds. The purpose of the letter starts with the multiple sources available and allows schools to access all information relevant to securing those funds through application processes.

National Education Technology Plan

The National Education Technology Plan (NETP) from the US Department of Education Office of Education Technology is a consistent source of information in the area of one to one technology. This plan has principles that are aligned to current policy requirements from Title IV Part A, and are intended to assist states and districts with their technology plans and implementations (Office of Educational Technology, 2017). This plan has recently changed to being updated every two years in order to keep up with trends in technology. The overarching theme in the plan is looking at ways to effectively support teaching and learning through the use of technology. In a larger sense, the NETP helps leaders look at national trends and successes in order to better form their own technology plans to assist with effective technology use at a more local level.

Future Ready Schools

The Future Ready Schools in the United States are part of a technology initiative of the Office of Education Technology to help schools prepare students for 21st century skills (Future Ready Schools, 2017). Their framework is one that provides a good roadmap for schools to look at to accomplish their technology goals. One-to-one technology is almost required to meet the demands of 21st century learning. Each school district needs a group that includes all stakeholders from instructional to financial to technology to leadership to teachers to students, in order to develop a shared vision regarding the direction that learning will take within their schools (Future Ready Schools, 2016). This recommendation is a critical part of any technology plan and district leadership must not only be aware of the need for it but they must lead the process and conversation in their school district. Unfortunately, at this time, the planning process provided through this initiative is only a recommendation and not a requirement within education policy in federal law. Schools can choose to follow it if they think it is important enough to follow. Unlike school improvement planning policy which requires schools to complete a plan annually, technology strategic plans are only done at the direction of the local school board and district leadership.

State Context

The state of Oklahoma has followed some of the national trends for implementing instructional technology in the classroom. Looking at a comparison with other states, California had schools implementing individual technology for students as early as 2002 (Cuban, 2013).

After looking at the national strategic plan for technology, and then going to the Oklahoma Department of Education website, it is clear that one thing is missing. SETDA shows that Oklahoma does not have a digital learning plan and school districts are not required to create one either ("SETDA Resources," 2018). As discussed in the previous section this planning only gets completed if local district leadership choses to do the planning. Oklahoma education policy currently does not require technology plans. Funding sources as far as technology goes in Oklahoma come from either federal dollars, grants, or local tax revenue levied through bond issues.

State Funding

According to the SETDA website, Oklahoma does have dedicated funding for digital resources from the line item for textbooks (SETDA, 2016). This funding was not allocated for 2017-2018 school year (SETDA, 2016), which creates another issue for schools that have implemented technology or would look to implement it. Schools that adopt technology must have several things to make the implementation successful. A large part of the problem that presents itself with technology implementation in Oklahoma is the funding sources for the technology to be used.

Bond Issue Funding

Many schools in Oklahoma have funding resources both from federal Title I money to implement technology and local bond funds that can be passed in order to upgrade technology (US Department of Education, 2017). The schools that do not receive federal funds are forced to upgrade when a bond issue can be passed.

Oklahoma schools rely on local bond issue funds to purchase technology and passage of bonds in Oklahoma has been found to be more successful when technology was included as part of the bond issue (Beckham & Maiden, 2003). The importance of this funding has to be emphasized because schools in Oklahoma are reliant on bond funding for technology initiatives. Larger school districts, however, have a different problem related to bond funding because they have a high demand for capital improvements (Bowers & Chen, 2015) that must be balanced with the technology needs of the district. Many factors have to be considered in the process of securing bond funding, which most recently is focused more on the capital improvement funding than it is on technology (Beckham & Maiden, 2003; Bowers & Chen, 2015; Bowers & Lee, 2013) This problem has caused many districts to look to their patrons in order to provide for the technology needs of their school districts.

Grant Funding

The Oklahoma Education Technology Trust was established in 2001 in a partnership started by then Attorney General Drew Edmondson and AT&T. The trust started to help the state comply with the Telecommunications Act of 1996 and increase the access that schools had to technology and technology infrastructure. The OETT began a partnership with the University of Oklahoma around that same time and the K-20 Center was established as well. Since it was established and the first grants were awarded in 2003, 289 schools have received these grants (K-20 Website). The number of grants each year differs based on the applications and individual schools are responsible for applying. Principals are responsible for the application process once they have attended training from the K-20 Center which is required. This model supports the ideas set forth in this proposal for principals to serve as the technology leader with a leadership team in their building.

Education policy continues to evolve in Oklahoma and in the United States as technology advances are made every year. Education technology policy has to meet the needs of schools and learning in order to provide guidelines for leadership to make the best decisions regarding the use of devices to support learning (Dexter et al., 2017; Richardson, Sauers, & McLeod, 2015). Strategic planning by the Oklahoma Department of Education and US Department of Education continues to provide schools with guidelines and best practices to implement technology effectively (Office of Educational Technology, 2017). Policy has the power to shape the future of schools by providing opportunities for all students, utilizing the best tools available to students and teachers.

Purpose Statement

Technology tools have long been a part of the educational landscape for teachers and principals as well as the leadership needed to implement them. The experience of a teacher in their classroom with technology shapes how much they can accomplish with student learning in the classroom. Currently technology and education have had a long-standing relationship beginning with the pencil, the book, computers, and internet-enabled devices (Saettler, 2004). However, teachers and effective technology integration can have the biggest impact on student learning and achievement in the classroom (Polly, Mims, Shepherd, & Inan, 2010). Effective school principals are the next closest factor besides the classroom teacher affecting student achievement at all levels of K-12 education (Leithwood, Harris, & Hopkins, 2008). Spending on technology in public schools currently numbers in the billions of dollars and much of the focus on that spending is geared at reducing the student to technology ratio down to a single device for every student (Dexter, Richardson, and Nash, 2017).

Educational leadership requires a lot of skills today and especially considering the amount of technology available to teachers and students in the classroom. The need for educational leaders to have technology expertise has increased exponentially as new technologies become available in education. Militello and Friend (2013) describe the role reversal that occurs often because of technology inexperience forcing teachers into the role of learner, which can be an uncomfortable place for many. Teachers are used to being the expert in the room and technology causes a shift that results in students becoming the expert. One-to-one technology programs have become so commonplace in many states that it has created a need for technology skills to be distributed throughout K-12 schools in teachers, building leadership, technology specialists, and district leadership (McLeod, Bathon, & Richardson, 2011). One-to-one technology research is increasing as the funding needed to implement such initiatives becomes available to more school districts. In fact, some states have had one to one initiatives going for over 10 years (Stallard & Cocker, 2015). The implementation of these type of programs has necessitated a different kind of leadership for technology in schools, instructional leadership has always been the focus of principals but the increase in technology requires a technology leadership component to be part of instructional leadership.

Technology leadership in educational instruction initiatives is incredibly important in K-12 education because of its impact on learning in the classroom and potential to create lasting change of day to day instruction (Leithwood, Harris, & Hopkins, 2008) . Technology leadership has the most potential to change the educational climate and culture of today's educational landscape.

Research Questions

This study seeks to answer the following research questions:

1. To what extent do principals in Oklahoma schools possess technology competencies?
2. Is there a difference between the technology competencies principals possess in schools based on the level of access they have to the technology?
3. What are the relationships between these technology competencies that principals possess?
4. What are the differences between principals with one-to-one and not one-to-one technologies?

Definitions

Educational Technology - Educational technology is defined by Spector as, "The disciplined application of scientific principles and theoretical knowledge to support and enhance learning and performance (Anglin, 2011)."

One to One Technology – A school environment which provides an internet-enabled device for each individual student. Examples of this type of technology would be a laptop, an iPad, a Surface tablet, or any other tablet computing device.

Technology Competencies – Different skills that are required for accomplishing different tasks that are required of school administrators. These skills are constantly refined and redefined by the demands of the job that school principals do. The International Society for Technology in Education (ISTE) has redefined these recently.

Technology Leadership-The ability to create a learning ecosystem for students and teachers in a K-12 education setting (Papa, 2015). The role of leader in this setting requires both a personal and professional commitment to understanding and use of technology (Papa, 2015).

Instructional Leadership – Providing resources and support for teaching and learning within a school. Insuring that structures are in place to provide professional development and all necessary resources to provide engaging instruction.

Chapter 2: Literature Review

Over a billion dollars is spent every year for education technology and resources in schools, (Dexter et al., 2017). Money is spent on devices, teacher training, and support of the devices. Building leadership of technology initiatives is important because the investment of resources demands that results happen in schools. Learning will happen in schools with or without the help of technology, but building principals are the gatekeeper to make sure that technology is used and in an effective manner (Anderson & Dexter, 2005). Potential benefits to increased use of technology in schools are increasing engagement because it is centered more around the interests of students and competition for the enrollment of students in schools (Collins & Holverson, 2009). A number of leadership characteristics are necessary for the technology use to be effective in schools: vision, focus on learning outcomes and curriculum, teacher professional development, and support (ISTE, 2009; PSEL, 2017; NETP, 2017; Hitt & Tucker; 2016). Technology leadership is critical to the learning environment in classrooms today because teachers and students use technology for a majority of their tasks in classes. Building principals are the most important part of accounting for effective technology use in schools especially as it relates to one to one technology initiatives. As leaders navigate the accountability system and standards-based curriculum (ESSA, 2016; Collins & Holverson, 2009), technology integration has the potential to bridge the achievement gap by allowing for more personalized learning (NETP, 2017). It is also important to define technology leadership because today it is so often delegated to the “techie” person in a leadership role, when best practice for instructional leadership necessitates that instructional leaders have solid technology leadership as part of their leadership style. Technology leadership is defined as creating an ecosystem for teachers and students, as well as commitment to using technology and learning how to use technology

(*Technology Leadership for School Improvement*, 2011). Creighton even defines the type of leadership needed for technology as "entrepreneurial leadership (2011, p. 5)", looking for new ways of doing things regardless of whether the process or product needed to execute a plan actually exists.

The US Department of Education Office of Technology has found these skills to be so important that they are discussed in both the National Education Technology Plan (NETP) and the Future Ready Schools initiative which began in November of 2014 (Office of Educational Technology, 2017). The NETP provides a vision for educators to impact learning in schools and gives both examples and advice for all levels of education technology in K-12 schools. It also provides a snapshot of technology across the country by giving some updates to different parts of the previous plan in 2010. Several components of the NETP will be discussed more in depth in later sections of this literature review. Future Ready Schools was started in 2014 to help jumpstart state participation in technology planning and get schools to focus on different elements of student learning involving technology immersion (Technology, 2016). A connection to Oklahoma exists only through a handful of superintendents that have taken the pledge to be a Future Ready Leader. Oklahoma has not taken part in this initiative at a state level and this shows where part of the problem with technology leadership in Oklahoma lies (Technology, 2017). Oklahoma has to look at technology leadership from the classroom level all the way up to the state level if we want to effectively impact learning in the classroom with technology.

Oklahoma provides a good context for this study for many reasons, technology has become the central focus for many schools looking to save costs on learning materials and other resources. Schools have become focused on delivering high quality content at a lower cost which requires each student and teacher to have the same device in order to best utilize the technology.

Principals are still the person usually charged with leading the technology implementation and providing support to teachers (Christensen et al., 2018). Given much of the policy resources and planning at the national and state level, studying the technology competence of leaders is important in Oklahoma. The amount of investment from a monetary standpoint requires that implementation of technology has a high quality of return for school districts. Oklahoma schools and principals deserve to have a level of support in this endeavor because the future of education is relying on the success of technology centered instruction for students.

Synthesis of Problem and Current Literature

The central problem for this research is the amount of money invested on devices to deliver instruction but the need for additional support for teachers and administrators to implement the technology in an effective way. Looking at the problem from the technology competence of the building leadership will add a perspective that is critical to the success of any learning initiative and informs policymakers, school leaders, and school boards for future investment in the technology sector of education.

There are a significant number of ways that technology can be used and integrated into educational practice and pedagogy. The importance of technology competence in principal leadership needs to be studied because a principal's support of instruction has a potential for the largest impact on student learning (Christensen et al., 2018; K. Leithwood & Sun, 2012). In the day to day operations of schools for supporting teachers in classroom learning and instruction, the principal is the primary decision maker in almost every case. Continuing to improve the technology experience of principals will only serve to increase the the experience of the teachers and students served by those principals (Christensen et al., 2018).

Principals need to be both a user of technology in their own right, as well as facilitating learning time for their teachers to become more proficient users of technology (Anderson & Dexter, 2005). Few studies have looked at the impact of educational leaders and their technology experience with large scale implementation initatives (McLeod, Richardson, & Sauers, 2015a). Most studies that have been done at this point are evaluating the role of the student or teacher in technology initiatives. This is problematic given that the change leader in many instances is none of those people, it often falls to a principal to make decisions on a day to day basis regarding the implementation of technology within a school (Anderson & Dexter, 2005; Christensen et al., 2018; Schrum & Levin, 2013).

Many different themes of the literature have come out of the reading for this research, consistently the themes of creating a shared vision/values, learning outcomes and curriculum, building professional capacity, and supporting learning/system design. These themes are listed in the table below alongside the corresponding leadership standards/frameworks from current literature and they are addressed in Chapter 3 by the survey instrument that was chosen for this research proposal. Those themes are organized into the following sections of the literature review and are included for the research value they provide to supporting the need for further technology leadership research. The articles studied in this review show mostly qualitative research methods because vision is more conceptual than literal and measurable. Leadership/institutional factors are addressed in many areas as being a significant influence on technology use and leadership in schools (Anthony, 2012). A significant gap exists in the literature with respect to leadership for technology and quantitative methodology.

Table 1 Leadership and Technology Standards for Principals

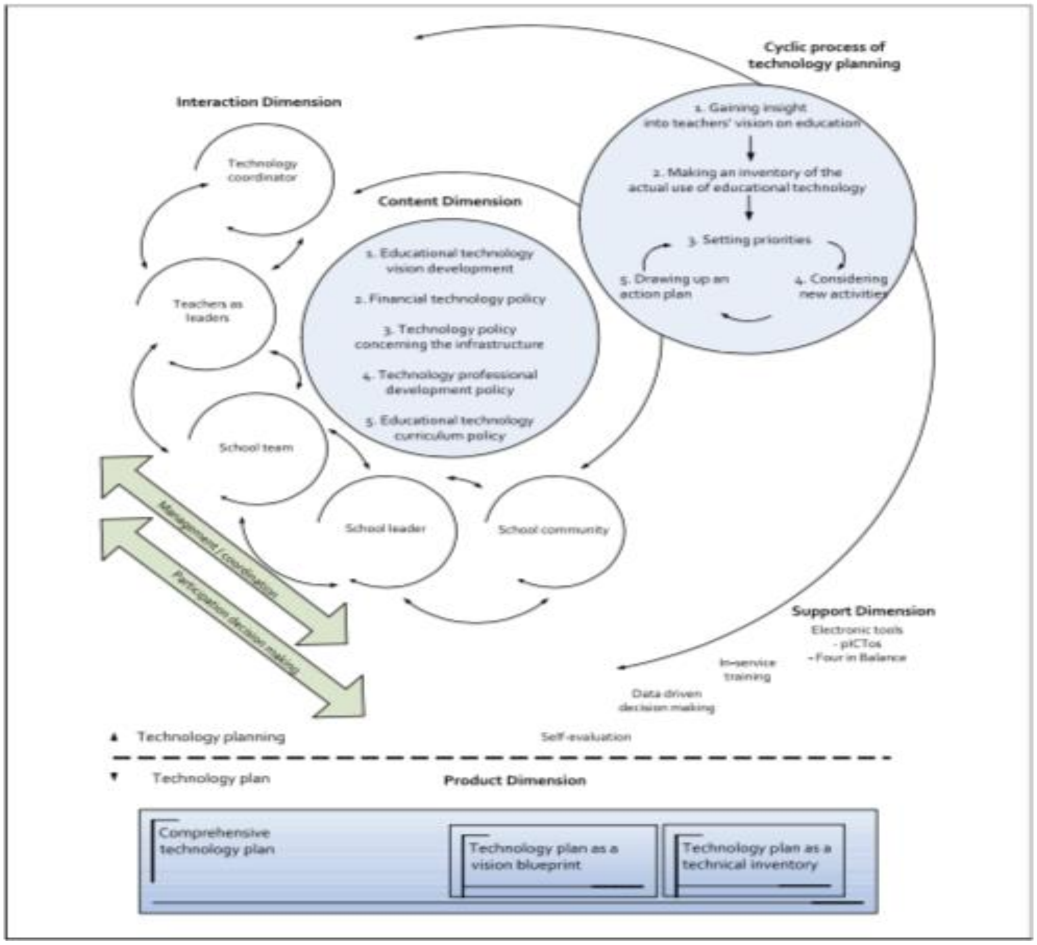
Technology Leadership Themes	International Society for Technology in Education Educational Leader Standards 2009	Professional Standards for Educational Leaders 2015	Hitt and Tucker 2016 Unified Domains of effective leader practices
Creating a Vision and Shared Values	Visionary Leadership (Standard 1)	Mission, Vision, and Core Values (Standard 1)	Establishing and conveying the vision
Learning Outcomes and Curriculum	Digital Age Learning Culture (Standard 2)	Ethics and Professional Norms (Standard 2)	Facilitating a high-quality learning experience for students
Building Professional Capacity	Excellence in Professional Practice (Standard 3)	Equity and Cultural Responsiveness (Standard 3)	Building professional capacity
Supporting Learning/System Design	Systemic Improvement (Standard 4)	Curriculum, Instruction, and Assessment (Standard 4)	Creating a supportive organization for learning
Equitable Opportunity/Community Involvement	Digitial Citizenship (Standard 5)	Community of Care and Support for Students (Standard 5)	Connecting with external partners
		Professional Capacity of School Personnel (Standard 6)	
		Professional Community for Teachers and Staff (Standard 7)	
		Meaningful Engagement of Families and Community (Standard 8)	
		Operations and Management (Standard 9)	
		School Improvement (Standard 10)	

Vision

One of the most emphasized points in the NETP section on leadership focuses on the creation of a shared vision. Technology by itself is just a tool but the creation of a plan which includes all manner of stakeholders can be part of that vision will help set goals for the program and give a direction to it (Office of Educational Technology, 2017). Technology leadership consistently requires a clear vision as stated in NETS*A standards (ISTE, 2009), PSEL standards (CCSSO, 2015), and leadership practices (Hitt & Tucker, 2016). Vision, mission, and core values are such an important part of all leadership that those are the first standard for leaders in the PSEL standards (2015). Literature from the leadership area consistently identifies vision as the most important attribute that impacts classrooms no matter the role that the leader plays in their educational job (Anderson & Dexter, 2005; Jingping & Leithwood, 2015). An important term from this leadership literature is distributed leadership, which is a concept that is central to vision in technology leadership. Many times schools focus on the technical support aspect of technology leadership with their technical staff but stop short of insuring that organizational leaders within schools and districts have the technical expertise to help vision and lead a technology initiative (Anthony, 2012; Bennett, 2009) The articles included in this section of the literature review retain a focus on the vision of the technology leadership being studied.

An important part of vision in the planning process is related to strategic planning of the overall technology implementation, Vanderlinde and Van Braak (2013) created a framework for technology plans and the technology planning process. Figure 1 shown on the following page is the most comprehensive concept map for developing a technology plan in the literature that was reviewed. It serves as a starting point for the development of a district vision and planning process.

Figure 1 Vanderlinde and Van Braak Framework



(p. E15)

This process provides relevant guidelines about the importance of distinguishing between a process and a product with reference to technology plans. For technology plans leadership standards such as the PSEL (2015), ISTE (2009), and key leader practices from Hitt and Tucker's leadership literature review (2016) are extremely useful for looking at leader behaviors to create outcomes, and this framework provides many of the key components in leadership standards and literature. Goals for continuous improvement are essential to any good planning process, and many parts of this process would be useful for curriculum implementation as well. Evaluating the effectiveness of technology implementation is extremely important to the sustainability of technology integration. Creating a vision for leadership was discussed at length as an important piece of the planning process for training principals (Leithwood & Jantzi, 2005; Richardson, Flora, & Bathon, 2013).

Visioning by a leader and a group of stakeholders in a school runs through each study that shows positive results and successful implementation of technology in schools. The leader has both the positional power and the community buy-in to implement a technology successfully. A common theme throughout technology literature in leadership journals is the importance of the leadership providing a clear purpose and vision for the school they are leading (Anderson & Dexter, 2005; Christensen et al., 2018; Dexter et al., 2017; McLeod et al., 2015a).

For example, Berrett, Murphy, and Sullivan (2012) helped to explain a principal's role in creating a vision for implementation of technology in schools. This study describes vision in a much clearer picture because the qualitative methods tell the story to the need for clear vision in the technology implementation process. Building principals were interviewed using questions that outlined their role in the technology process. This study was conducted in a district that clearly had a strong vision for the implementation plan because the role of the principals was very much a facilitator of a team, which leads to the conclusion of the necessity for strong visionary leadership in the process of implementation. Vanderlinde, van Braak, and Dexter (2012) also mention the importance of a common vocabulary related to technology and making it a part of the school culture. Leadership roles do not have to be occupied by the building administrator but rather a group of invested faculty members can be led by the vision of the leadership in both the school and district. Again going back to the idea of distributed leadership making technology implementation align more closely to a clear vision for the process (K. Leithwood, Jantzi, & Mascall, 2002; K. A. Leithwood, Mascall, & Strauss, 2009).

The more supportive and helpful the administrator can be in the implementation, the higher rate of success each school will have (Berrett, Murphy, & Sullivan, 2012). The importance of all levels of stakeholders being involved in the process is critical to the successful implementation of any initiative that has an impact on teaching and learning practice in K-12 education. Another key reason why distributed leadership is so important in the technology planning process. A vision aligned with technology standards is not always the vision that is created by school leaders; instructional focus is often the primary goal of the vision process and technology is an afterthought in it (Richardson, Flora, & Bathon, 2013).

For example, Pereira, Baranauskas, and da Silva (2013) use a value pie, a very useful tool to look at big picture of a vision to complete the image of technology's relationship to values and building a literacy or competency based on those values. This research ties values to vision and makes it a part of the culture of an organization. It is frequently difficult to foresee problems with technology implementation, or to describe conflicts with values because the problems are only known after the fact. The value pie that is included provides relevance to the the discussion of creating a vision based on values. Principals could evaluate the aspects of programming by looking at this pie and then assessing organizational needs related to the values that the program brings to the district. This is an important lens through which one to one technology’s worth can be determined because it requires a level of problem solving and question asking that may not have previously been included in the process.

Regardless of program or purpose for education, vision is a critical component of any plan for educational leaders because it provides a focus for everything that a school does. A school without a vision is like a ship with no rudder or sails, it will float but it has no direction or energy. Two of the three main leadership frameworks for school principals list vision as the first standard in the leadership process (Hitt & Tucker, 2016; PSEL, 2015). Vision does more for the outcomes of any type of strategic plan for a school than any other component of the plan because it serves to meet the needs of the culture of the school and the faculty tasked with doing the work of carrying out the plan (Leithwood & Jantzi, 2005).

Learning Outcomes and Curriculum

Technology leadership must have a focus on learning outcomes and curriculum to be effective. The NETP, NETS*A standards, PSEL standards, and research literature all have a version of learning outcomes and curricular focus included in at least one standard (Hitt & Tucker, 2017; International Society for Technology in Education, 2018; National Board for Policy in Educational Administration, 2015; United States Department of Education Office of Education Technology, 2017). Strong instructional leadership is foundational to successful technology leadership because so much of the instruction is based on tasks and pedogogical knowledge. This section of the literature review will focus on outcomes of learning and curriculum related to technology leadership. The intended outcomes of any technology initiative are to create meaningful learning experiences for students, teaching students critical technology skills for their future work, and making learning more engaging for students.

An example study by Walker, Recker, Ye, et al (2012) made a comparison of teacher learning using online tools and project-based learning. It was completed with a control and variable group using one that involved online tools, then using another that had online tools and project-based learning. Study findings showed a significant amount of growth in the pre- and post-assessment of teacher learning with the group that had project-based learning as part of their group. These results are critical to translate into student learning outcomes because students like teachers learn more from doing and using their critical thinking skills to complete a task. Students need more than just online tools they need an objective to meet and the opportunity to use their creativity to meet those learning outcomes of projects. This concept is important for many reasons. The outcomes of this study could be taken into the realm of technology leadership. Adult learning and student learning are not too different in scope. Project-based learning is engaging and encourages critical thinking as well as growth for its participant. This type of learning should be replicated more often with one to one technology to create more learning opportunities for teachers and students.

Meaningful learning experiences for students

This section focuses on literature related to that part of technology leadership, a critical piece to any technology initiative is the learning experience for the student. As a principal, the importance of looking at technology and its impact on student population is critical. Principals are responsible for making sure all of their students receive access to the technology and the learning experiences that can be provided for them with its use (Christensen et al., 2018). The technology tools that are readily available to students in suburban schools are still similar, but the use of them is often limited by school policies. Technology policies must be supportive of the individual learning needs of students, which vary greatly in different areas with high minority, low-socioeconomic status than they are in suburban middle class schools (Garland, 2010).

Assistive technology (AT) and instructional technology (IT) are important means of decreasing a learning gap for students with disabilities by using a device to allow them to stay on pace with their peers (Parette et al., 2013). Principals need to be more aware of the assistive technology that devices can provide today. Many times students could be kept on track with their peers using just a few accomodations that assistive technology can provide. Technology is a great way to modify work for students with disabilities outside of self-contained special education classrooms.

Teaching students critical technology skills for their future work

As a principal, the importance of knowing about digital citizenship is a job requirement, and it must be addressed in any technology plan. Students, parents, teachers, and administrators must all have working knowledge of aspects of digital citizenship in order to better support the involvement of students in the application of technology in their learning process (Hollandsworth, Dowdy, & Donovan, 2011). There is the important issue of a lack of technology standards aligned with content specific standards in education. Pointing to yet another reason why NETS*A standards should be utilized by districts because they align perfectly with student and teacher expectations (Christensen et al., 2018; ISTE, 2009).

Key competencies for learners has been studied in research, just as important as those competencies are the ones required of leaders in technology initiatives (Kukulska-Hulme, 2010). The overarching theme through these competencies is the ability to think critically and to be able to find resources for real-world problem solving. Kukulska-Hulme (2010) studied a program in which the learners were surveyed to develop a better understanding of their technology proficiency and use. The methods used in this study were centered around learner's technology competence but the same survey information could very well inform the leadership competence of the proposed study. Technology competence is a key feature of this research proposal and using a survey to collect quantitative data centered around leadership could provide results to analyze for the competencies of technology leadership in principals.

Students need to know how to appropriately interact given the amount of time spent on social media and accessing information on electronic devices necessitates. Principals have to be aware of these digital citizenship skills because of their growing impact in the lives of students and their education is important (Christensen et al., 2018). Content skills related to technology as opposed to life skills related to technology are unique, and frequently those lessons about the differences are learned in a principals office rather than in a classroom. Many students could benefit from increased classroom instruction time being devoted to teaching essential digital skills for life as well as academics (Ribble & Miller, 2013).

Making learning more engaging for students

Today's students are often assumed to have the technology skills required to use technology in meaningful ways because they have grown up using technology almost since birth. However, many of them lack those skills because they have never had the rigorous coursework that requires actual application of technology skills rather than just a cursory knowledge of them (Brabazon, 2014). Technology leaders should be expected to acquire some of these same skills in order to provide support to the teachers and students that they are serving in their leadership role.

As a leader one must insure technology is available for teachers to access and master as well as understand the technology application for the mode of learning they want students to utilize. Important terms for teachers are the three E's of technology: enabling, engaging, and empowering (Franklin, 2011). This model helps change the idea of technology integration for any new technology to be added to the information learning system. The concept that technology is really just a means for information delivery helps make any new technology the vehicle for learning in classrooms. Students have grown up with technology, and they have a fundamental understanding of how that process has worked, but teachers need the guidance of making meaning through the application of technology for academic purposes. The disconnect is insuring that educators are able to bridge the gap between their previous mode of “drill and kill” through lecture into a technology application which is more than just a glorified worksheet.

As a school leader, the ability to identify what quality technology based learning looks like is important as is knowing the different policies that help support learning (Kong et al., 2014). Situational awareness is essential for a school leader’s survival. As a principal, the importance of looking at technology and its impact on student population is critical. Technology policies must be supportive of the individual learning needs of students, which vary greatly in different areas with high minority, low-socioeconomic status than they are in suburban middle class schools (Garland, 2010).

Student engagement is more important with technology than it has been at any other time. Teachers are competing daily for the attention of students because so many distractions exist in the lives of kids. Technology can be a tool to increase engagement as long as the focus on skills and learning exists in the classroom . In order for the technology tool to be utilized in a learning centered way, the teachers and principals must possess a certain level of competence to accomplish an engaging lesson with measurable outcomes. This creates a strong need for understanding on the part of a leader to know exactly what engagement with technology looks like.

Building Professional Capacity

Professional development and providing support for teachers in schools are two outcomes that contribute to the success of any initiative in a school, whether curriculum or technology. These two outcomes provide pathways to building professional capacity in the teachers and educational leaders in the building. A plan of any type of organizational change involving instruction and technology must provide for training of teachers regarding the proposed changes as well as providing support after the training to insure effective implementation of the plan (Cuban, 2010; Fullan, 2008; Leithwood, 2009). The literature provides many different tools for helping provide teachers with learning and training opportunities to increase their technology skills for classroom teaching. Principals are the architects of the training and support of instructional and technology initiatives to build the capacity of their school and impacting student learning within their buildings.

For example, Yeung, Taylor, Hui, et al (2012) used correlation between teacher's competency with technology versus their compliance of using it in their lessons because it was required by their leadership. This study brought forward some interesting conclusions about the need for value in the application of the technology competence. Teachers must have a culture that provides for their ability to see value in using the technology that they know. It is not just enough to know how to use it but the why it is useful must be coupled with a requirement. Just because a requirement is made to use technology doesn't mean that the teachers automatically see a need for why it should be used. They must have a value to the use of technology. This information is extremely critical to the implementation of a technology system because teachers must know the value of what is expected of them. It is not enough just to say that using technology is important they need to understand the importance of the results being part of the process. Culture is an important piece to building a teacher technology capacity in schools. Principals must include this as a component in any technology initiative implementation.

Principals have to understand the use of the technology so they can provide appropriate means to deliver content and provide teachers the tools they need to make learning relevent and meaningful for students. For example, Franklin (2010) studied the seven digital citizenship topics that can be addressed: digital access, digital communication, digital rights, digital security, digital commerce, digital safety, and digital responsibility. This is an important consideration for technology leadership in decision making because these digital citizenship topics play a significant role in the process.

Professional Development

Technology professional development starts with improving the ability of leadership to support it. Learning by teachers and leaders is critical to creating an innovative culture as part of any building technology initiative (Christensen et al., 2018). For example, Davis, Eickelmann, and Zaka (2013) studied the ability of technology and people to change over time provides valuable information about structuring a school to better collaborate with one another through the usage of Web 2.0 tools. The findings of this study showed that schools that were leading the way had strong leadership that encouraged technology usage as well as knowledge of the ways that technology could better facilitate learning.

A study by Gunn and Hollingsworth (2013) gives teacher's input in the form of a survey, collecting data to provide insight into the district's ability to support the learning capacity of teachers. The teachers were also required to participate in professional development that was designed to increase their knowledge of technology and differentiation. The results revealed that the system was very effective, and that professional development increased the teacher technology skills. A variation of this program could benefit a district to improve its use of technology in classrooms because it provided a learning opportunity to support the use of technology in the classroom.

A learning network for teachers to connect with each other and help them effectively participate in their own professional development is another improvement in district level technology support discussed in the literature. Personalization leads to better buy-in from teachers because the motivation for personalized PD is intrinsic to each teacher (Christensen et al., 2018). The level of motivation leads the PD to be more practice focused because teachers become more reflective by looking at what their own needs are in learning new teaching practices. The online professional learning communities are a larger part of this process because they are built in a context that is suited to the time, place, availablity, and needs of the teacher seeking out the community in which they are interacting (Brooks & Gibson, 2012). Blogs are increasingly popular, and Twitter has become a professional development generator through chats and internet links. Additionally, many mobile apps and websites provide a way for educators to connect and share ideas. This type of learning becomes more and more important because it allows teachers flexibility in choosing professional development by providing more opportunities of when and where to participate (Ranieri, Manca, & Fini, 2012).

Anthony (2012) outlines a significant problem in technology leadership, the need for evaluating the effectiveness of implementation. To ensure that teachers are receiving training that completes their knowledge, rather than training which contradicts or impedes it because it does not give the necessary application of technology. If a system does not come full circle between implementation and support, success of the program is incapable of accurate measurement. Teachers need to have meaningful and relevant professional development using the technology tools that are good fits for classroom needs.

Providing support for technology

As a technology leader, it is important that appropriate feedback is solicited from teachers regarding the utility of technology training so that it can assess the needs of professional development training from the available technology tools(Richardson et al., 2013; Richardson et al., 2015; Richardson & Sterrett, 2018; Schrum & Levin, 2013). In other words, the easier it is for the teachers, the more the teachers will apply and use technology with the students.

Technology instruction is improved by providing opportunities for of training on differentiation and professional development. Leaders must have feedback from teachers in order to provide adequate support for technology use by using the feedback to adjust what they are doing. Cobb (2010) raises several good points in a study of technology-based differentiated instruction through schools in Cleveland, Ohio. Differentiation happens best with high quality, intensively supported professional development in the program being used for the instruction. An effective example of technology PD showed when teachers were given surveys and evaluations to assess the PD needs and training resources it helped to design the learning opportunities for teachers (Cifuentes, Maxwell, & Bulu, 2011). The effectiveness of the professional development was evaluated by teachers completing a questionnaire to get a measure of their technology abilities and the actual implementation in their classroom practices. The results showed not only an increase in the teacher's abilities to implement technology, but also an increase in the student's level of engagement in learning.

A simple understanding of technology is no longer acceptable to implementing it in the classroom, teachers must understand the curricular goals they are trying to reach in order to best utilize technology to help students meet those goals. For example, Ertmer and Ottenbreit-Leftwich (2010) studied four variables with teachers using technology to implement instructional change: knowledge, self-efficacy, pedagogical beliefs, and subject and school culture. The findings showed a lagging behind in effective technology use mainly because teachers lack the skills to appropriately facilitate learning with technology.

Modeling technology use for teachers is another important way that leaders support teachers to use technology in their classrooms. To illustrate, Cakir (2012) studied with a focus on the attitudes of principals and the aptitude of the computer integration teachers in elementary schools in Turkey. Leaders in this study gave support to teachers in the form of a technology teacher to assist in the integration of technology. The classrooms described in this study serve a two-fold purpose, one is teaching students digital literacy and the other is teaching teachers how to effectively use technology in the classroom to enhance student learning. The conclusions of this study seemed to favor the idea that despite the need for leaders to model the integration of technology, many administrators only had a surface understanding of the technology. The computer teachers in this study were not as aware of current technologies as one would expect them to be. Even though most of them knew what the newest Web 2.0 tools were, they had little understanding as to effectively using them as an instructional tool (Cakir, 2012). This study points out a clear problem in the technology implementation process, which Christensen, et al. (2018) identifies and encourages leaders to realize that technology learning is a continuous process and in order to effectively use technology knowing what tools are available is different than knowing how to use those tools in a classroom. A disconnect exists between available technology, support of that technology, and application of the technology and support in the classroom. These are all key pieces in the education technology puzzle that have to be addressed by school leaders and they point to a need for strong technology leadership in education.

The effectiveness of technology is still largely dependent on the individual abilities of teachers and technology leaders (Anderson & Dexter, 2005; Blau & Shamir-Inbal, 2017; Christensen et al., 2018; McLeod et al., 2011; McLeod et al., 2015a; Richardson et al., 2013; Richardson et al., 2015; Richardson & Sterrett, 2018). In order to do this in a way that best suits the needs of students, leaders have to understand the technology and the curriculum to complement each other in ways that provide teachers and students with meaningful content interaction (Christensen et al., 2018). Teachers must have a willingness to bring their own learning into the classroom and allow students the ability to rise and fall, fail and learn in order to better implement meaningful technology interaction within their classrooms. Technology leaders need a good understanding of this connection in order to lead any technology implementation.

An important mechanism for technology leaders to include in implementation is vetting programs for effective use and purchase to meet specific curricular needs. The decision-making process is not frequently reviewed to ensure that effective implementation time is considered. Often only the outcomes of the use of technology are sought. Educational leaders need many kinds of information, and the amount of time that it will take to effectively implement a program or technology is crucial because of the need to evaluate usefulness to determine what purchases will be made in the future (Means, 2010).

Learning/System Design

The vision of a system for technology use within a school maximizes the impact that technology has on learning within a building. Designing that system is one of the most critical pieces of technology leadership for a principal. Christensen, et al. (2018) mention multiple times in their study of technology leadership the need for stakeholder involvement in decision-making, providing support, and leading learning with respect to technology use in a school.

There are a number of factors created by school leaders that impact technology implementation. Understanding how a leader can change from a systems thinking theory point of view to effectively impact technology use was one such factor. Levin and Schrum (2013) studied the impact of systems thinking on using technology to help improve schools. The main thinking in utilizing this approach was to see what the potential impact of technology leadership could be. The initial focus of the study changed because the role of systems thinking became more evident as the research was collected. The identification process in this research was necessary to insure that all of the parts of this study helped identify best practices from schools who had shown a pattern of successful technology initiatives. Selecting schools that had diverse representation between geographic regions, history, and culture of the school were a significant part of the process. In terms of findings, this study identified eight factors in successful implementation of technology initiatives: vision, leadership, school culture, technology planning and support, professional development, curriculum and instructional practices, funding, and partnerships.

Leaders need to understand and see what great schools do to find the processes that best fit the needs of their teachers and students. Schrum and Levin (2013) looked at several exemplary schools to help them understand what the key characteristics of these schools happened to be so that other schools might replicate their success. These schools were identified by several characteristics, but the most important ones were a consistent pattern of excellence marked by winning awards on a regular basis with respect to the use and implementation of technology. These schools have much to teach and this is why this article is so important for technology leaders. It is crucial that they look at the overall successes of these schools so that they can duplicate some of the systems and processes that caused these districts to become successful. Christensen, et al. (2018) notes many of these same characteristics from a conference collaboration listing important traits shared by a group of experts at EDUSummIT 2017.

Teaching practices and commitment to a strong culture of using new teaching strategies to enhance student learning proved to be an important component in a high impact technology implementation (Christensen et al., 2018). The principal's role as a leader in technology implementation cannot be emphasized enough. The attitude of the principal is a key component in the energy level displayed in the learning culture of the building. Teachers will follow the lead of their leader, when they feel supported and see the work that their principal does to support their learning. This factor increases the level of technology implementation (Byker, 2014; Christensen et al., 2018).

In looking at system design and connecting that to the vision of technology use for a school, several studies were examined. Blau and Presser (2013) explored an important implementation tool that was discussed in the form of islands of innovation and comprehensive innovation. Looking at the two different models showed some difficulty with only a fraction of the organization implementing the system as opposed to the whole organization. In order to best serve the leadership and teaching needs of the entire organization technology information systems must be utilized at all levels of the organization in the comprehensive model. As a decision maker in the organization technology leaders need to have an idea of the kinds of information that users will utilize and become familiar with most easily. That ensures any technology implementation will go smoothly when those priorities are kept in mind.

Another example of system design came from Kopcha (2010) studying a systems-based model of implementation to facilitate the best method of technology integration. There were five different facets of technology barriers that are presented in this article; time, beliefs, access, professional development, and culture. The main components of this plan are supported from previous literature but the most important addition to the model from this study is the culture piece. Christensen, et al. (2018) emphasizes the culture/vision piece as a key part of any system designed to create innovation and support technology use through learning leaders.

The difference between other economic industries in technology integration that has made great strides in technology implementation is because they don't have such a huge focus on outcomes and performance measures that are woefully behind the technological times (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). This study also shows the difficulty in measuring technology implementation with a large scope of outcomes that would have to be measured to determine success or failure. Looking at specific things like technology ratios between students and devices can be important but classroom integration is still an area that needs an appropriate measureable outcome because effective instruction must be paired with technology to be complete. As a school leader the importance of measuring success in technology integration is paramount to successful implementation in schools. Any systemwide plan must have an evaluation and analysis component to make sure that the technology is not only effective but also the best instructional fit for the educational outcomes that are sought.

Equitable Opportunity/Community Involvement

Technology in education has many of the same challenges with the opportunity for equity that exists in the availability of technology to teachers and students. The opportunity gap that exists with technology causes differences within many communities across the United States (Tierney, Corwin, & Ochsner, 2018). Tierney and Kolluri discuss the different kinds of capital that technology can help create for students in certain communities. They talk extensively about the ways that access to technology can affect the ability of a student to use technology (Tierney & Kolluri, 2018). Students, teachers and leaders all have a relationship to technology equity within their respective community. At times it can even create an imbalance of power for members of certain communities when they have less access to technology (Tierney et al., 2018). The implications of this in the research on technology leadership are important to consider because leaders are just as affected at times by an opportunity gap based on where their schools are located and the funding they receive.

Conclusion

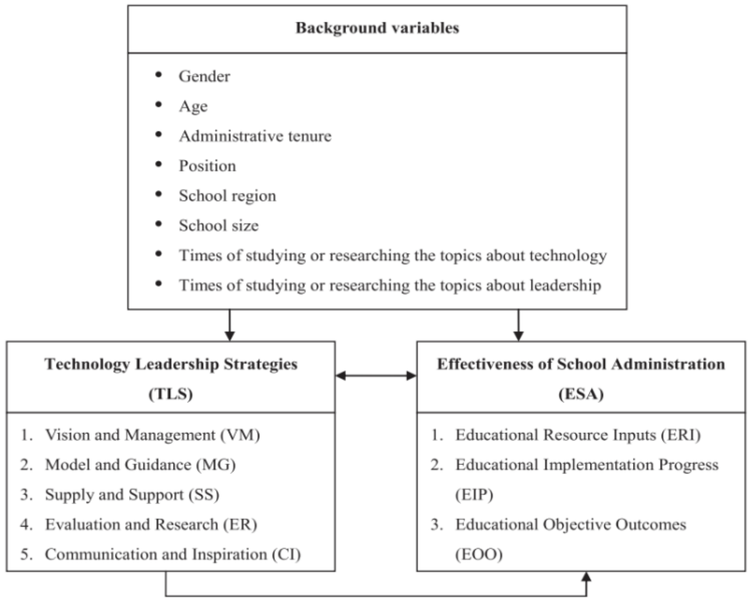
Technology has become an integral part of classroom instruction in the United States during the last thirty years in public schools. The latest trend within the last ten to fifteen years has been a one to one technology program for students in the classroom (Dexter, Richardson, & Nash, 2017). As more technology is implemented by school districts, school leaders need the tools to effectively lead a program for their students and teachers. A study of these characteristics has long term benefits for both the school district and the state education department because leadership preparation and professional development are two of the most important factors in a school's overall success (Leithwood, Harris, & Hawkins, 2008).

Until recent changes in the cost of the available technology in Oklahoma, the implementation of technology has some real potential because many districts have not been able to afford the cost of the technologies available to purchase. In terms of being able to implement the technology with the most fidelity, the time is now and preparing leaders to impact their schools with effective technology implementation would bring great benefit to both the students and teachers of Oklahoma schools. Learning leaders with an innovative and change oriented mindset are a necessary component in that effective technology leadership (Christensen et al., 2018).

Technology planning can address many of the needs across a district to help teachers and students effectively use devices as learning tools (Richardson et al., 2015). Improvement of teacher professional development is always ongoing in today's climate of technology use. Upgrading infrastructure has to be part of an effective improvement plan and bringing the number of network devices to a low ratio is extremely important. The ability of the district to make quicker decisions based on important student data is important as well. Having a strong plan in place to improve technology implementation that is key (Christensen et al., 2018). In general, the technology plan must include a well-developed infrastructure, support system, professional development program, and evaluation process (Dexter, Richardson, and Nash, 2017).

Evaluation on a consistent basis is an essential component to the culture of digital learning. Without a solid and constantly improving way to analyze the use of technology and reflect on the processes that feed that technology use any program is doomed to fail (Christensen et al., 2018). Reflection and evaluation are key components in this process and must be a part of every process that requires input from various stakeholders (Solar, Sabattin, & Parada, 2013). Weng and Tang (2014) created a research model that has many of the components being measured by the survey that principals will take in this stu

Figure 2 Weng and Tang Research Framework



(Weng & Tang, 2014, p. 95)

The literature reviewed for this study shows a clear need for more information in the area of principal's technology leadership. Oklahoma is emerging now in the area technology initiatives and a study of the current picture of leadership in Oklahoma would be beneficial to district and state leaders looking to implement technology on a building level scale. A large gap exists in the literature when it comes to the principal's role in technology leadership, specifically with respect to Oklahoma principals. This literature review was based on a combination of the leadership characteristics in the NETP (2017), domains that Hitt and Tucker (2016) identified in their unified model of effective leader practice, ISTE NETS*A standards (2009), and PSEL standards (National Policy Board for Education Administration, 2018).

Chapter 3: Introduction

Technology has become such a huge part of daily life and work in the United States that it inevitably must be a part of the educational system in this country. The popularity of one-to-one technology in this country has spread like wildfire and become the newest trend within the education community (Dexter, Richardson, & Nash, 2017). In the United States, there are schools in every state that have implemented technology initiatives. The U.S. Department of Education has developed a technology strategic plan every two years. However, Oklahoma has slowly adopted the latest technology initiative and a number of reasons for that speed of adoption exist.

Funding is a barrier to the implementation of technology, but a bigger barrier would be technology leadership in schools that effectively maintains the initiative with fidelity C. Stratton (Personal communication, June 8, 2017). Technology leadership has a complexity that changes almost as quickly as new technologies appear (Dexter, Richardson, & Nash, 2017). A problem with technology implementation is building leadership lacking the technology knowledge to effectively support and maintaining the initiative in all of its facets. The research questions for this study seeks to identify specific technology competencies of principals. In the hope that those characteristics can be replicated in either principal preparation programs or professional development provided to principals as part of their ongoing professional learning.

Principals are often the feet of district initiatives whether on a small scale within just a few classrooms or a larger scale of a building wide initiative (Dexter, Richardson, & Nash, 2017). The leadership provided by principals in a technology initiative cannot be underscored enough. Sauers and McLeod (2017) studied teacher's technology integration and competency in one to one schools compared to those at non-one to one schools in Iowa. This same type of information would be very useful with respect to administrators at one to one schools and non-one to one schools in Oklahoma. This study provides a methodological example of what could be done to study the research questions of technology competencies for principal's leadership and could lead to further research looking at specific technology initiatives in Oklahoma.

There are several conceptual frameworks that provide important skills and standards of technology beginning with ISTE NETS*A Standards (2009) and Professional Standards for Educational Leaders (2015). But there is a unified framework that Hitt and Tucker (2016) researched which combines the most important aspects of both sets of standards and research: support, vision, system, instructional plan, and professional development necessary for the technology leadership at the school level to implement technology. These frameworks are visually combined in Appendix A in order to help show the relationship between them.

The research problem for this study is a lack of research about the technology leadership competencies of principals based on their individual experience and expertise. As well the ability of those competencies to be replicated for future implementation and training of principals. McLeod, Richardson, and Sauers (2015) state,

> The effective incorporation of digital technologies into the school enterprise requires superintendents to take on new responsibilities and acquire new skill sets, and thus, most superintendents recognize the importance of creating new digitally-suffused learning environments for students(McLeod, Richardson, & Sauers, 2015b, p. 105).

While the statement is about principals, the principle of the idea is that leadership needs new skills to make learning relevant and meaningful with today's technology. Richardson, Bathon, and Flora (2013) speak to the need for a vision in technology leadership in schools by examining how principals are prepared to create that vision. Technology leadership has long been led by a desire to try new or different means of learning with technology to better understand how students learn. As well as that learning can be demonstrated with technology being utilized on an individual basis with both the teacher and the student using the technology.

Research Questions

This study asks the following research questions:

1. To what extent do principals in Oklahoma schools possess technology competencies?
2. Is there a difference between the technology competencies principals possess in schools based on the level of access they have to the technology?
3. What are the relationships between these technology competencies that principals possess?
4. What are the differences between principals with one-to-one and not one-to-one technologies?

Research Design

Technology leadership studies have used a qualitative research design in many of the studies in the literature (Dexter, Richardson, and Nash, 2017), for this reason the methodology that lends the most generalizability would be a quantitative study. Studies using a quantitative research design allow for more generalizability to a larger population of educational leaders especially if they have a true experimental design (Creswell, 2014). This study aims to inform training at a district, university, and state level for the planning professional development for building principals. Collecting this type of data can only be done through a quantitative methodology because the competencies that are being measured lend themselves most naturally to a survey format. Although qualitative does have limitations to the way that data is captured and often the narrative piece that explains the more detailed nuances of a technology implementation, this type of study is more difficult to conduct with technology competencies because the instruments used to collect the data are not quite as readily available as they are for quantitative research. Sauers and McLeod (2017) used a quantitative methods approach that employed a survey for analyzing the differences between teacher technology integration and competency scores at schools that have employed certain types of technology programs and teachers at schools that have not employed the same types of technology programs. Their study was able to look at many variables, and used propensity score matching between the samples of each to make sure that they were comparing schools that were made up of similar characteristics. The approach used in this research is strong for many reasons and was chosen for this study of administrators and technology competence in Oklahoma.

Research design as it relates to technology leadership has been done in many ways, the majority of which has been with a qualitative methodology. Dexter, Richardson, and Nash completed an empirical review of existing literature on technology leadership that they determined had a majority of research being done with mostly either qualitative or quantitative methodology (2017). This proposal follows a quantitative methodology because it provides more generalizable results to inform policy and technology leadership preparation in Oklahoma.

Another obstacle to the research on technology leadership is where the focus should be looking into, the teachers in the classroom or the principals responsible for leading the organizational change needed to implement technology. These two different approaches seem to cause the research to diverge into different areas instead of being focused on either teaching or leadership. Both topics are able to offer insights into the effects of technology on learning in the classroom, however, each have their strengths and weaknesses related to which methods are more suited to measuring principals technology competence. The approach chosen for this study was one that focuses on the technology competencies of the building principal because their role is most central to the implementation being set forth from a planning and execution standpoint for technology.

The research design chosen for this study is a non-experimental, cross-sectional survey (Creswell, 2014). A survey method was chosen for the cost-effectiveness of an online survey, amount of time needed to collect data, and the ease of access for the population to be surveyed (Ravid, 2015). Almost 1500 principals are working in the state of Oklahoma currently and the amount of time that it would take to randomize a sample to conduct interviews or focus groups would take a significant amount of time (OSDE Website, 2019). The research design for this study will be to find a correlation between the technology experiences of building leadership and to help generalize the results to a larger audience of building technology leadership experience related to technology and support for technology. The purpose of this research is experimental because the survey has been conducted and IRB approval was necessary prior to the survey being conducted (Creswell, 2014).

Technology leadership presents a complex problem in measuring what elements of leadership are required. Leadership standards alone require at least three different sets of information in order to see the full picture of leadership. The first set being the Professional Standards for Educational Leaders (2015) that were revised by the Council of Chief State School Officers (CCSSO) and the National Policy Board for Education Administration (NPBEA). These standards set the tone for the principal programs in higher education across the country. These standards are important to look at from the standpoint of knowing what kind of preparation leaders get when they complete their training to become principals (National Policy Board for Education Administration, 2015). A second set of standards is the National Education Technology Standards for Administrators (NETS*A) created and updated by the International

Society for Technology in Education (ISTE, 2009). These standards were revised a couple of years ago in 2018, this research used the 2009 revision for the survey because the survey was written using the standards from 2009 (ISTE). The purpose of these standards is to take the leadership tasks of a principal and include with those tasks the important emerging role of technology as part of leading today's schools (Brooks-Young, 2009). The final set of standards comes from Hitt and Tucker (2016) and serves more as a literature review of leadership standards from journal articles in educational leadership. All three contain important leadership competencies for building principals but one has the focus on technology leadership, which is the overarching goal of this research. The NETS*A standards incorporate all of the leadership standards from the remaining two sets and includes technology skills embedded within the leadership components. These standards are the focal point of the survey instrument that was chosen because they encompass everything needed to lead technology in a school (ISTE, 2002).

Sample

The participants in this study were principals working in Oklahoma school districts. The survey was sent out to all principals, the survey data that was targeted would be from all principals in the state of Oklahoma (Ravid, 2015). The population studied was all principals in the state of Oklahoma. Administrators completed the survey to show a relationship between technology competence and access to technology.

The sample of survey results that were needed for the population is 102 (Cohen, 2007). The total number of head principals in Oklahoma from the available email list on the State Department of Education website was 1,751. Of that list approximately 219 responses were started and a total of 172 responses were recorded with 2 responses opting not to participate in the survey. The number of completed responses for the survey totaled 170.

All principals in Oklahoma received the survey and 170 principals responded to questions regarding their technology competence (Creswell, 2014). The independent variable of this study was the extent to which they are able to access technology at their school (Ravid, 2015). The dependent variables are the technology competencies of the principals. Three different populations were studied by this research, principals' technology competencies at schools with low access to technology, principals' technology competencies at schools with moderate access to technology, and principals' technology competencies at schools with high access to technology. The impact of the principals' technology experience between these three populations was an important thing to explore because this study aims to see a relationship between the technology experience of the different populations.

Survey Instrument

The survey instrument that was used is the Principals' Technology Leadership Assessment (PTLA, 2005). This survey was developed by the University Council of Educational Administration (UCEA) Center for the Advanced Study of Technology Leadership in Education (CASTLE). Based on the NETS*A developed by ISTE in 2002, this instrument was intended to help with technology planning and implementation for administrators. There are many types of measurement that can be used for this study, but it is important to note that there are many facets to technology implementation and alignment with specific technology skills is important when assessing the level of skill that leaders within a district have. School leaders are always trying to find new and better ways of teaching and recording information which better utilize available technology to extend learning. The survey was designed with domains similar to those in Hitt and Tucker (2016) Unified Framework, which matches both the literature review and the NETS*A standards recommended by ISTE for administrator's technology skills. All questions in the survey are closed-ended and answered on a Likert scale of none at all, a little, a moderate amount, a lot, and a great deal. The Principal's Technology Leadership Assessment gave an organizational performance outcome and individual performance outcome because it informs both the organizational processes and the individual processes within each building. The survey is included in the appendix at the conclusion of this paper. Modifications to the survey were made with the permission of the author as documented in the appendix.

PTLA questions originated with the NETS*A standards that were first written in 2002 and the survey itself was written and pilot tested in 2005. This design helps correlate the questions in the survey to the tasks of administrators. The survey itself is modified with the permission of Scott McLeod and the Center for the Advancement of Technology Leadership in Education (see Appendix with documentation). Upon searching databases for dissertations that have used this survey instrument there are twenty-two total in the library database. A majority of these dissertations have chosen to modify the questions and changes with the NETS*A standards have also brought changes in either wording or categorizing questions. After reviewing the modifications that have been used in the previous research, the importance of updating with standards revisions is necessary and also adding a few questions for demographic purposes must be done.

Technology leader competence has become more critical with the implementation of large scale technology initiatives bringing technology into more teachers and students hands. The technology competencies possessed by building leaders are the research study variables that are going to be used in this study. The other consideration for modifying this survey is the update to the NETS*A standards that concluded last year (ISTE, 2018). Keeping the technology standards relevant to the practices of leaders is extremely important given the changing availability and use of technology in education. The PTLA being based on the NETS*A standards lends the credibility that ISTE has in technology competency for educational leaders today to the current study.

Reliability

The reliability of this survey instrument was tested by sending out the PTLA (2005) survey to 74 principals for a pilot test in August of 2005. Cronbach's alpha (α) equaled 0.95 for instrument as a whole for reliability. Item test correlation between each item and the instrument as a whole was 0.39 to 0.80 and only 7 items had a correlation of less than 0.50. Errors commonly found with this survey instrument include three different types: leniency error, halo error, and recency error. The leniency error is when the respondent to the survey gives themselves a higher rating than they deserve, this error can be avoided by providing honest, open feedback that offers room for improvement in the future. Halo error is when someone rates themselves about the same on almost all aspects of the survey, an error of this type is avoided by showing that some areas of weakness exist and not every area represents strength. Recency error occurs when the respondent gives answers based on their most recent behavior instead of looking at an entire year period, a fixed length of time for the survey answers can help avoid this type of error.

Data collection

The survey that was taken for this research was approved by the IRB on July 17, 2019. An email list of principals in Oklahoma was obtained from the Oklahoma State Department of Education website.

I received IRB approval for this study on July 17, 2019, and the modified PTLA survey was sent to building principals across Oklahoma using Qualtrics. The survey was sent out to all principals in Oklahoma from the list that is provided on the State Department of Education website. Once that information was added to Qualtrics the email for the survey was sent out through Qualtrics on August 2, 2019 for the first time to 1,751 email addresses. A second email was sent out as a reminder for completing the survey on August 13, 2019 to 1,672 email addresses. The final email distribution went out on August 31, 2019 to 1,643 email addresses. After those three distributions a total of 153 responses were completed and 30 partial responses were recorded. The results were transferred into SPSS directly from Qualtrics and then several variables were cleaned using SPSS and Excel. It was sent out three times over a period of one months and business cards for recruitment of responses were handed out at one education conference. potential reliability and validity issues.

This survey was chosen to allow principals to show their technology experience in a quick and honest manner that is collected inexpensively through an electronic survey. The survey will be answered by principals to make the results more generalizable to a larger group. The principal's leadership and technology experience are an important component to identifying characteristics and practices that might become future standards for education leaders to better implement technology within the classroom in school districts. Qualtrics will populate spreadsheets from the survey results and then they can be uploaded into SPSS to complete the statistical analysis portion of the research design. In this survey the independent variable is one to one technology and the dependent variable is the technology competence of the principal (Creswell, 2015).

Variables

The demographic variables that were examined in the survey results were the first variables measured in the survey. Years of experience in education was measured on a scale of 5 years or less, 5-10 years, 10-15 years, 15-20 years, and 20 years or more. Experience as a classroom teacher before becoming a principal was measured on the same scale. The number of years' experience as a principal and as an assistant principal used the same scale of years as well. Gender was used with male, female, and other as choices. The age variable was presented with a range of the following answers: 22-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-64, and 65 or older.

The grade levels of the school variable allowed an answer of individual grade levels beginning with Pre-K and going through 12th grade. In order to make sure that the grade level variable measured the outcomes needed for the research questions, it was recoded using Excel and a formula that allowed the grade levels to be captured if they fell within the following ranges: elementary grades pre-K through 5th, middle school 6th-8th grades, and high school 9th-12th grades. Each of those scaled categories included an option for any ranges that did not include all of those scales. After creating those ranges with the Excel formula and allowing for schools that included the entire range of grade levels for pre-K-12 grades or not; the recoded variable was able to be presented with 5 new variables of early childhood, elementary, middle school, high school, and all grades pre-K-12.

Title I funding was a question presented with a yes or no answer with respect to receiving funds from the federal government. The rural/non-rural variable was answered by whether the school is in a county with a population of less than 50,000 people for rural and more than 50,000 people for non-rural.

The technology available to principal's variable had the choice of as many of the following that applied including desktop computer, laptop, projector, interactive whiteboard, tablet, document camera, and two options to answer with an open-ended other answer. This variable was not collected in a way that allowed for answering the research questions in a meaningful way so the variable had to be recoded by creating a new variable of technology access by creating a scale that used the sum of all the answer choices. Once the sum was created then the scale for this variable was recoded using a scale of 1-2 devices being low access, 3-5 being mid-level access, and 6 or more being high level access. Once the sum was created, a new variable of level of technology access was added to the dataset. The technology available to teachers used the same scale as the technology available to principal's variable.

The district technology training available variable allowed a selection of as many as apply from the choices as follows: workshops, online classes, individual support, open-ended other, and none of the above. District assigned technology personnel available in a building was answered with a yes or no. The allocation of funding as an administrator to support technology training for teacher's learning was answered with a yes or no. The availability of one-to-one technology to students was a yes or no question and an answer of yes gave the option to answer two more questions. If the answer to that question was no then the survey went to the next section of variables that related to principal's technology competence. The type of one-to-one technology available to students variable was answered from the choices of laptops, tablets, or a combination of laptops and tablets. The final demographic variable concerned the operating system of the one-to-one devices available to students, those choices were Android, Apple OS, Microsoft, and open-ended other.

Principal's technology competencies were measured in six separate sections from the PTLA survey instrument: Leadership and Vision section, Learning and Teaching section, Professional Practice and Productivity section, Support, Management, and Operations section, Assessment and Evaluation section, and Social, Legal, and Ethical Issues section. Each of these sections contained at least 4 questions and they were closed-ended using a Likert scale of 5 being none at all, 4 a little, 3 a moderate amount, 2 a lot, and 1 a great deal. The answers to these questions should have been listed beginning with 1 being the first choice and 5 being the last choice when the survey was sent out. They were recoded after data collection to reflect the scale correctly with 1 being none at all, 2 a little, 3 a moderate amount, 4 a lot, and 5 a great deal.

Statistical Tests

The statistical tests used to analyze the collected data require multiple steps to fully answer the research questions. The first research question used descriptive statistics for the entire sample gathering the mean, standard deviation, maximum, minimum, and graphs with percentages would be completed. (Ravid, 2015). Each part of the demographic data is represented with a histogram to show the results and describe the variables listed in the previous section. These variables were selected because they provide data points that could generate important predictions when all statistical tests were completed. (Ravid, 2015). These results include demographic data regarding years of experience teaching, years of experience as a principal, age, gender, level of school, socioeconomic status of the school, access to technology as a principal, student one-to-one technology and the location of the school (rural or non-rural). These independent variables offer some other ways to disaggregate the data in very meaningful ways (Creswell, 2014).

The next statistical test would be a factorial ANOVA to analyze the differences between three dependent groups. The best comparison of data was putting the leader's technology access into three dependent groups, those with low, medium, and high access to technology in their district to compare principal's technology competencies from the 6 sections of the survey related to technology leadership (Ravid, 2015).

Answering the third research question requires a correlation matrix to measure the relationships between principal's technology competencies. The purpose for the comparison between different competencies is to predict a pattern and allows for analysis of each variable to be compared in order to describe relationships that exist in the data (Ravid, 2015).

The fourth statistical test would be a series of t-tests to compare results from principals in schools with one-to-one technology and principals in schools without one-to-one technology as the independent variable and the dependent variables would be selected from the 6 sections of the technology leadership competencies contained in the survey. This test would provide descriptive statistics and a comparison of means for two independent samples with the purpose of looking at two separate populations and could provide interesting insight into the technology leadership of Oklahoma schools from a demographic standpoint (Ravid, 2015). A closer look at these two populations provides some interesting conclusions from the survey results as they apply to technology leadership in Oklahoma (Creswell, 2014).

Limitations

This study is limited to the role of the principal because the PTLA survey instrument used in the study was designed for the role of the principal; therefore, the literature review is limited. Initially the role of superintendent was the target audience for this survey because they are generally the decision maker in the process of one to one technology implementation. However, the survey instrument was not reliable for that role because districts often times have different people that are responsible for the tasked assigned to various domains measured through the study (Interview, McLeod UCEA 2017). At a building level this was not an issue because the principal has responsibilities to make sure that each domain is covered within their building to effectively implement the one to one technology. Responsibility might be delegated to a person within the building, but they are still within the sphere of influence for the principal in the building. The design of the study being quantitative limits the study because a mixed methods approach would provide more balance to understanding principal's technology competencies. A correlation seeks to explain relationships between variables, therefore the researcher has to remember that correlation does not imply causation (Creswell, 2014). The number of schools in Oklahoma that have been identified with one to one initiatives is minimal and limits the responses from the targeted comparison group. Self-reported data limits validity because it is relying on all respondents giving open, honest answers regarding their technology competence (PTLA, 2005).

Conclusion

This survey could be immensely helpful even if it is only used as an internal survey instrument for the technology department of a school district. One of the biggest problems that leaders have is finding a bridge to help communicate between leadership and technology. The PTLA has important information for both technology departments and leadership departments within school districts. Using it as an evaluation tool periodically would radically change the way that technology leadership operates in a school district. For many years, the focus has been to develop the PD for teachers using technology and has been lacking to develop technology leadership within a building.

The survey data from this study could also provide a path to a qualitative study of principals in Oklahoma to determine some of the individual experiences of those principals that could be barriers to preparation for technology leadership and implementation of technology initiatives in Oklahoma. Technology leadership poses a problem to all leaders in schools until they understand and reflect on the needed skills that they may not possess.

Technology integration requires a certain amount of planning on the part of the principals to effectively implement a vision, build capacity, support learning among students, provide professional development and engage stakeholders in the community. This study seeks to understand the impact of the principal on the technology planning process and help improve the work of implementing technology as a building leader. At this time there are no required trainings or programs on technology implementation for building leadership in Oklahoma. Results of this research could provide important planning information for the coming years to both district and state education technology leadership to help them effectively plan for building lead technology initiatives

Chapter 4: Results

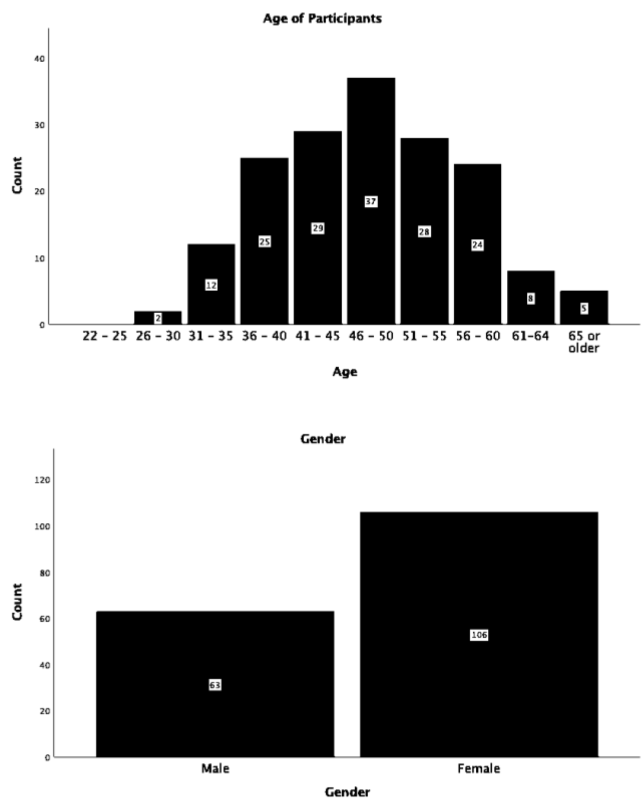
Principals have many responsibilities when leading a school, none more important than roles within instructional leadership (Hitt & Tucker, 2016);Robinson, Lloyd & Rowe, 2008). Technology plays such a strong role in instruction that principals knowing their own technology strengths and weaknesses is an essential tool for leading their schools (Anderson & Dexter, 2005; Dexter et al., 2017). The purpose of this survey was to assess the technology skills of principals across the state of Oklahoma and provide research to help shape future work leading instruction with technology implementation. This survey is a self-assessment that principals report their own experience with the latest technology plan/implementation in their school. The results are organized in this chapter by research questions. Demographic data for the principals who responded to the survey is described first to provide background about the research participants. Next, six sections of the survey are visualized to help provide an overall picture of the technology competencies that principals in Oklahoma possess. In the third section, principals' technology access and its relationship to the technology competencies are tested using an ANOVA for comparison. In the fourth section, correlation tables are used to demonstrate the relationships between principals technology competencies. In the final section of results, t-tests that measure differences in technology competencies between principals at schools with a one-to-one technology program and principals at schools without a one-to-one technology program. Principals play an important role in technology implementation, so these results will help inform future decisions about improving the technology skills principals need to lead schools today.

Participant Demographic Data

The total number of principals who answered the survey with incomplete and complete responses was N = 170. Principal provided information about their background and context.

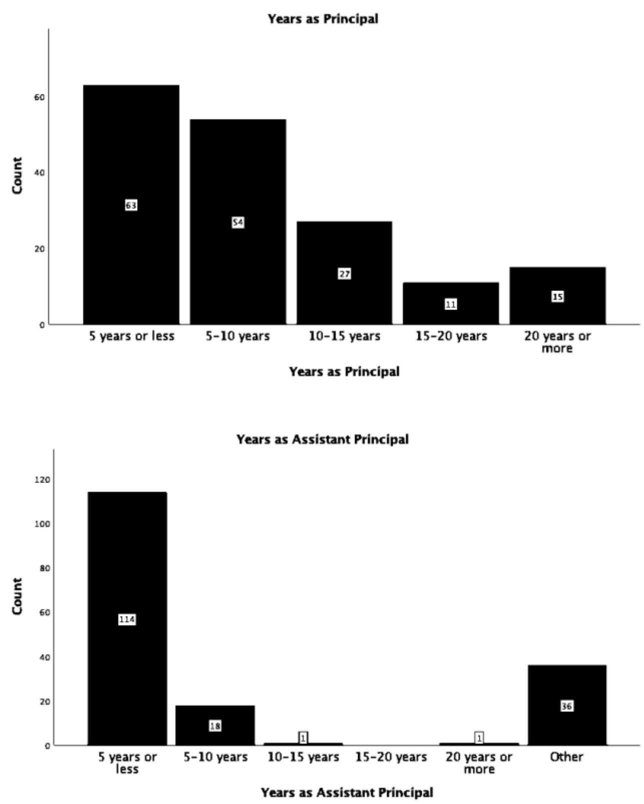
These characteristics included: age, gender, leadership and classroom experience, school grade levels, urbanicity, Title I status, access to technology, student one-to-one technology availability. The age of participants and gender are shown in Figure 3. The highest frequency of principals reported their age in the 46-50 range with the large majority of principals falling between 36 and 60. More principals responded as female (n = 106) compared to male (n = 63). The age of participants ranged from 26 years of age to participants that were over 65 years of age. Sixty-two percent of responses came from female principals and 38 percent of responses were from male principals.

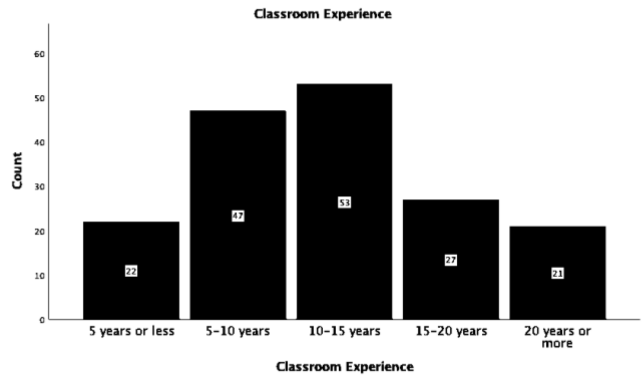
Figure 3 Age and Gender of Participants



Distribution of the responding principals’ experience is displayed in Figure 4, which uses three key indicators: years as principal, assistant principal, and the years of classroom experience. This data also shows diversity in principals’ level of experience with classroom teaching experience and assistant principal experience prior to becoming a principal. Sixty-nine percent of responses came from principals with less than 10 years of experience as a principal and 31 percent of the responses came from principals with more than 10 years of experience as a principal. Twenty-one percent of the responses came from principals who had no experience as an assistant principal. Forty-one percent of the respondents had less than 10 years of experience as a classroom teacher, while only 28 percent of respondents had more than 15 years of experience as a classroom teacher.

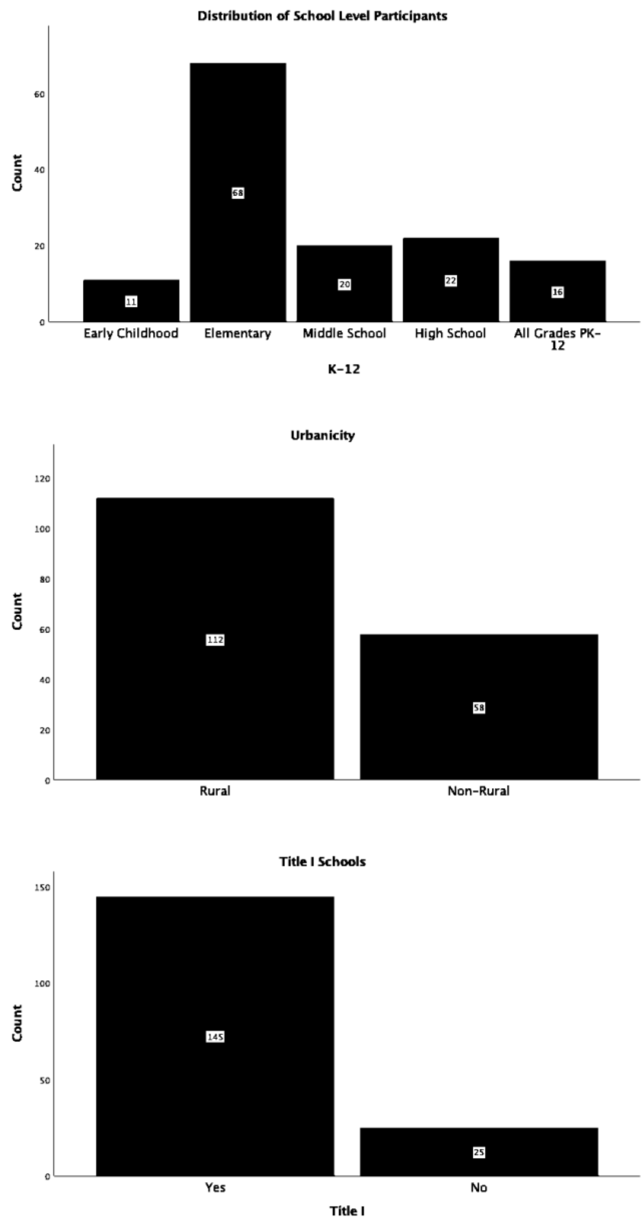
Figure 4 Type and Years of Experience of Participants





The next important demographic information that describes principals in this study was the grade level of their school, location of their school, and socio-economic status of their school. Principals' responses in these categories are displayed in Figure 5. They also show a broad range of school level, school location, and socio-economic status of schools served by the principals who responded to the survey. Forty-seven percent of the responses came from principals of early childhood and elementary schools. Twelve percent of the responses came from middle school principals and 13 percent of the responses came from high school principals. Sixty-six percent of the responses were from principals serving in rural schools while 44 percent of responses were from non-rural schools. The rural schools were in counties with a population lower than 50,000 and non-rural schools were in counties with a population larger than 50,000. Eighty-six percent of responses were from principals at schools that receive Title I Federal funds based on their population of students receiving free and reduced lunches, meaning that their student population has a higher rate of poverty than other schools.

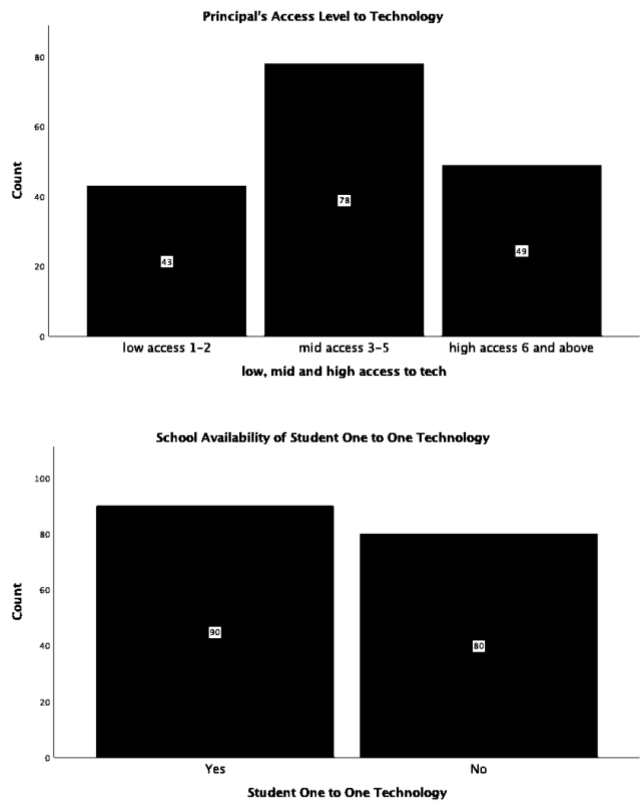
Figure 5 School Level, School Location, and Socio-economic status



The final piece of demographic information that principals reported in the survey relates to principals' technology access and the availability of one-to-one technology to the students at the schools which they lead. Twenty-five percent of the responses came from principals that have access to less than 2 types of technology, 46 percent came from principals with access to 3-

5 types of technology, and 29 percent came from principals with access to 6 or more types of technology. Fifty-three percent of the responses came from principals at schools with one-to-one technology available to students. All of these demographics paint a clear picture of the experience of principals that submitted responses to my survey.

Figure 6 Technology Access for Principal's and Students



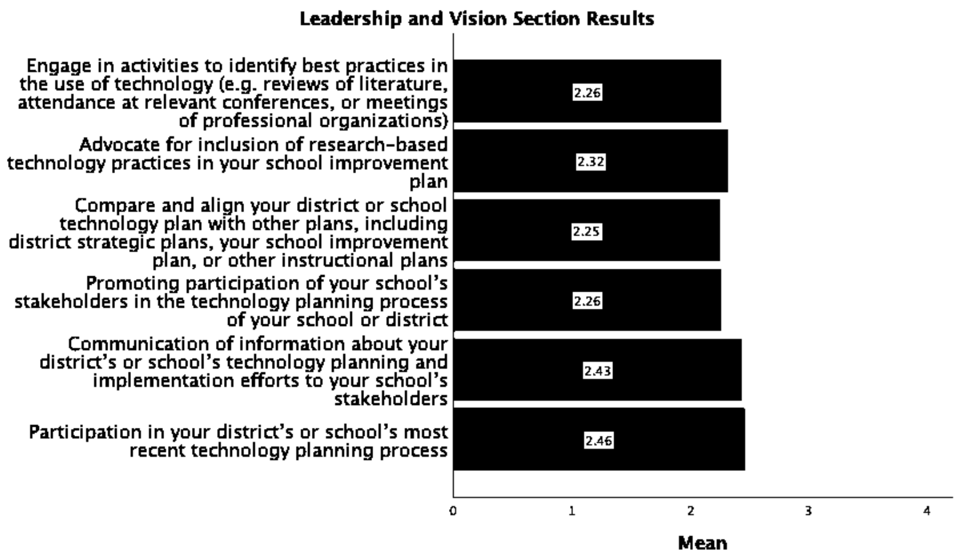
To what extent do principals in Oklahoma schools possess technology competencies?

This section shows the extent that principals reported technology competencies. The technology competencies are organized into survey subsections: leadership and vision, learning and teaching, productivity and professional practice, support, operations and management, assessment and evaluation, and social, legal and ethical issues.

Leadership and Vision Results

The first section of the survey showed the extent of technology competencies that principals possess related to leadership and vision regarding technology practices. These results showed a mid-range mean, which shows the average principal to be moderately involved in the vision and leadership process. Principals reported the most involvement with communicating about technology implementation to stakeholders ($\mu = 2.43$) and participating in the technology planning process ($\mu = 2.46$). Principals reported the least involvement….However, principals' responses about their leadership and vision of technology only varied by about .2 across the averages of these items.

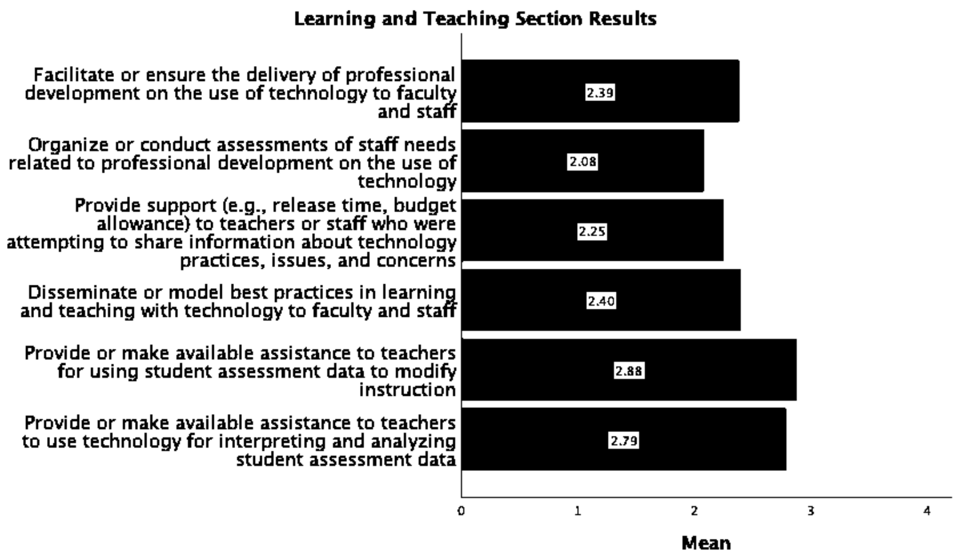
Figure 7 Leadership and Vision Section Results Bar Graph of Means



Learning and Teaching

The second section of the survey focused on the technology work done by principals that facilitated teacher use of technology and use of technology to interpret and analyze assessments to modify instruction. Means in this section were the highest related to principals assessment and modification of instruction based on assessment data ($\mu = 2.88$). The remaining questions in this section dealt with principals getting feedback from teachers in order to plan professional development (μ = 2.43), identify best practices (μ = 2.4), and provide assistance with technology practices (μ = 2.79). The question with the lowest mean was organizing and conducting assessments of staff needs on professional development for teachers use of technology (μ = 2.08), a significant piece to technology integration and planning for principals.

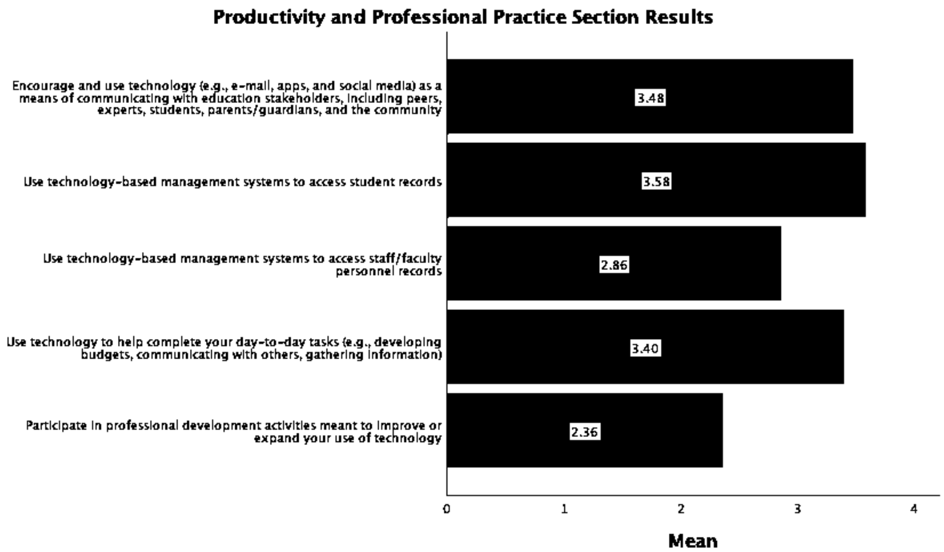
Figure 8 Learning and Teaching Section Results Bar Graph of Means



Productivity and Professional Practice

This section focused on the use of technology by principals themselves and their use of it on day to day tasks. The results in this section provided means for responses based on how much each principal used technology on a daily basis (μ = 3.4). One important low mean from this group was the amount of time that principals spend on improving their own technology use (μ = 2.36).

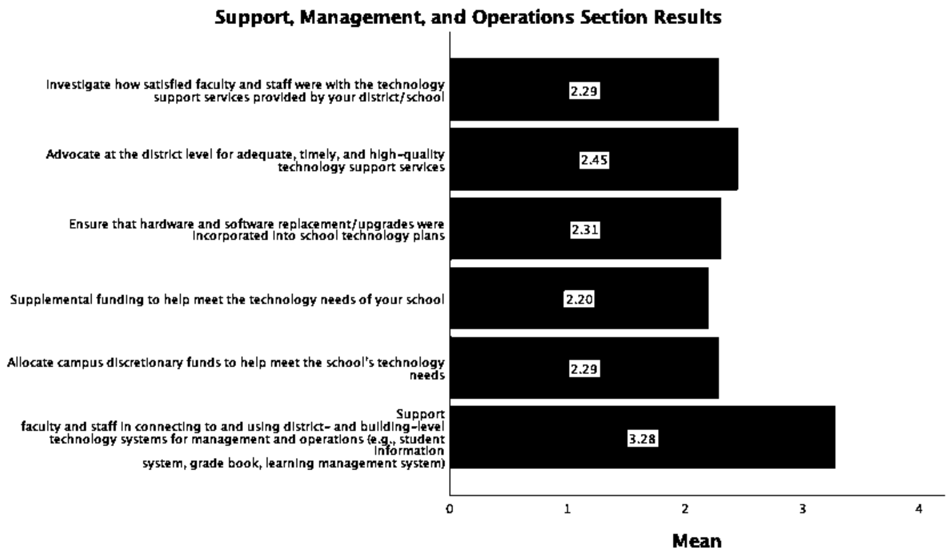
Figure 9 Productivity and Professional Practice Section Bar Graph of Means



Support, Operations, and Management Section

This section shows results shown in Figure 10, that were important with respect to principals lack of involvement in technology funding (μ = 2.43) and principals having more involvement in planning for supporting technology through district resources (μ = 2.43). Results also showed that minimal effort is spent on principals getting feedback on the effectiveness of support that teachers and staff have access to in their technology use (μ = 2.43). The highest mean from this section related to principals connecting teachers with the available support resources that the school has for their technology use (μ = 2.43).

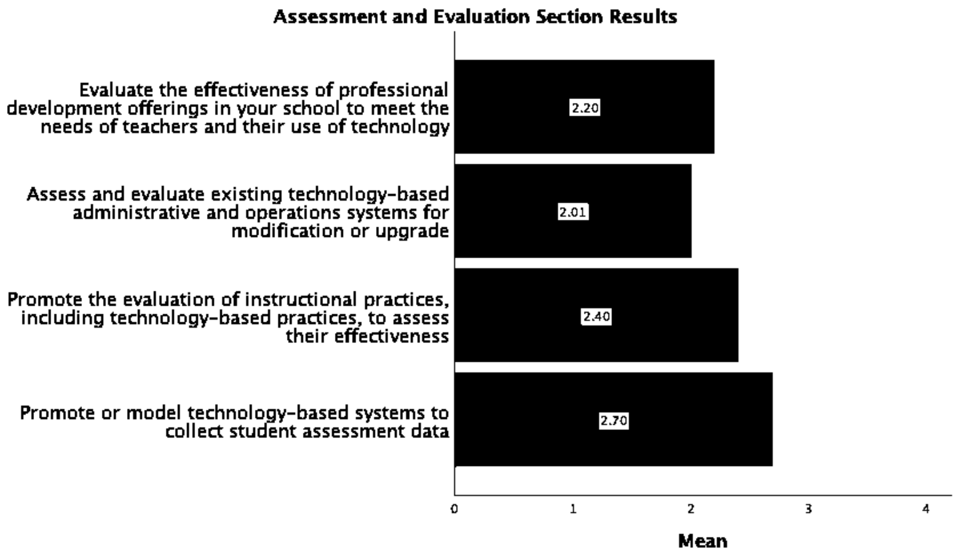
Figure 10 Support, Management, and Operations Section Results Bar Graph of Means



Assessment and Evaluation

This section also highlights in Figure 11, a lower involvement when it comes to principals evaluating what a school is doing with technology. The lowest mean in this section is principals evaluating and assessing if upgrades or modifications are needed for the existing technology ($\mu = 2.43$). Another result to note from this section is the highest mean again involves looking at principals promoting and modeling the ways that student data is collected ($\mu = 2.43$).

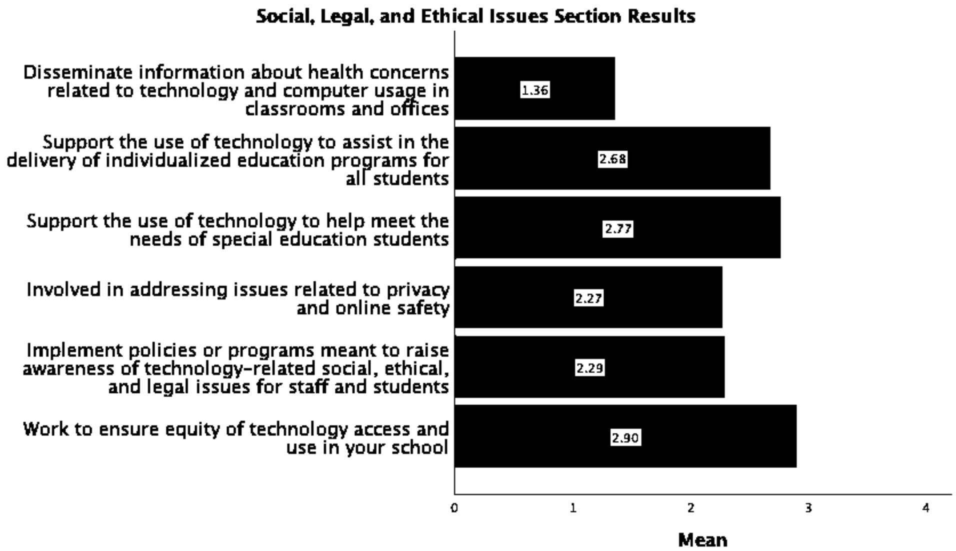
Figure 11 Assessment and Evaluation Section Bar Graph of Means



Social, Legal, and Ethical Issues

This section is one of the most telling sections related to technology use in schools in three ways shown in Figure 12. Principals knowing health concerns related to the use of technology ($\mu = 2.43$) was the lowest mean result from the entire survey. The other two results that were important in this section were the results related to principals' knowledge of online safety ($\mu = 2.43$) and creation of policy surrounding the use of technology ($\mu = 2.43$). Equity and providing an opportunity for all students to access technology ($\mu = 2.43$) is important and principals reported lower means for that competency as well.

Figure 12 Social, Legal, and Ethical Issues Section Results Bar Graph of Means



Technology competence is an important skill for a building leader to possess, and the more those skills can be identified and measured the better prepared principals will be to lead schools which engage in technology usage to improve teachers' skills in teaching students with technology.

Is there a difference between the technology competencies principals possess in schools based on the level of access they have to the technology?

This section of the results uses an ANOVA to compare the competencies that principals possess based on their level of access to technology. The groups for the ANOVA were divided by the level of access to technologies (i.e. desktop, laptop, tablet, document camera, etc.) in their school. Principals were divided into three groups: low, middle, and high access to technology, based on the distribution of responses to the original survey item in which principals selected multiple technologies available. Low access to technology was represented by the principals who responded that they have access to either one or two types of technology. Middle access to technology was represented by principals who have access to three to five types of technology. High access to technology was represented by principals who have access to six or more types of technology. Each of the following sections contains the results of the ANOVA tests that were run to compare these three independent groups that represent levels of technology access for principals.

ANOVA Results Leadership and Vision

Principals' answers in the leadership and vision section showed that there is no significance between the groups by the standard of $p < .05$. Those competencies related to participating in the vision ($F = .279$, $p = .757$), advocating for inclusion of research-based technology practices in your school improvement plan ($F = .039$, $p = .962$), or engaging in activities to identify best practices in the use of technology ($F = .620$, $p = .539$). The results in this section would indicate that access to technology has no effect on whether principals participate in the vision and planning for technology use in their schools.

Table 2 ANOVA Results Leadership and Vision Section

		Sum of Squares	df	Mean Square	F	Sig.
Participation in your district's or school's most recent technology planning process	Between Groups	1.044	2	.522	.279	.757
	Within Groups	301.657	161	1.874		
	Total	302.701	163			
Advocate for inclusion of research-based technology practices in your school improvement plan	Between Groups	.147	2	.073	.039	.962
	Within Groups	303.365	161	1.884		
	Total	303.512	163			
Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Between Groups	1.752	2	.876	.620	.539
	Within Groups	227.492	161	1.413		
	Total	229.244	163			

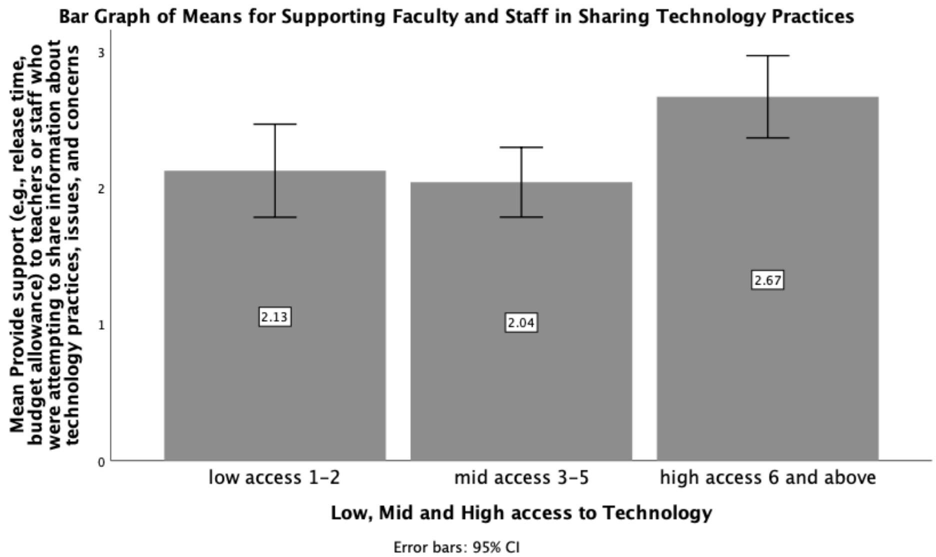
ANOVA Results Learning and Teaching

The principals' level of access and its relationship with learning and teaching competencies were compared in this section of results. The questions in this section did have some significant results after running the data analysis. This section shows a difference with teachers being provided support/time to share practices with other teachers about technology practices, issues, and concerns based on their level of access to technology ($F = 5.275$, $p < .05$). Figure 13 shows the mean responses about sharing practices for each access group low (μ = 2.13), mid (μ = 2.04), and high (μ = 2.67) . This figure shows that the access level to technology makes a difference to the amount of support that an administrator is able to provide to teachers. The lower the access to the technology the less support the administrator is able to provide to teachers.

Table 3 ANOVA Table Learning and Teaching Section

		Sum of Squares	df	Mean Square	F	Sig.
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Between Groups	2.069	2	1.035	1.037	.357
	Within Groups	158.647	159	.998		
	Total	160.716	161			
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Between Groups	12.203	2	6.102	5.275	.006
	Within Groups	183.920	159	1.157		
	Total	196.123	161			
Organize or conduct assessments of staff needs related to professional development on the use of technology	Between Groups	4.757	2	2.378	1.966	.143
	Within Groups	191.193	158	1.210		
	Total	195.950	160			
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Between Groups	.943	2	.471	.470	.626
	Within Groups	159.329	159	1.002		
	Total	160.272	161			

Figure 13 Bar Graph of Providing Support to Teachers Sharing Technology Practices



ANOVA Results Productivity and Professional Practice

A comparison of the competencies in this section of results was completed between productivity and professional practice questions. By the standard of $p < .05$ the differences shown in the ANOVA table find no significance in the results of the productivity and professional practice section for any of the groups when compared. These results show there is no difference between the use of technology ($F = .850$, $p = .429$), training for technology ($F = .901$, $p = .408$), and encouragement of technology use ($F = .9$, $p = .409$) by the level of access that principals have to technology.

Table 4 ANOVA Results Productivity and Professional Practice Section

		Sum of Squares	df	Mean Square	F	Sig.
Participate in professional development activities meant to improve or expand your use of technology	Between Groups	2.062	2	1.031	.901	.408
	Within Groups	178.504	156	1.144		
	Total	180.566	158			
Use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)	Between Groups	1.251	2	.626	.850	.429
	Within Groups	114.787	156	.736		
	Total	116.038	158			
Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Between Groups	1.183	2	.591	.900	.409
	Within Groups	102.490	156	.657		
	Total	103.673	158			

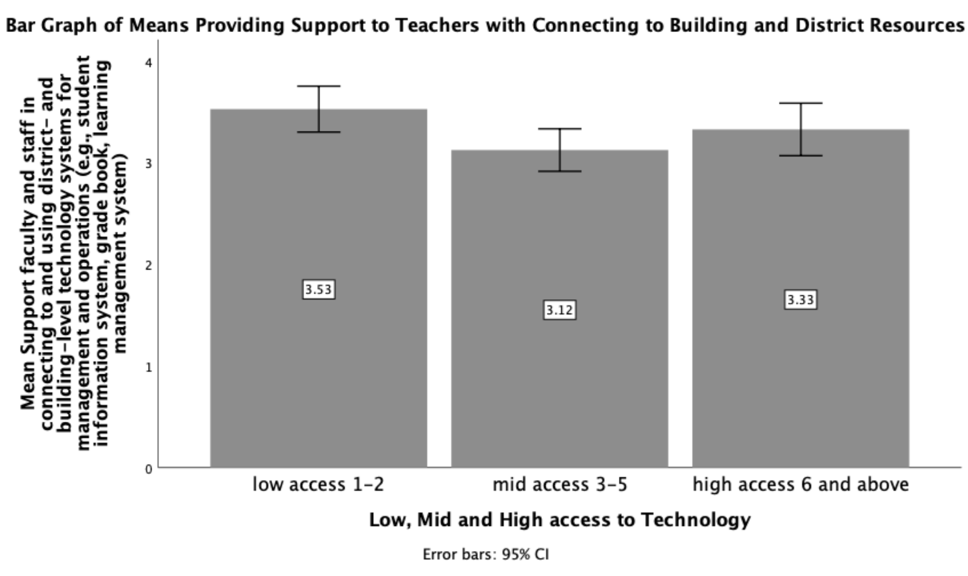
ANOVA Results Support, Management, and Operations

This section compared between the technology access groups in the competencies related to support, management, and operations. The results of this section do not show significance by educational standards of $p < .05$, but the results do show a relationship between the highest mean reported in the previous section with the graphs of means. A high mean and a result that is close to significance ($\sim p < .10$) may also show one area where principals competence with technology usage is connected. As displayed in figure 14, the percentages of principals that answered about connecting teachers to district and building resources ($F = 2.951$, $p = .055$) have high means in the low access ($\mu = 3.53$), mid access ($\mu = 3.12$), and high access ($\mu = 3.33$). This result is important to show that access to technology does not create a barrier for administrators to connect teachers to technology resources within their building and district.

Table 5 ANOVA Results Support, Management, and Operations Section

		Sum of Squares	df	Mean Square	F	Sig.
Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Between Groups	4.196	2	2.098	2.951	.055
	Within Groups	109.473	154	.711		
	Total	113.669	156			
Allocate campus discretionary funds to help meet the school's technology needs	Between Groups	7.333	2	3.666	2.405	.094
	Within Groups	234.769	154	1.524		
	Total	242.102	156			
Supplemental funding to help meet the technology needs of your school	Between Groups	.351	2	.176	.094	.911
	Within Groups	288.528	154	1.874		
	Total	288.879	156			
Advocate at the district level for adequate, timely, and high-quality technology support services	Between Groups	1.062	2	.531	.386	.680
	Within Groups	211.830	154	1.376		
	Total	212.892	156			
Investigate how satisfied faculty and staff were with the technology support services provided by your district/school	Between Groups	4.299	2	2.149	1.744	.178
	Within Groups	189.803	154	1.232		
	Total	194.102	156			

Figure 14 Bar Graph of Supporting Faculty Connecting to Building and District Resources



ANOVA Results Assessment and Evaluation

The assessment and evaluation section of the ANOVA results did not show any significance between the groups of principals with different levels of access and the competencies that were measured in this section. Results show the following values: promoting the evaluation of instructional practices (F = .846, p = .431), assessing and evaluating technology systems (F = .215, p = .807) and evaluating the effectiveness of professional development offerings (F = 1.719, p = .183). These results are all well above the standard of significance for this test of p < .05. Results in this section help to show that the differences between groups of principals with technology access does not impact the evaluation of technology.

Table 6 ANOVA Results Assessment and Evaluation Section

		Sum of Squares	df	Mean Square	F	Sig.
Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Between Groups	2.094	2	1.047	.846	.431
	Within Groups	184.426	149	1.238		
	Total	186.520	151			
Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Between Groups	.600	2	.300	.215	.807
	Within Groups	208.393	149	1.399		
	Total	208.993	151			
Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	Between Groups	3.850	2	1.925	1.719	.183
	Within Groups	166.828	149	1.120		
	Total	170.678	151			

ANOVA Results Social, Legal, and Ethical Issues

The results from the social, legal, and ethical issues section are detailed below in table 7. The data did not show any significant results for any of the technology competencies being measured in the groups being compared. Insuring equity of access (F = .035, p = .966), implementing policies or programs to raise awareness of technology related issues (F = .975, p =

.380), and disseminating information about health concerns related to technology (F = 1.298, p = .276) are all well above the standard of p < .05 for statistical significance. The lack of significance in this comparison shows that level of access to technology does not impact whether principals are aware of social, legal, and ethical issues related to technology competencies.

Table 7 ANOVA Results Social, Legal, and Ethical Issues Section

		Sum of Squares	df	Mean Square	F	Sig.
Work to ensure equity of technology access and use in your school	Between Groups	.072	2	.036	.035	.966
	Within Groups	151.428	147	1.030		
	Total	151.500	149			
Implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students	Between Groups	2.338	2	1.169	.975	.380
	Within Groups	176.335	147	1.200		
	Total	178.673	149			
Disseminate information about health concerns related to technology and computer usage in classrooms and offices	Between Groups	3.064	2	1.532	1.298	.276
	Within Groups	173.496	147	1.180		
	Total	176.560	149			

What are the relationships between technology competencies?

The relationships between principal's technology competencies are examined through a correlation test to answer the research question, which sought to find a relationship between the technology competencies that principals possess. Correlation tests were run between specific competencies to determine if there are any connections or predictors to different technology competencies. Sections were chosen for comparison because of the perceived connection they have to each other, and each section was compared to one other section at a minimum. The competencies compared were chosen because they were the comparison questions for the ANOVA tests in the previous section and the t-tests in the final research question.

Correlation Results Leadership and Vision/Learning and Teaching

This section details the correlation results between competencies in leadership and vision with competencies in learning and teaching. The results are shown in Table 8 with the portion that is inside of the box being the focal point for the analysis to follow. This data reports relationships between competencies that are important to effective planning/vision for technology and technology-infused instructional practices for principals to encourage technology use in their building. The significance in this section (r = .634) represents a moderately strong, positive relationship between engaging in activities to identify best practices in the use of technology and facilitating or ensuring the delivery of professional development on the use of technology to faculty and staff. These two variables explain 40 percent of the variance in this correlation comparison. The next significant data (r = .623) in this correlation represents a moderate relationship between engaging in activities to identify best practices in the use of technology and organizing or conducting needs assessments related to professional development on the use of technology. These two variables explain 39 percent of the variance in this correlation. The final significant data in this correlation is (r = .599) between engaging in activities to identify best practices in the use of technology and disseminating or modelling best practices in learning and teaching with faculty and staff. These two variables explain 36 percent of the variance in this correlation. In conclusion, the relationships between these competencies shows moderately strong relationships between competencies in leadership and vision with teaching and learning.

Table 8 Correlation Results Leadership and Vision/Learning and Teaching

Correlations

		Participation in your district's or school's most recent technology planning process	Advocate for inclusion of research-based technology practices in your school improvement plan	Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Disseminate or model best practices in learning and teaching with technology to faculty and staff	Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Organize or conduct assessments of staff needs related to professional development on the use of technology	Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff
Participation in your district's or school's most recent technology planning process	Pearson Correlation	1	.545**	.561**	.387**	.252**	.445**	.410**
	Sig. (2-tailed)		.000	.000	.000	.001	.000	.000
	N	164	164	164	162	162	161	162
Advocate for inclusion of research-based technology practices in your school improvement plan	Pearson Correlation		1	.742**	.527**	.452**	.550**	.535**
	Sig. (2-tailed)			.000	.000	.000	.000	.000
	N		164	164	162	162	161	162
Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Pearson Correlation			1	.599**	.516**	.623**	.634**
	Sig. (2-tailed)				.000	.000	.000	.000
	N			164	162	162	161	162
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Pearson Correlation				1	.643**	.568**	.645**
	Sig. (2-tailed)					.000	.000	.000
	N					162	161	162
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Pearson Correlation					1	.631**	.590**
	Sig. (2-tailed)						.000	.000
	N					162	161	162
Organize or conduct assessments of staff needs related to professional development on the use of technology	Pearson Correlation						1	.677**
	Sig. (2-tailed)							.000
	N						161	161
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Pearson Correlation							1
	Sig. (2-tailed)							
	N							162

** Indicates significance at the .01 level

Correlation Results Learning and Teaching/Support, Operations, and Management

This section details the correlation results between competencies in learning and teaching with competencies in teaching/support, operations, and management. The results are shown in table 9 with the portion that is inside of the box being the focal point for the analysis to follow. Learning and teaching showed a correlation to support, operations, and management in several competencies, these are outlined in the following analysis. The first significant data correlation is ($r = .597$) which explains 36 percent of the relationship between facilitating or ensuring the delivery of professional development to faculty and staff and investigating how satisfied faculty and staff were with the technology support services provided by their district/school. The next significant data in this correlation table is ($r = .579$) which explains 34 percent of the relationship between organizing or conducting assessments of staff needs related to professional development on the use of technology for faculty and staff. The last significant data from this correlation is ($r = .569$) which explains 32 percent of the relationship between organizing or conducting assessments of staff needs related to professional development on the use of technology for faculty and staff and advocating at the district level for adequate, timely, and high quality technology support services. These relationships show connections between competencies which allows for principals to see the connection between learning and teaching with support, operations, and management.

Table 9 Correlation Results Learning and Teaching/Support, Operations, and Management

Correlations

		Disseminate or model best practices in learning and teaching with technology to faculty and staff	Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Organize or conduct assessments of staff needs related to professional development on the use of technology	Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Allocate campus discretionary funds to help meet the school's technology needs	Supplemental funding to help meet the technology needs of your school	Advocate at the district level for adequate, timely, and high-quality technology support services	Investigate how satisfied faculty and staff were with the technology support services provided by your district/school
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Pearson Correlation	1	.643**	.568**	.645**	.350**	.389**	.342**	.423**	.469**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000
	N	162	162	161	162	157	157	157	157	157
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Pearson Correlation		1	.631**	.590**	.358**	.439**	.378**	.474**	.496**
	Sig. (2-tailed)			.000	.000	.000	.000	.000	.000	.000
	N		162	161	162	157	157	157	157	157
Organize or conduct assessments of staff needs related to professional development on the use of technology	Pearson Correlation			1	.677**	.278**	.426**	.441**	.569**	.579**
	Sig. (2-tailed)				.000	.000	.000	.000	.000	.000
	N			161	161	156	156	156	156	156
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Pearson Correlation				1	.348**	.521**	.468**	.597**	.530**
	Sig. (2-tailed)					.000	.000	.000	.000	.000
	N				162	157	157	157	157	157
Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Pearson Correlation					1	.346**	.294**	.361**	.292**
	Sig. (2-tailed)						.000	.000	.000	.000
	N					157	157	157	157	157
Allocate campus discretionary funds to help meet the school's technology needs	Pearson Correlation						1	.481**	.562**	.457**
	Sig. (2-tailed)							.000	.000	.000
	N						157	157	157	157
Supplemental funding to help meet the technology needs of your school	Pearson Correlation							1	.512**	.359**
	Sig. (2-tailed)								.000	.000
	N							157	157	157
Advocate at the district level for adequate, timely, and high-quality technology support services	Pearson Correlation								1	.653**
	Sig. (2-tailed)									.000
	N								157	157
Investigate how satisfied faculty and staff were with the technology support services provided by your district/school	Pearson Correlation									1
	Sig. (2-tailed)									
	N									157

**Indicates significance at .01 level

Correlation Results Learning and Teaching/Assessment and Evaluation

This section details the results from comparing the domains of learning and teaching competencies with assessment and evaluation competencies. The results this analysis focuses on will be the data that are contained in the box on the top right side of the table and comparing these technology competencies showed some moderately strong relationships between principals technology competencies. The first significant correlation between the competencies in table 10 is (r = .677) between organizing or conducting assessments of staff needs related to professional development on the use of technology to faculty and staff with facilitating or ensuring the delivery of professional development on the use of technology to faculty and staff. This r value explains 46 percent of the relationship between these technology competencies. The next significant correlation between the competencies in this table is (r = .653) between organizing or conducting assessments of staff needs related to professional development on the use of technology to faculty and staff with evaluating the effectiveness of professional development offering in their school to meet the needs of teachers and their use of technology. This r value explains 43 percent of the relationship between these technology competencies. Another significant correlation is (r = .645) between disseminating or modeling best practices in learning and teaching with technology to faculty and staff with facilitating or ensuring the delivery of professional development on the use of technology to faculty and staff. This r value explains 42 percent of the relationship between these technology competencies. The overall significance of this table shows three moderately strong relationships between technology competencies in learning and teaching with technology competencies in assessment and evaluation.

Table 10 Correlation Results Learning and Teaching/Assessment and Evaluation

Correlations

		Disseminate or model best practices in learning and teaching with technology to faculty and staff	Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Organize or conduct assessments of staff needs related to professional development on the use of technology	Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Pearson Correlation	1	.643**	.568**	.645**	.635**	.575**	.622**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	162	162	161	162	152	152	152
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Pearson Correlation		1	.631**	.590**	.616**	.482**	.569**
	Sig. (2-tailed)			.000	.000	.000	.000	.000
	N		162	161	162	152	152	152
Organize or conduct assessments of staff needs related to professional development on the use of technology	Pearson Correlation			1	.677**	.611**	.497**	.653**
	Sig. (2-tailed)				.000	.000	.000	.000
	N			161	161	151	151	151
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Pearson Correlation				1	.624**	.568**	.708**
	Sig. (2-tailed)					.000	.000	.000
	N				162	152	152	152
Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Pearson Correlation					1	.631**	.659**
	Sig. (2-tailed)						.000	.000
	N					152	152	152
Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Pearson Correlation						1	.645**
	Sig. (2-tailed)							.000
	N						152	152
Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	Pearson Correlation							1
	Sig. (2-tailed)							
	N							152

**Indicates significance at .01 level

Correlation Results Productivity and Professional Practice/Learning and Teaching

This section details the correlation results between competencies in productivity and professional practice with competencies in learning and teaching. The results are shown in table 11 with the data that is inside of the box being the focus for the analysis to follow. Technology competencies for productivity and professional practice relationship with learning and teaching technology competencies showed significance in several areas. The first significant data is ($r = .700$), one of the stronger relationships between technology competencies compared for this research question. This r value explains 49 percent of the relationship between participating in professional development activities meant to improve or expand principal's use of technology with facilitating or ensuring the delivery of professional development on the use of technology to faculty and staff. The next significant correlation is ($r = .565$), between participating in professional development activities meant to improve or expand principal's use of technology with organizing or conducting assessments of staff needs related to professional development on the use of technology to faculty and staff. This r value explains 32 percent of the relationship between these technology competencies. The last significant correlation is ($r = .564$) between participating in professional development activities meant to improve or expand principal's use of technology with disseminating or modeling best practices in learning and teaching with technology to faculty and staff. This r value explains 32 percent of the relationship between technology competencies.

Table 11 Correlation Results Productivity and Professional Practice/Learning and Teaching Section

Correlations

		Participate in professional development activities meant to improve or expand your use of technology	Use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)	Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Disseminate or model best practices in learning and teaching with technology to faculty and staff	Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Organize or conduct assessments of staff needs related to professional development on the use of technology	Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff
Participate in professional development activities meant to improve or expand your use of technology	Pearson Correlation	1	.314**	.327**	.564**	.527**	.565**	.700**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	159	159	159	159	159	158	159
Use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)	Pearson Correlation		1	.637**	.292**	.283**	.299**	.345**
	Sig. (2-tailed)			.000	.000	.000	.000	.000
	N		159	159	159	159	158	159
Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Pearson Correlation			1	.278**	.213**	.260**	.335**
	Sig. (2-tailed)				.000	.007	.001	.000
	N			159	159	159	158	159
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Pearson Correlation				1	.643**	.568**	.645**
	Sig. (2-tailed)					.000	.000	.000
	N				162	162	161	162
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Pearson Correlation				.643**	1	.631**	.590**
	Sig. (2-tailed)						.000	.000
	N					162	161	162
Organize or conduct assessments of staff needs related to professional development on the use of technology	Pearson Correlation						1	.677**
	Sig. (2-tailed)							.000
	N						161	161
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Pearson Correlation							1
	Sig. (2-tailed)							
	N							162

**Indicates significance at .01 level

Correlation Results Productivity and Professional Practice/ Support, Operations, and Management

This section details the correlation results between technology competencies in productivity and professional practice with technology competencies in support, operations, and management. The results are shown in table 12 with the data that is inside of the box being the focus for the analysis to follow. Relationships between these two groups of technology competencies provided very little significance when the results were compared. The strongest significant correlation value (r = .572) between principals encouraging and using technology as a means for communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community with principals supporting faculty and staff in connecting to and using district- and building-level technology systems for management and operations. This r value explains 33 percent of the relationship between these technology competencies. The next significant correlation value (r = .494) between principals participating in professional development activities meant to improve or expand their use of technology with principals advocating at the district level for adequate, timely, and high-quality technology support services. This r value explains 24 percent of the relationship between these technology competencies. The significance of these two correlation results were the only values in this table that provided an explanation with more than 20 percent of the relationship between the two technologies being compared.

Table 12 Correlation Results Productivity and Professional Practice/ Support, Operations, and Management

Correlations

		Participate in professional development activities meant to improve or expand your use of technology	Use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)	Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Allocate campus discretionary funds to help meet the school's technology needs	Supplemental funding to help meet the technology needs of your school	Advocate at the district level for adequate, timely, and high-quality technology support services	Investigate how satisfied faculty and staff were with the technology support services provided by your district/school
Participate in professional development activities meant to improve or expand your use of technology	Pearson Correlation	1	.314**	.327**	.331**	.412**	.386**	.494**	.358**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	159	159	159	157	157	157	157	157
Use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)	Pearson Correlation	.	1	.637**	.425**	.337**	.235**	.337**	.296**
	Sig. (2-tailed)			.000	.000	.000	.003	.000	.000
	N		159	159	157	157	157	157	157
Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Pearson Correlation			1	.572**	.351**	.308**	.345**	.286**
	Sig. (2-tailed)				.000	.000	.000	.000	.000
	N			159	157	157	157	157	157
Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Pearson Correlation				1	.346**	.294**	.361**	.292**
	Sig. (2-tailed)					.000	.000	.000	.000
	N				157	157	157	157	157
Allocate campus discretionary funds to help meet the school's technology needs	Pearson Correlation					1	.481**	.562**	.457**
	Sig. (2-tailed)						.000	.000	.000
	N					157	157	157	157
Supplemental funding to help meet the technology needs of your school	Pearson Correlation						1	.512**	.359**
	Sig. (2-tailed)							.000	.000
	N						157	157	157
Advocate at the district level for adequate, timely, and high-quality technology support services	Pearson Correlation							1	.653**
	Sig. (2-tailed)								.000
	N							157	157
Investigate how satisfied faculty and staff were with the technology support services provided by your district/school	Pearson Correlation								1
	Sig. (2-tailed)								
	N								157

**Indicates significance at .01 level

Correlation Results Leadership and Vision/Assessment and Evaluation

This section details the correlation results between technology competencies in leadership and vision with technology competencies in assessment and evaluation. The results are shown in table 13 with the data inside of the box being the focus for the analysis to follow. The first significant correlation value (r = .658) between principals engaging in activities to identify best practices in the use of technology with principals evaluating the effectiveness of professional development offerings in their school to meet the needs of teachers and their use of technology. This r value explains 43 percent of the relationship between these technology competencies. The next significant correlation value (r = .556) between principals engaging in activities to identify best practices in the use of technology with principals promoting the evaluation of the instructional practices, including technology-based practices, to assess their effectiveness. This r value explains 31 percent of the relationship between these technology competencies. The final significant correlation value (r = .542) between principals advocating for the inclusion of research-based technology practices in their school improvement plan with principals evaluating the effectiveness of professional development offerings in their school to meet the needs of teachers and their use of technology. This r value explains 29 percent of the relationship between these technology competencies.

Table 13 Correlation Results Leadership and Vision/Assessment and Evaluation Section

Correlations

		Participation in your district's or school's most recent technology planning process	Advocate for inclusion of research-based technology practices in your school improvement plan	Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology
Participation in your district's or school's most recent technology planning process	Pearson Correlation	1	.545**	.561**	.336**	.450**	.418**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	164	164	164	152	152	152
Advocate for inclusion of research-based technology practices in your school improvement plan	Pearson Correlation		1	.742**	.531**	.505**	.542**
	Sig. (2-tailed)			.000	.000	.000	.000
	N		164	164	152	152	152
Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Pearson Correlation			1	.556**	.494**	.658**
	Sig. (2-tailed)				.000	.000	.000
	N			164	152	152	152
Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Pearson Correlation			.556**	1	.631**	.659**
	Sig. (2-tailed)			.000		.000	.000
	N			152	152	152	152
Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Pearson Correlation			.494**	.631**	1	.645**
	Sig. (2-tailed)			.000	.000		.000
	N			152	152	152	152
Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	Pearson Correlation			.658**	.659**	.645**	1
	Sig. (2-tailed)			.000	.000	.000	
	N			152	152	152	152

**Indicates significance at .01 level

Correlation Results Leadership and Vision/Social, Legal, and Ethical Issues

This section details the correlation results between technology competencies in leadership and vision with technology competencies in social, legal, and ethical issues. The results are shown in table 13 with the data that is inside of the box being the focus for the analysis to follow. The first significant correlation value is ($r = .561$) between principals engaging in activities to identify best practices in the use of technology with principals implementing policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students. This r value explains 31 percent of the relationship between these technology competencies. The next significant correlation value is ($r = .542$) between principals engaging in activities to identify best practices in the use of technology with principals working to ensure equity of technology access and use in their school. This r value explains 29 percent of the relationship between these technology competencies. These correlation values show a moderately strong relationship with principals connecting the technology vision of a school to current social, legal, and ethical issues in school technology usage.

Table 14 Correlation Results Leadership and Vision/Social, Legal, and Ethical Issues Section

Correlations

		Participation in your district's or school's most recent technology planning process	Advocate for inclusion of research-based technology practices in your school improvement plan	Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Work to ensure equity of technology access and use in your school	Implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students	Involved in addressing issues related to privacy and online safety	Disseminate information about health concerns related to technology and computer usage in classrooms and offices
Participation in your district's or school's most recent technology planning process	Pearson Correlation	1	.545**	.561**	.388**	.367**	.451**	.248**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.002
	N	164	164	164	150	150	150	150
Advocate for inclusion of research-based technology practices in your school improvement plan	Pearson Correlation		1	.742**	.495**	.511**	.513**	.410**
	Sig. (2-tailed)			.000	.000	.000	.000	.000
	N		164	164	150	150	150	150
Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Pearson Correlation			1	.542**	.561**	.467**	.497**
	Sig. (2-tailed)				.000	.000	.000	.000
	N			164	150	150	150	150
Work to ensure equity of technology access and use in your school	Pearson Correlation				1	.543**	.504**	.400**
	Sig. (2-tailed)					.000	.000	.000
	N				150	150	150	150
Implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students	Pearson Correlation					1	.707**	.594**
	Sig. (2-tailed)						.000	.000
	N					150	150	150
Involved in addressing issues related to privacy and online safety	Pearson Correlation						1	.573**
	Sig. (2-tailed)							.000
	N						150	150
Disseminate information about health concerns related to technology and computer usage in classrooms and offices	Pearson Correlation						.573**	1
	Sig. (2-tailed)							
	N							150

**Indicates significance at .01 level

What are the differences between principals with one-to-one and not one-to-one technologies?

The final research question shows whether the presence of one-to-one technology makes a difference in the technology competence of principals. Each section of the survey was examined by using the same questions from the first two research questions to see if any significant results could be analyzed. Analysis of all six sections of the test revealed several interesting results and a few of the sections had significant results. Each section is broken down with its individual table and significant results are also represented in a bar graph.

Leadership and Vision One-to-One T-Tests

The data in this section details the comparison of principals technology competencies at schools whose students have one-to-one technology with principals technology competencies at schools without one-to-one technology. These t test results did not show any significant results for any of the questions that were analyzed as shown in table 15. A possible reason for this would be that regardless of whether a school has one-to-one technology, the leaders are involved in the planning and identification of best practices for technology use.

Table 15 Leadership and Vision One-to-One Technology T-Test Results

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Participation in your district's or school's most recent technology planning process	Equal variances assumed	.871	.352	-.100	162	.921	-.021	.214	-.443	.401
	Equal variances not assumed			-.100	161.993	.921	-.021	.213	-.442	.400
Advocate for inclusion of research-based technology practices in your school improvement plan	Equal variances assumed	.388	.534	-.910	162	.364	-.194	.213	-.616	.227
	Equal variances not assumed			-.912	161.940	.363	-.194	.213	-.615	.226
Engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)	Equal variances assumed	3.733	.055	.688	162	.492	.128	.186	-.239	.494
	Equal variances not assumed			.692	161.276	.490	.128	.185	-.237	.492

T-Tests Results Learning and Teaching Section

The data in this section details the comparison of principals technology competencies in the domain of learning and teaching at schools whose students have one-to-one technology with principals technology competencies at schools without one-to-one technology. Learning and teaching technology competencies did not show any significance as shown in table 16. This could be explained by several different reasons but the main reason would be that the presence or absence of technology for students does not create a barrier for technology practices being supported in classroom instruction.

Table 16 Learning and Teaching T-Test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Disseminate or model best practices in learning and teaching with technology to faculty and staff	Equal variances assumed	.022	.882	1.712	160	.089	.267	.156	-.041	.576
	Equal variances not assumed			1.710	158.035	.089	.267	.156	-.041	.576
Provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns	Equal variances assumed	.389	.534	1.322	160	.188	.229	.173	-.113	.571
	Equal variances not assumed			1.325	159.888	.187	.229	.173	-.112	.570
Organize or conduct assessments of staff needs related to professional development on the use of technology	Equal variances assumed	.046	.831	1.040	159	.300	.181	.174	-.163	.526
	Equal variances not assumed			1.039	157.706	.300	.181	.175	-.163	.526
Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Equal variances assumed	.214	.644	1.399	160	.164	.219	.156	-.090	.528
	Equal variances not assumed			1.400	159.351	.164	.219	.156	-.090	.528

T-Test Results Productivity and Professional Practice

The data in this section details the comparison of principals technology competencies in the domain of professional practice at schools whose students have one-to-one technology with principals technology competencies at schools without one-to-one technology. The technology competencies in this section showed no significant results as shown in Table 17. This is likely explained by the identical reason which the previous two sections' results were not significant as well: technology is utilized by principals regardless of the technology's availability to students at their school.

Table 17 T-Test Results Productivity and Professional Practice Section

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Participate in professional development activities meant to improve or expand your use of technology	Equal variances assumed	.177	.674	1.280	157	.203	.217	.169	-.118	.551
	Equal variances not assumed			1.278	155.261	.203	.217	.170	-.118	.552
Encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Equal variances assumed	.109	.742	-.233	157	.816	-.030	.129	-.285	.225
	Equal variances not assumed			-.233	155.897	.816	-.030	.129	-.285	.225

T-Test Results Support, Operations, and Management Section

The data in this section details the comparison of principals technology competencies in the domain of support, operations, and management at schools whose students have one-to-one technology with principals technology competencies at schools without one-to-one technology. The technology competencies in support, operations, and management t-test resulted in no significant difference between the groups shown in Table 18. The availability of technology to students is again the reason that results are not significant in these technology competencies for principals because the use of technology is not dependent on the presence of the technology in the school.

Table 18 T-Test Results Support, Operations, and Management Section

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)	Equal variances assumed	1.152	.285	-1.067	155	.288	-.145	.136	-.415	.124
	Equal variances not assumed			-1.062	147.919	.290	-.145	.137	-.416	.125
Advocate at the district level for adequate, timely, and high-quality technology support services	Equal variances assumed	1.579	.211	-.359	155	.720	-.067	.187	-.437	.302
	Equal variances not assumed			-.360	154.629	.719	-.067	.186	-.435	.301
Investigate how satisfied faculty and staff were with the technology support services provided by your district/school	Equal variances assumed	.511	.476	1.115	155	.266	.199	.178	-.153	.550
	Equal variances not assumed			1.113	152.470	.268	.199	.178	-.154	.551

T-Test Results Assessment and Evaluation

The data in this section details the comparison of principals technology competencies in the domain of assessment and evaluation at schools whose students have one-to-one technology with principals technology competencies at schools without one-to-one technology. The assessment and evaluation section t-test did not have any significant results for a principals' technology competencies. All planning requires more processes that assess and evaluate the problems that exist within a system and these planning processes are part of every school regardless of the technology access.

Table 19 T-Test Results Assessment and Evaluation Section

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Equal variances assumed	2.669	.104	1.095	150	.275	.197	.180	-.159	.553
	Equal variances not assumed			1.095	146.414	.275	.197	.180	-.159	.553
Assess and evaluate existing technology-based administrative and operations systems for modification or upgrade	Equal variances assumed	6.339	.013	1.735	150	.085	.329	.190	-.046	.704
	Equal variances not assumed			1.735	144.313	.085	.329	.190	-.046	.704
Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	Equal variances assumed	.963	.328	1.300	150	.196	.224	.172	-.116	.564
	Equal variances not assumed			1.300	149.237	.196	.224	.172	-.116	.564

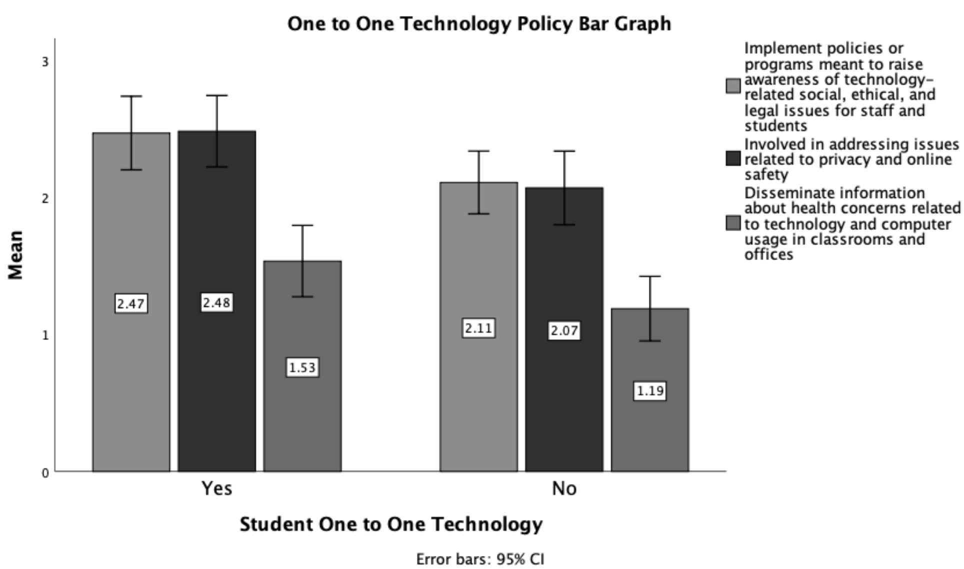
T-Test Results Social, Legal, and Ethical Issues

One-to-one technology comparisons with competencies in social, legal, and ethical issues had some significant results. These significant results regarding three different competencies are shown in Table 20; implementing policies to raise awareness of social, legal, and ethical issues for students and teachers, involved in addressing issues with online privacy and safety, and disseminating information about health information related to technology use in the classroom. These three competencies are specifically related to issues that schools with one-to-one technology experience more frequently than schools that do not have one-to-one technology available to students. The mean result at schools with one-to-one technology ($\mu = 2.47$) for the competency of implementing policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students, where schools without one-to-one technology had a ($\mu = 2.11$) result. The mean result at schools with one-to-one technology ($\mu = 2.48$) for the competency involving in addressing issues related to privacy and online safety, and schools without one-to-one technology had a ($\mu = 2.07$) result. The mean result for principals at schools with one-to-one technology ($\mu = 1.53$) for the competency disseminating information about health concerns related to technology and computer usage in classrooms and offices, while principals at non-one-to-one schools reported a ($\mu = 1.19$) result. Figure 16 illustrates those means which shows the comparisons between the two groups results for the significant results in the initial t-test. This result is significant because schools with one-to-one technology would have a greater need to make sure that these issues are researched and addressed for the one-to-one technology planning to be effective.

Table 20 T-Test Results Social, Legal, and Ethical Issues Section

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Work to ensure equity of technology access and use in your school	Equal variances assumed	.162	.688	1.053	148	.294	.173	.165	-.152	.499
	Equal variances not assumed			1.053	147.873	.294	.173	.165	-.152	.499
Implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students	Equal variances assumed	4.927	.028	2.034	148	.044	.360	.177	.010	.710
	Equal variances not assumed			2.034	144.381	.044	.360	.177	.010	.710
Involved in addressing issues related to privacy and online safety	Equal variances assumed	.154	.695	2.203	148	.029	.413	.188	.043	.784
	Equal variances not assumed			2.203	147.863	.029	.413	.188	.043	.784
Disseminate information about health concerns related to technology and computer usage in classrooms and offices	Equal variances assumed	1.976	.162	1.969	148	.051	.347	.176	-.001	.695
	Equal variances not assumed			1.969	146.522	.051	.347	.176	-.001	.695

Figure 15 One to One Technology Social, Legal, and Ethical Issues Bar Graph



Conclusion

The survey results from this study provided answers regarding Oklahoma principals' technology competencies, demographics, level of access to technology, and the impact one-to-one student technology has on their technology competence. Demographic data provides a picture of the current leaders in Oklahoma schools. Principals have a broad range of experiences in Oklahoma, technology competency results were displayed in the six domains of competencies contained in this survey; showing the means for each competency and allowing for a comparison across the board. The access to technology for principals was compared using the ANOVA test to describe the relationship between individual access to technology and individual principles technology competencies. Correlation tables showed the relationships between individual principles technology competences. The t-test results measured the differences between technology competencies for principals in schools with one-to-one student technology as opposed to the principals at schools without one-to-one technology. In conclusion, the data results reported in this chapter provides some opportunities for informing policy, future technology planning, administrator preparation, and future research in the state.

Chapter 5: Introduction

Oklahoma principals' technology competencies are the topic of focus for this research and the results present some interesting results and possibilities for future research as well. This chapter describes the additions to current literature made by this study's results from Chapter 4. After summarizing the main findings, the next section details the additions that this research makes to current literature in the summary of contributions. Next, the limitations of this study are addressed for the research that was completed. The implications for practice are outlined in section that follows after the limitations. The final section summarizes the future research possibilities for principals' technology competence.

Research Questions

1. To what extent do principals in Oklahoma schools possess technology competencies?
2. Is there a difference between the technology competencies principals possess in schools based on the level of access they have to the technology?
3. What are the relationships between these technology competencies that principals possess?
4. What are the differences between principals with one-to-one and not one-to-one technologies?

Discussion of Main Findings

The main findings of my survey research from Oklahoma principals will be outlined in this section according to the research questions. Demographic information gives a picture of Oklahoma principals and recognizes the broad scope of responses that were received for this survey. The research questions and supporting literature provide some explanation of how technology competencies could be improved but by looking through the lens of the demographic information it helps tell the story of these results. Principals' technology experiences are different across the state and are important to understanding how to improve many educational processes in Oklahoma that affect technology implementation in schools.

To what extent do principals in Oklahoma schools possess technology competencies?

The technology skills outlined by ISTE (2009) as necessary ones for administrators to possess were present with a majority of the respondents for the survey. ISTE standards are the measuring stick for all K-12 educators to follow (ISTE, 2009; ISTE, 2016; ISTE, 2017). They give a broad scope of the skills for the use of technology with students, teachers, and administrators. These technology skills also line up with the Professional Standards for Educational Leaders that are produced by the Council of Chief State School Officers every 5 years.

A cause of principals' lacking technology experience would also be demonstrated by looking at principal turnover. Based on the data collected and research from Grissom, Bartanen, and Mitani, principal turnover in schools with high numbers of students of poverty is higher than the turnover level of principals at schools with lower numbers of poverty (2019). This research relates to the results of this study based on the number of principals who responded that are from Title I schools and the amount of experience that they reported having in a building principal position. Principal quality was the primary focus of the study that was done in Tennessee to show the differences in the level of experience that principals have prior to being hired as a principal in any school in the state (Grissom, Bartanen, and Mitani, 2019). School leadership affects both students and teachers in schools, the impact of frequent changes in leadership would cause issues in every aspect of the school including technology implementation (Bartanen, Grissom, and Rogers, 2019). This study took into consideration many factors that have an effect on schools when principals leave a school. The data comparison for measuring the effects of principal turnover looked at reading and math achievement as a means to measure the impact in years following a principal transition, which would likely have some of the same effects on technology implementation as well (Bartanen, Grissom, & Rogers, 2019). These studies show that the transition that a school goes through in leadership has a lasting impact of at least 3 years in most cases on the schools achievement in math and reading (Bartanen et al., 2019; Grissom, Bartanen, & Mitani, 2019). Translating to technology implementation and leadership, the results would likely have a similar effect on school technology leadership if data existed to make the comparison for those two areas of interest.

Technology Skills of Oklahoma Principals

The findings from this research question include a number of skills that principals in Oklahoma possess. Initially the problem of practice for this study was to understand the technology competencies that principals have in Oklahoma. While the results show that they have technology competencies, there are also a number of competencies that could be improved with a focus on a few skills in principal preparation programs. Strategic planning being one of the most important pieces of preparation for school technology leadership (Hitt & Tucker, 2016; ISTE, 2009).

While coursework can be very beneficial for creating a theoretical background about vision setting, much of the work that principals need is in the form of practical steps to actually carry out the vision they have in mind (Richardson et al., 2013). This research supports the idea that technology leaders must have a certain skillset to effectively lead. Preparation includes both leadership skills and technology skills merged into the school setting, very little research exists on the measurement of these skills or even a specific list of skills.

Access to Technology for Oklahoma Principals

Technology access for principals is an important part of their journey as technology leaders and this question looked specifically at the impact that access has on their technology competencies. The existing literature supports the need for principals to have technology available to themselves in addition to students and teachers. Technology starts in the principal preparation programs that must give leaders a focus on the NETS – A standards in their coursework (Richardson et al., 2013). Awareness of these technology standards is one thing but the application of the standards creates a need that is currently not filled in all principal preparation programs. Leaders must insure a number of pieces are part of their school in order to successfully integrate change and they have to be central in the planning part of the technology change (Blau & Shamir-Inbal, 2017). Many times leaders delegate responsibility to another person on their staff to help teachers with technology and say it is important but in order for the teachers to use technology as a tool, it must be an integral part of the school vision and instructional planning (Anderson & Dexter, 2005; Dexter, 2005; Dexter et al., 2017; Tucker & Dexter, 2011).

Relationship Between Technology Skills of Oklahoma Principals

Principal's technology competencies were compared in this question with a correlation test to determine if connections existed between different skills they possess. These relationships showed some interesting connections in terms of principal leadership practices by identifying the specific competencies that affected each other. These competencies were important to building expertise for principals with technology planning and providing professional development for their staff (ISTE, 2009). Principal's must have a clear vision of technology leadership in their building, and forming that is an important part of preparation to be a school principal today

Principals Technology Skills at Schools with One-To-One Devices

Technology skills are particularly important for principals at schools where devices are one-to-one with students. These schools have a level of access to technology that should open the door to more innovative instructional practices. Oklahoma does not have one to one resources and guidance as strong as some other states. A strategic plan similar to the National Education Technology Plan would be of great benefit to future technology planning in Oklahoma (Office of Educational Technology, 2017) This type of web resource would offer a level of connectedness and collaboration that many schools lack when it comes to technology integrations. Principals like teachers are often staying in the classroom technology environments where they find the most comfort and that frequently keeps schools from changing because of the hesitation many teachers and leaders have to change their technology environments (Davis, Eickelmann, & Zaka, 2013). Some of the problem that creates this difficulty is the level of proficiency that students and teachers possess might be higher than the principal of the school. If this exists in a school it can also hinder the development of technology implementation because the principal might be less inclined to learn from students or teachers how to better use technology (Erbes, Lesky, & Myers, 2016). Virtual schooling has also become a form of competition with traditional brick and mortar schools because it offers a level of choice that may not be present in schools today (Toppin & Toppin, 2016).

The increased availability of technology requires a level of support for both principals and teachers both from a device trouble shooting/repair standpoint as well as pedagogical standpoint. Most research today is focused on the effects of technology on student achievement as a way to measure the success or failure of technology (Erbes et al., 2016).

Limitations

The limitations for this study will be outlined in this section and described in detail. First, the study included only principals for the survey data so the results will only translate to the role of a principal. The survey was completed by a majority of female principals which could be considered a limitation of the data. Another limitation of the study would be that 69 percent of responses came from principals with less than 10 years of experience as principal. The experience level of a principal does have an impact on their experience with schoolwide planning and could affect the way that principals answered questions for this survey. Other limitations with experience could also be the number of years that principals served as assistant principals, which was less than 5 years for 67 percent of the responses.

An additional limitation of this study would also be the number of principals that responded who have an elementary or early childhood background. Technology use looks differently at every level of schooling and having more responses from a secondary background could have changed the results that were found. The final limitation impacting the results of this survey would be that 66 percent of responses came from rural schools. Results could be different between the locations of schools and results tended to show that rural schools were more involved in the planning of technology implementation so that would translate to their willingness to give input about technology planning.

Implications for Practice

> We need our school leaders and teachers to understand how learning technologies work and how they change the basic interactions of teachers and learners. Our technology

> leaders need to work together with educators, not as missionaries bearing magical gifts, but as collaborators in creating new opportunities to learn. It will take a concerted effort to bring about such a radical change in thinking. (Collins & Halverson, 2010, p. 26)

The technology leadership practices for principals today are such an integral part of working in K-12 education which should be a focus at all levels of policy and preparation for school leadership (ISTE, 2009; PSEL, 2017; NETP, 2017; Hitt &Tucker, 2016). Principals can only teach teachers skills which are practiced just as they would expect teachers to teach students in their classrooms. A disconnect for those skills seems to exist within different levels of experience for principals as well as ages of principals (Davis et al., 2013). The US Department of Education Office of Technology finds these competencies to be so vital, they are part of the National Education Technology Plan and the Future Ready Schools initiative (Office of Educational Technology, 2017). ISTE has also prioritized these skills in all facets of their technology frameworks for educators, these include students, teachers, and leadership (ISTE, 2009; ISTE, 2016).

Oklahoma has been in a teacher shortage for several years now and as much as a teacher shortage impacts instruction in classrooms, the same can be said for a shortage of administrators with significant experience (Bartanen et al., 2019; Grissom et al., 2019). The lasting impact of transitions of leadership on technology is a problem that has no existing data to support its impact on schools. Principal and teacher turnover have been studied extensively from a student achievement standpoint and many of the effects that have been seen in those studies could affect technology as well (Erbes et al., 2016). In states with existing data that schools provide annually this information is much easier to compile. However, at the current time Oklahoma does not have the specific data available to make a comparison of principal's experience. The Oklahoma

State Department of Education has information posted online for contacting principals and for their current salaries but a open records request would be required to obtain the necessary records for compiling information specific to number of years' experience for principals.

A couple of recommendations from my own experience are based on the way we prepare principals for their job as technology leaders. Communication should be strengthened between the different leaders within school districts regarding planning technology implementation. This communication include instructional technology, curriculum, school, and district leadership. Every school should consider a position filled by a technology specialist, designated to implement technology beside the teachers and leaders in schools with fidelity.

Principal preparation is important to producing outcomes in practical applications of technology usage and communication. Coursework on technology leadership research is helpful to the overall understanding of technology and where it fits in a larger educational context. A required class in instructional technology would be helpful to leaders because it is more practical and its technology application is more beneficial to leaders supporting teachers. Technology that is used on a daily basis like email, word processing, spreadsheets and internet browsers are generally mastered by principals on their own. Learning management systems, apps and other creative tools are useful for principals to be an effective role model for teachers. These are tools that many are not familiar with but would streamline many tasks that principals complete daily.

Communication between all types of stakeholders in a school district is vitally important to planning technology implementation. Large districts often have silos of leadership which looks like technology, curriculum, school and district leadership. Those silos are often operating in the same space but independently of each other and they need to be talking to each other so they can best serve students and teachers. A steering committee centered around a strategic plan could all three silos into one place. Curriculum, technology, school, and district leadership all have important functions but they also only see their part of the larger context. Putting them at the same table to plan strategically gives a voice to every piece of the whole picture, so that all questions have an opportunity to be answered before they happen instead of after an implementation has already failed.

School districts should have a technology specialist in each school within their district once they have implemented one-to-one technology. This technology specialist would give training on technology. This training is more important after a one-to-one implementation because teachers need a way to learn technology that is accessible to them. This position is a necessary step if technology is going to be successful as part of the educational environment. Teachers and principals already have some skills but it is important that there is one person in the building that teaches everyone technology. Teachers learn best from each other and there are so many technology tools available and a large number of devices being managed by the technology department. The importance of an instructional technologist being in each building is paramount to successful technology implementation.

Future Research

The future research for principals' technology competencies will be of continued importance with the amount of technology use that happens in schools today. Changes in the educational landscape for Oklahoma principals makes future research on technology that much more vital to being able to improve the skills of principals in training at universities and those currently in the workforce. This research would be beneficial in other states as well to see if there are different methods of preparation that get principals needed training in the area of technology competence.

Some needed research would also include a focus on some measurable outcomes in schools that use technology in order to show the successes that come with using technology. Currently, there are some planning processes that exist but a survey instrument could be developed using a framework that includes the standards and conveys the technology implementations many moving parts that helps show a level of progress from the beginning of a technology implementation to the end.

Another topic of future research would be looking at the conversations that need to take place between various levels of leadership in large, urban districts to support technology leader development and successful implementation of technology. Drawing on my own experience with technology implementation in a large urban district, there are plenty of stakeholders in this process but it seems to be a difficult task to get all of the right people and processes in place to effectively improve technology use in a large district.

Technology research studies that were part of the literature review for this research were largely done in countries other than the United States (Dexter et al., 2017). Technology research that looks at good leadership and technology use at the same time is a necessary next step in both the United States and the state of Oklahoma.

Conclusion

Principals' technology competencies in Oklahoma have significant improvement needs to prepare principals for the technology needs in schools today. The research questions that were presented in this study answer some very basic needs with respect to the current state of principals technology competence in Oklahoma. Looking at the levels of competence currently allows for a place to begin a conversation about what is happening to prepare school leaders for leading technology in their buildings. Oklahoma principals already have some experience with technology leadership but there is always room to improve especially when the amount of technology in schools continues to increase. To prepare for the ever evolving future of technology in schools, principals need all of the available tools and competencies to meet the changing needs of teachers and students in schools. This study presents the results of the research questions as a starting point for future policy and curriculum planning in school administration.

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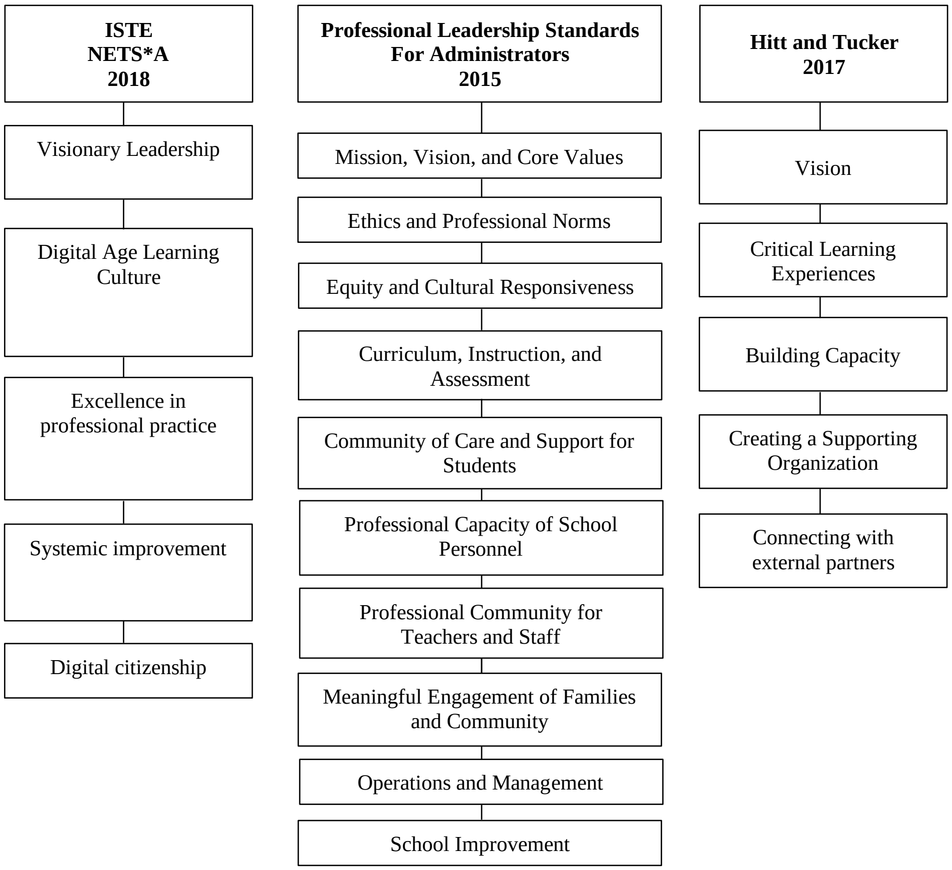
Appendix A


ISTE NETS*A 2018
Visionary Leadership
Digital Age Learning Culture
Excellence in professional practice
Systemic improvement
Digital citizenship
Professional Leadership Standards For Administrators 2015
Mission, Vision, and Core Values
Ethics and Professional Norms
Equity and Cultural Responsiveness
Curriculum, Instruction, and Assessment
Community of Care and Support for Students
Professional Capacity of School Personnel
Professional Community for Teachers and Staff
Meaningful Engagement of Families and Community
Operations and Management
School Improvement
Hitt and Tucker 2017
Vision
Critical Learning Experiences
Building Capacity
Creating a Supporting Organization
Connecting with external partners

Appendix B

Subject: Re: PTLA
Date: Saturday, December 30, 2017 at 12:18:03 PM Central Standard Time
From: Scott McLeod
To: Walk, Kara D.
CC: scott.mcleod@ucdenver.edu
Attachments: image.jpeg, PTLA Packet.pdf, 2016 - Gregory - AACTE Paper Presentation.pdf, 2015 - Brunson - PTLA Dissertation (Bowie State U).pdf, 2015 - Gregory - PTLA Dissertation (Bowie State U).pdf, 2012 - Metcalf - PTLA Dissertation.pdf, Banglu (School principal's tech leadership competency).pdf

Hi Kara,

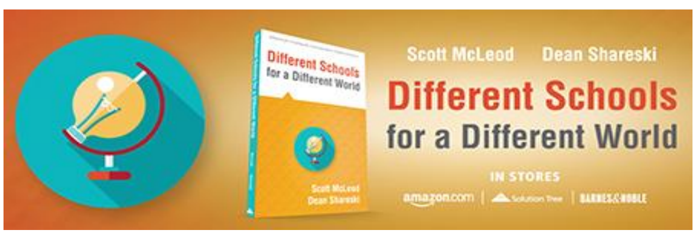
Great to hear from you! You are welcome to use the PTLA and/or modify it as desired with proper attribution. Please see http://www.dangerouslyirrelevant.org/copyright. I would like to request a PDF copy of any writings (articles, dissertation, etc.) that emerge from your use of the PTLA. Also, as you note, several other dissertations have used the PTLA so make sure you find all of those for your literature review!

Note that we're no longer supporting Options 2-4 in the attached packet. Thanks. Good luck with your study.

Happy New Year!

SCOTT

Scott McLeod, J.D., Ph.D.
Associate Professor, Educational Leadership, University of Colorado Denver
dr.scott.mcleod@gmail.com | dangerouslyirrelevant.org | @mcleod
1-707-722-7853 | Calendar dangerouslyirrelevant.org/calendar
#makeschooldifferent



Available at http://bit.ly/mcleodshareski

On Thu, Dec 28, 2017 at 12:33 PM, Walk, Kara D. <karawalk@ou.edu> wrote:

> Dr. McLeod,
>
> We spoke at UCEA this November and at the time I was looking to research superintendents and 1 to 1 initiatives. At this point I have changed my focus to principals at schools in Oklahoma with 1 to 1 initiatives and those at schools without 1 to 1 initiatives. I am looking to use the PTLA for this research and includes some demographic questions for comparison purposes.
>
> I want to make sure that I have the correct documentation for citing it and permission to do so. I have looked at a few dissertations that use it and one in particular cited a 2009 version of the PTLA

Appendix C

Principal's Technology Leadership Assessment Survey

You are being given this technology leadership assessment at the request of the researcher, which will use the results to conduct a study of technology leadership competencies in Oklahoma. Assessment items are based on the International Society for Technology in Education's (ISTE) National Educational Technology Standards for Administrators (NETS-A). The purpose of the assessment is to provide building-level administrators with detailed and comparative information about their technology leadership competencies.

The individual items in the assessment ask you about the extent to which you have engaged in certain behaviors that relate to K-12 school technology leadership. Answer as many of the questions as possible. If a specific question is not applicable, leave it blank. For example, if a question asks about technology planning activities in your district, and your district has not engaged in any such activities, leave the item blank. Note that leaving multiple items blank may limit the usefulness of the assessment results.

As you answer the questions, think of your actual behavior over the course of the last school year (or some other fixed period of time). Do not take into account planned or intended behavior. As you select the appropriate response to each question, it may be helpful to keep in mind the performance of other principals that you know. *Please note that the accuracy and usefulness of this assessment is largely dependent upon your candor.* If done with care, the results can provide you with valuable information as you seek to extend or improve your leadership skills.

When assessing behaviors and performance, individuals have a tendency to make several types of errors. You should familiarize yourself with the following errors:

Leniency error. This occurs when an individual gives himself an assessment higher than he deserves. This could occur for several reasons: the individual has relatively low performance standards for himself; the individual assumes that other individuals also inflate their ratings; or, for social or political reasons, the individual judges that it would be better not to give a poor assessment. As you assess yourself, you should understand that accurate feedback will provide you with the best information from which to base further improvement.

Halo error. This occurs when an individual assesses herself based on a general impression of her performance or behavior, and the general impression is allowed to unduly influence all the assessments given. An example of halo error would be an individual who rates herself highly on every single assessment item. It is rare that individuals perform at exactly the same level on every dimension of leadership. It is more likely that an individual performs better in some areas than on others.

Recency error. This occurs when an individual bases an assessment on his most recent behavior, as opposed to his entire behavior over some fixed period of time (e.g., the last year). This assessment should be based on your behavior over the entire year (or other fixed period of time).

The following terms appear throughout the assessment. Keep these definitions in mind as you read the items and make your response.

Technology. Generally refers to personal computers, networking devices and other computing devices (e.g., electronic whiteboards and personal digital assistants (PDAs)); also includes software, digital media, and communications tools such as the Internet, e-mail, CD-ROMs, and video conferencing.

Technology planning. Any process by which multiple stakeholder groups (e.g., district administration, school administration, faculty, and parents) convene to develop a strategy for the use or expanded use of technology in instruction and operations. Technology planning need not be separate from other planning efforts, but should be a recurring theme if integrated within a more comprehensive planning process.

Research-based. A practice that employs systematic, empirical methods that draw on observation or experiment to provide reliable data. Research-based work uses research designs and methods appropriate to the research question posed and are presented in sufficient detail for replication. The strongest research-based practices typically obtain acceptance through peer-reviewed journals or expert panels.

Assessment. A method of measurement used to evaluate progress. Student assessment typically refers to a method of evaluating student performance and attainment to determine whether or not a student is achieving the expected outcome(s).

Demographic Information

1. Does your school have one to one technology in any form?

No	Yes
1	2

2. How many years have you worked in education?

10 years or less	10-15 years	15-20 years	20-25 years	25 years or more
1	2	3	4	5

3. How many years have you been an administrator?

1-5 years	5-10 years	10-15 years	15-20 years	20 years or more
1	2	3	4	5

4. How do you identify yourself?

Female	Male
1	2

5. How old are you?

25-32 years	33-40	41-48	49-55	56 or older
1	2	3	4	5

6. What grade levels does your school have?

Elementary	Middle School	High School
1	2	3

7. Does your school receive Title I funding?

No	Yes
1	2

8. How would you categorize your school?

Urban	Suburban	Rural
1	2	3

I. Leadership and Vision

1. To what extent did you participate in your district's or school's most recent technology planning process?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you communicate information about your district's or school's technology planning and implementation efforts to your school's stakeholders?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you promote participation of your school's stakeholders in the technology planning process of your school or district?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent did you compare and align your district or school technology plan with other plans, including district strategic plans, your school improvement plan, or other instructional plans?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you advocate for inclusion of research-based technology practices in your school improvement plan?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

6. To what extent did you engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

II. Learning and Teaching

1. To what extent did you provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you provide or make available assistance to teachers for using student assessment data to modify instruction?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you disseminate or model best practices in learning and teaching with technology to faculty and staff?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent did you provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you organize or conduct assessments of staff needs related to professional development on the use of technology?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

6. To what extent did you facilitate or ensure the delivery of professional development on the use of technology to faculty and staff?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

III. Productivity and Professional Practice

1. To what extent did you participate in professional development activities meant to improve or expand your use of technology?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you use technology-based management systems to access staff/faculty personnel records?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent did you use technology-based management systems to access student records?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you encourage and use technology (e.g., e-mail, blogs, videoconferences) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

IV. Support, Management, and Operations

1. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, electronic grade book, curriculum management system)?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you allocate campus discretionary funds to help meet the school's technology needs?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you pursue supplemental funding to help meet the technology needs of your school?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent did you ensure that hardware and software replacement/upgrades were incorporated into school technology plans?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you advocate at the district level for adequate, timely, and high-quality technology support services?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

6. To what extent did you investigate how satisfied faculty and staff were with the technology support services provided by your district/school?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

V. Assessment and Evaluation

1. To what extent did you promote or model technology-based systems to collect student assessment data?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you assess and evaluate existing technology-based administrative and operations systems for modification or upgrade?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent did you evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

VI. Social, Legal, and Ethical Issues

1. To what extent did you work to ensure equity of technology access and use in your school?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

2. To what extent did you implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

3. To what extent did you implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

4. To what extent were you involved in addressing issues related to privacy and online safety?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

5. To what extent did you support the use of technology to help meet the needs of special education students?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

6. To what extent did you support the use of technology to assist in the delivery of individualized education programs for all students?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

7. To what extent did you disseminate information about health concerns related to technology and computer usage in classrooms and offices?

Not at all	Minimally	Somewhat	Significantly	Fully
1	2	3	4	5

Appendix D

The UNIVERSITY of OKLAHOMA

Institutional Review Board for the Protection of Human Subjects

Approval of Initial Submission – Exempt from IRB Review – AP01

Date: July 17, 2019

IRB#: 10879

Principal Investigator: Kara Dawn Walk

Approval Date: 07/17/2019

Exempt Category: 2

Study Title: Technology Competencies of Principals in Oklahoma

On behalf of the Institutional Review Board (IRB), I have reviewed the above-referenced research study and determined that it meets the criteria for exemption from IRB review. To view the documents approved for this submission, open this study from the *My Studies* option, go to *Submission History*, go to *Completed Submissions* tab and then click the *Details* icon.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46.
- Request approval from the IRB prior to implementing any/all modifications as changes could affect the exempt status determination.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- Notify the IRB at the completion of the project.

If you have questions about this notification or using iRIS, contact the IRB @ 405-325-8110 or irb@ou.edu.

Cordially,

Ioana Cionea, Ph.D.
Vice Chair, Institutional Review Board

Appendix E

Principal's Technology Competencies and Experience

Survey Flow

Standard: Consent (1 Question)
Block: Demographic Information (15 Questions)
Standard: One-to-One Technology Demographic (2 Questions)
Standard: Leadership and Vision (6 Questions)
Standard: Learning and Teaching (6 Questions)
Standard: Productivity and Professional Practice (5 Questions)
Standard: Support, Management, and Operations (6 Questions)
Standard: Assessment and Evaluation (5 Questions)
Standard: Social, Legal, and Ethical Issues (6 Questions)
Standard: Amazon Gift card (1 Question)

Page Break

Start of Block: Consent

Q1 **Online Consent to Participate in Research Would you like to be involved in research at the University of Oklahoma?** I am Kara Walk from the Educational Leadership and Policy Studies Department and I invite you to participate in my research project entitled Principal's Technology Competence. This research is being conducted at the University of Oklahoma. You were selected as a possible participant because you are a building principal in Oklahoma. You must be at least 18 years of age to participate in this study. **Please read this document and contact me to ask any questions that you may have BEFORE agreeing to take part in my research. What is the purpose of this research?** The purpose of this research is to measure the technology skills that Oklahoma principals. **How many participants will be in this research?** 100 to 500 people will take part in this research. **What will I be asked to do?** If you agree to be in this research, you will take a short survey with multiple choice answers. You will be asked to complete some demographic information regarding your experience as a principal. You will also be asked to include some information about your use and support of technology as a principal. **How long will this take?** Your participation will take between 15-30 minutes of time to complete the survey and include demographic data. **What are the risks and/or benefits if I participate?** There are no risks and no benefits from being in this research. **Will I be compensated for participating?** You will not be reimbursed for your time and participation in this research. Any participant that completes the survey will have an opportunity to be entered into a drawing for 4 $25 Amazon gift cards. The winners will be contacted via email at the close of the survey. **Who will see my information?** In research reports, there will be no information that will make it possible to identify you. Research records will be stored securely and only approved researchers and the OU Institutional Review Board will have access to the records. Data are collected via an online survey system that has its own privacy and security policies for keeping your information confidential. Please note no assurance can be made as to the use of the data you provide for purposes other than this research. **Do I have to participate?** No. If you do not participate, you will not be penalized or lose benefits or services unrelated to the research. If you decide to participate, you don't have to answer any question and can stop participating at any time. **Who do I contact with questions, concerns or complaints?** If you have questions, concerns or complaints about the research please contact Kara Walk at (405) 535-5477 or karawalk@ou.edu. You can also contact my faculty advisor Dr. Angela Urick at (405) 325-4202 or urick@ou.edu. You can also contact the University of Oklahoma – Norman Campus Institutional Review Board (OU-NC IRB) at 405-325-8110 or irb@ou.edu if you have questions about your rights as a research participant, concerns, or complaints about the research and wish to talk to someone other than the researcher(s) or if you cannot reach the researcher(s). *Please print this document for your records. By providing information to the researcher(s), I am agreeing to participate in this* research.

○ I agree to participate (5)

○ I do not want to participate (19)

End of Block: Consent

Start of Block: Demographic Information

Q2 How many years have you worked in education?

- ☐ 5 years or less (1)
- ☐ 5-10 years (2)
- ☐ 10-15 years (3)
- ☐ 15-20 years (4)
- ☐ 20 years or more (5)

Q3 How many years have you worked as a principal?

- ☐ 5 years or less (1)
- ☐ 5-10 years (2)
- ☐ 10-15 years (3)
- ☐ 15-20 years (4)
- ☐ 20 years or more (5)

Q4 How long did you work as a classroom teacher prior to becoming a school principal?

☐ 5 years or less (1)

☐ 5-10 years (2)

☐ 10-15 years (3)

☐ 15-20 years (4)

☐ 20 years or more (5)

Q5 How do you identify yourself?

○ Male (1)

○ Female (2)

○ Other (3) ____

Q6 How old are you?

◯ 20 - 25 (1)

◯ 26 - 30 (2)

◯ 31 - 35 (3)

◯ 36 - 40 (4)

◯ 41 - 45 (5)

◯ 46 - 50 (6)

◯ 51 - 55 (7)

◯ 56 - 60 (8)

◯ 61-64 (9)

◯ 65 or older (10)

Q7 What is your ethnicity?

Select as many as apply.

- ▢ White (1)
- ▢ Black or African American (2)
- ▢ American Indian or Alaska Native (3)
- ▢ Asian (4)
- ▢ Native Hawaiian or Pacific Islander (5)
- ▢ Other (6) ____

Q8 What grade levels are present in your school?

- ☐ Pre-K (1)
- ☐ K (2)
- ☐ 1 (3)
- ☐ 2 (4)
- ☐ 3 (5)
- ☐ 4 (6)
- ☐ 5 (7)
- ☐ 6 (8)
- ☐ 7 (9)
- ☐ 8 (10)
- ☐ 9 (11)
- ☐ 10 (12)
- ☐ 11 (13)
- ☐ 12 (14)

Q9 Does your school receive Title I Federal funding?

- ○ Yes (1)
- ○ No (2)

Q10 How would you categorize your school?

Rural - Population is less than 50,000 in the county where your school is located.
Non-Rural - Population is greater than 50,000 in the county where your school is located.

- ○ Rural (1)
- ○ Non-Rural (2)

Q11 What technology do teachers have available for their use at school?

Select as many choices as apply.

☐ Desktop Computer (1)

☐ Laptop (2)

☐ Interactive whiteboard (3)

☐ Projector (4)

☐ Tablet (5)

☐ Document Camera (6)

☐ Other (7) ____

☐ Other (8) ____

☐ None of the above (9)

Q12 What technology do you have available for your use at school?

Select as many as apply.

- ▢ Desktop Computer (1)
- ▢ Laptop (2)
- ▢ Projector (3)
- ▢ Interactive whiteboard (4)
- ▢ Tablet (5)
- ▢ Document Camera (6)
- ▢ Other (7) ____
- ▢ Other (8) ____
- ▢ None of the above (9)

Q13 What kind of district technology training and supports are available to you?

Select as many as apply.

☐ Workshops (1)

☐ Online classes (2)

☐ Individual support (3)

☐ Professional Conferences (4)

☐ Other (5) ____

☐ None of the above (6)

Q14 Do you have district personnel assigned to support technology in your school?

○ Yes (1)

○ No (2)

Q15 As an administrator, have you allocated money to support your teachers' learning of technology? Ex. Google Certifications, Apple Teacher, any training outside of courses offered by your district.

○ Yes (1)

○ No (2)

Q16 Do your students have access to one-to-one technology at your school?

○ Yes (1)

○ No (2)

End of Block: Demographic Information

Start of Block: One-to-One Technology Demographic

Display This Question:
If Q16 = Yes

Q17 Which one-to-one technology do you have in your school?

Select as many apply.

○ Tablets (1)

○ Laptops (2)

○ Combination of Laptops and Tablets (3)

Display This Question:
If Q16 = Yes

Q18 What type of operating systems do your devices use?

Select as many as apply.

▢ Android (1)

▢ Apple OS (2)

▢ Microsoft (3)

▢ Other (4) ____

End of Block: One-to-One Technology Demographic

Start of Block: Leadership and Vision

Q19 To what extent did you participate in your district's or school's most recent technology planning process?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q20 To what extent did you communicate information about your district's or school's technology planning and implementation efforts to your school's stakeholders?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q21 To what extent did you promote participation of your school's stakeholders in the technology planning process of your school or district?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q22 To what extent did you compare and align your district or school technology plan with other plans, including district strategic plans, your school improvement plan, or other instructional plans?

- ◯ A great deal (1)
- ◯ A lot (2)
- ◯ A moderate amount (3)
- ◯ A little (4)
- ◯ None at all (5)

Q23 To what extent did you advocate for inclusion of research-based technology practices in your school improvement plan?

- ◯ A great deal (1)
- ◯ A lot (2)
- ◯ A moderate amount (3)
- ◯ A little (4)
- ◯ None at all (5)

Q24 To what extent did you engage in activities to identify best practices in the use of technology (e.g. reviews of literature, attendance at relevant conferences, or meetings of professional organizations)?

- ◯ A great deal (1)
- ◯ A lot (2)
- ◯ A moderate amount (3)
- ◯ A little (4)
- ◯ None at all (5)

End of Block: Leadership and Vision

Start of Block: Learning and Teaching

Q25 To what extent did you provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data?

- ◯ A great deal (1)
- ◯ A lot (2)
- ◯ A moderate amount (3)
- ◯ A little (4)
- ◯ None at all (5)

Q26 To what extent did you provide or make available assistance to teachers for using student assessment data to modify instruction?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q27 To what extent did you disseminate or model best practices in learning and teaching with technology to faculty and staff?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q28 To what extent did you provide support (e.g., release time, budget allowance) to teachers or staff who were attempting to share information about technology practices, issues, and concerns?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q29 To what extent did you organize or conduct assessments of staff needs related to professional development on the use of technology?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q30 To what extent did you facilitate or ensure the delivery of professional development on the use of technology to faculty and staff?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

End of Block: Learning and Teaching

Start of Block: Productivity and Professional Practice

Q31 To what extent did you participate in professional development activities meant to improve or expand your use of technology?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q32 To what extent did you use technology to help complete your day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q33 To what extent did you use technology-based management systems to access staff/faculty personnel records?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q34 To what extent did you use technology-based management systems to access student records?

- ○ A great deal (1)
- ○ A lot (2)
- ○ A moderate amount (3)
- ○ A little (4)
- ○ None at all (5)

Q35 To what extent did you encourage and use technology (e.g., e-mail, apps, and social media) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community?

- ○ A great deal (1)
- ○ A lot (2)
- ○ A moderate amount (3)
- ○ A little (4)
- ○ None at all (5)

End of Block: Productivity and Professional Practice

Start of Block: Support, Management, and Operations

Q36 Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations (e.g., student information system, grade book, learning management system)?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q37 To what extent did you allocate campus discretionary funds to help meet the school's technology needs?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q38 To what extent did you pursue supplemental funding to help meet the technology needs of your school?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q39 To what extent did you ensure that hardware and software replacement/upgrades were incorporated into school technology plans?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q40 To what extent did you advocate at the district level for adequate, timely, and high-quality technology support services?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q41 To what extent did you investigate how satisfied faculty and staff were with the technology support services provided by your district/school?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

End of Block: Support, Management, and Operations

Start of Block: Assessment and Evaluation

Q42 To what extent did you promote or model technology-based systems to collect student assessment data?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q43 To what extent did you promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q44 To what extent did you assess and evaluate existing technology-based administrative and operations systems for modification or upgrade?

- ○ A great deal (1)
- ○ A lot (2)
- ○ A moderate amount (3)
- ○ A little (4)
- ○ None at all (5)

Q45 To what extent did you evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology?

- ○ A great deal (1)
- ○ A lot (2)
- ○ A moderate amount (3)
- ○ A little (4)
- ○ None at all (5)

Q46 To what extent did you evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology?

- ○ A great deal (1)
- ○ A lot (2)
- ○ A moderate amount (3)
- ○ A little (4)
- ○ None at all (5)

End of Block: Assessment and Evaluation

Start of Block: Social, Legal, and Ethical Issues

Q47 To what extent did you work to ensure equity of technology access and use in your school?

◯ A great deal (1)

◯ A lot (2)

◯ A moderate amount (3)

◯ A little (4)

◯ None at all (5)

Q48 To what extent did you implement policies or programs meant to raise awareness of technology-related social, ethical, and legal issues for staff and students?

◯ A great deal (1)

◯ A lot (2)

◯ A moderate amount (3)

◯ A little (4)

◯ None at all (5)

Q49 To what extent were you involved in addressing issues related to privacy and online safety?

◯ A great deal (1)

◯ A lot (2)

◯ A moderate amount (3)

◯ A little (4)

◯ None at all (5)

Q50 To what extent did you support the use of technology to help meet the needs of special education students?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q51 To what extent did you support the use of technology to assist in the delivery of individualized education programs for all students?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q52 To what extent did you disseminate information about health concerns related to technology and computer usage in classrooms and offices?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

End of Block: Social, Legal, and Ethical Issues

Start of Block: Amazon Gift card

Q53 Please enter your email address if you wish to be entered for the Amazon gift card drawings.

____

End of Block: Amazon Gift card