TECHNOLOGY LEADERSHIP AND TEACHERS' PERCEPTIONS OF THE PRINCIPAL TECHNOLOGY LEADERSHIP ROLE

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Veronica Jean Garza, M.Ed.

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Veronica Jean Garza

APPROVED BY

_____
Antonio Corrales, Ed.D., Chair

_____
Michelle Peters, Ed.D., Committee Member

_____
Norma Martinez, Ed.D., Committee Member

_____
Jane Mcintosh Cooper, Ed.D., Committee Member

RECEIVED BY THE COLLEGE OF EDUCATION

_____
Terry Shepherd, Ed.D., Associate Dean

_____
Joan Pedro, Ph.D., Dean

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ABSTRACT

TECHNOLOGY LEADERSHIP AND TEACHERS' PERCEPTIONS OF THE PRINCIPAL TECHNOLOGY LEADERSHIP ROLE

Veronica Jean Garza
University of Houston-Clear Lake, 2023

Dissertation Chair: Antonio Corrales, Ed.D.

The purpose of this mixed methods study was to examine principal's technology leadership and teachers' perceptions of the principal's technology leadership role in a school setting. A purposeful sample of 123 principals and 126 teachers located throughout Region IV were solicited to completed modified versions of the *Principal Technology Leadership Assessment* (PTLA), and semi-structured interviews were conducted with ten principals and teachers to learn more about the perceptions of both groups regarding the principal's technology leadership role. Descriptive statistics and t-tests were used to analyze the quantitative data, while an inductive coding process was used to analyze the transcribed interviews. The quantitative findings revealed that there are significant differences between what principals are doing and what teachers believe they should be doing as technology leaders, with the greatest differences among the Leadership & Vision and Support, Management, and Operations sub-scale activities. The

interview data revealed four emerging themes: resources, support, technology self-efficacy, and challenges. Based on the qualitative findings, principals need to ensure they provide resources and evaluate their effectiveness, and teachers need to feel supported by principals and provided with opportunities to collaborate. Additionally, technology self-efficacy improves with regular use of technology, and challenges that must be addressed include a lack of/an overabundance of resources, buy-in, and communication. The researcher concludes the study with implications and recommendations for future research based on these findings.

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CHAPTER I:

INTRODUCTION

Currently, society is living in a time when technology is not only available and encouraged to supplement education, but it is also necessary for students who utilize instructional technology due to the current COVID-19 pandemic (Mukhopadhyay et al., 2020). Over the course of a decade, technology has changed the way curriculum is delivered, students engage in learning, and instruction is differentiated to meet the needs of all scholars (Reddy & Bubonia, 2020). There are a number of factors that contribute to the successful implementation of technology in classroom instruction (Alenzi, 2016). However, a key factor in determining how well technology is integrated in schools today is the role that school leaders play in supporting teachers as they embrace this new way of learning (Christensen et al., 2018). The present study will examine technology leadership and teachers' perceptions of the principal's technology leadership role.

Research Problem

In recent years, the use of information and communication technology (ICT) has become a critical part of society, especially in light of the current pandemic which has meant moving to an online platform (Mukhopadhyay et al., 2020; Unal et al., 2015). Research indicates that instructional technology provides students with new and creative ways to engage and motivate students, allows teachers to easily differentiate instruction, and provides students with opportunities to prepare for post-secondary education and future career opportunities (Connor, 2017; Fatimah & Santiana, 2017; Karvounidis et at., 2017). Furthermore, research supports the idea that leadership is the most essential factor in effective school change, including change brought about by instructional technology (Gosmire & Grady, 2007). That said, awareness of technology leadership roles and responsibilities is critical in implementing technology in a school setting.

When considering the implementation of technology in schools, teachers play an important role; however, school leaders are key in implementing instructional technology effectively (Turan, 2002). Principals, for example, are a critical part of effective changes made to launch technology initiatives on a campus (Pautz & Sadera, 2017). Through collaboration and professional learning networks, principals are able to empower teachers and students while making student-centered learning a top priority through the three "Rs" in technology leadership: relationships, risk-taking, and reinventing (Sterrett & Richardson, 2020). For school leaders to effectively implement instructional technology, technology needs must be assessed, resources and support must be provided, and a clear vision on how technology will be utilized and monitored over time must be communicated with all stakeholders involved (Christensen et al., 2018).

Based on a study that examined the technology philosophy assumptions of K-12 technology leaders, participants felt that technology is a valuable tool for education, it is a new norm that school leaders must learn to embrace, and it will have a positive impact on the future of education (Webster, 2017). As educational technology leaders respond to their desire to prepare students for a future that will inevitably include technology, keeping up with technology tends to be their primary concern, and it is believed that this has affected the abilities of technology leaders (Webster, 2017). However, if school leaders feel confident in their technology leadership skills, their motivation for successfully integrating technology in the classroom will increase (Hacifazlıoğlu et al., 2011). The integration of technology is one way to increase student achievement, and by supplementing traditional classroom instruction with technology, it is believed that students will be able to achieve improved academic success (Doğan, 2018; Hew & Brush, 2006).

It is widely accepted that school leadership has great influence on student outcomes: therefore, how principals are prepared for their role has never been more important (Metcalf and LaFrance, 2013). In 2001, the International Society for Technology in Education (ISTE) developed educational technology standards for students and teachers, NETS-S and NETS-T, and in 2002, ISTE developed technology standards for leaders, known as NETS-A which were updated in 2009 (ISTE, 2009). The rationale for NETS-A was that leaders must be able to support students and teachers and ensure that conditions essential to ensuring optimal benefits from technology are in place (Knezek, 2009). According to a study conducted by Metcalf and LaFrance (2013), the vast majority of principals were not prepared for a technology-rich environment based on the expected standards. Based on these results, school leaders still require opportunities to learn about what is expected of them so they can better serve the teachers and students on their campuses.

Unfortunately, other research studies also indicate that school leaders often feel unprepared to serve as the technology leaders on campus (Ellis et al., 2021; Richardson & Sterrett, 2018). Principals have said they lack professional development on instructional technology resources and programs, which has made it difficult for them to serve as role models for the teachers they work with (Lindqvist, 2019; Lindqvist & Pettersson, 2019). This lack of professional learning opportunities has made it challenging for school leaders to know what resources should be purchased that would allow them to integrate technology effectively (Bass, 2021). Technology professional development is often still about embracing technology rather than focused on how it should be used for teaching and learning, which requires school leaders and teachers to think differently about how technology is used to operate schools and teach the curriculum (Richardson & Sterrett, 2018). Finally, principals must have clear expectations of their teachers' use of

technology in order for them to be evaluated based on how it is implemented (Alarcon et al., 2020). Currently, not all teachers are evaluated on their technology integration, which further indicates that leaders have not clearly communicated their roles in utilizing these tools.

Furthermore, there is a lack of research on the self-efficacy of school leaders' instructional technology and how it influences their roles as technology leaders. Research has shown that experienced school administrators tend to have high technology self-efficacy when compared to administrators with little experience because they understand their roles as technology leaders and are more adept at providing resources, staff development, and the necessary support to implement change such as integrating instructional technology (Doğan, 2018; Inan & Lowther, 2009; Unal et al., 2015). Research also suggests that instructional technology in-service programs are effective in helping school administrators develop their technology leadership self-efficacy when compared to school administrators who do not participate (Unal et al., 2015). In fact, the most effective instructional leaders embrace innovative technology, use it alongside their teachers, and collaborate to support one another in learning new forms of technology (Sterrett & Richardson, 2020).

There are many research articles that explain the significant role that school leaders and teachers play in integrating technology; however, there is limited research on teacher perceptions of technology leadership (Christensen et al., 2018; Germeroth et al., 2018; Liu & Hallinger, 2018; Pautz & Sadera, 2017; Sterrett & Richardson, 2020). A study was conducted in Spain to learn more about this topic and evaluate how Information and Communication Technology (ICT) coordinators who lead technology programs affect the attitudes and perceptions teachers have towards integrating technology in their classrooms (Moreira et al., 2018). The results of this study indicate

that ICT coordinator positions are becoming more critical, and teachers value their leadership in order to promote ICT in school settings. Teachers in this study considered ICT coordinators experts in technology, as they provide resources, technical support, and professional development. The roles of ICT coordinators mentioned by teachers include facilitating technology reform, providing a support system for teachers who are having issues with utilizing technology, and acting as mediators in ensuring that schools meet all ICT policy requirements (Moreira et al., 2018). School leaders must be aware of these expectations if they hope to support teachers in their role in implementing technology in schools.

Research has also been conducted on the instructional technology self-efficacy of teachers which supports the need for leaders to better understand how they can help teachers utilize instructional technology in their classrooms (Alenzi, 2016; Barton & Drexler, 2019; Liu & Hallinger, 2018). Teachers who feel well-trained, supported, and confident in their ability to integrate technology are more likely to utilize technology in the classroom (Alenzi, 2016). According to Barton and Dexter (2019), formal, informal, and independent professional learning promotes self-efficacy which directly relates to how teachers utilize technology and the frequency of its use in the classroom. In addition, when school leaders facilitate opportunities for teachers to learn their craft and motivate them to collaborate, teachers feel more confident in their abilities as educators (Liu & Hallinger, 2018). According to research conducted by Karakose et al., (2021), some teachers feel that campus leaders have not been supportive, since they felt principals had not taken the necessary steps to prepare for technology integration on campus, and it was perceived as an increased workload for teachers. That said, to improve the technology leadership of school leaders, there should be a clear understanding of what teachers

expect from administrators so that principals can grow in those areas and provide teachers with the support they need.

In conclusion, for teachers to effectively implement instructional technology in their classrooms, resources and professional development must be provided, evaluations must be put in place, and most importantly, school leaders must take an active role in the planning and implementation of the instructional technology utilized (Germeroth et al., 2018; Sterrett & Richardson, 2020; Vu et al., 2018). While there is a plethora of research to support the importance of these factors, there is limited research on technology leadership and teachers' perceptions of the role of technology leaders (Christensen et al., 2018; Germeroth et al., 2018; Liu & Hallinger, 2018; Pautz & Sadera, 2017; Sterrett & Richardson, 2020; Vu et al., 2018). This research is intended to learn about principals' technology leadership and teachers' perceptions of school leaders' technology leadership role in an effort to bridge the gaps that are uncovered.

Significance of the Study

Technology has become an important part of society today, and to prepare students to compete in a global economy, it is essential that educators embrace this new way of delivering instruction (Reddy & Bubonia, 2020). Research supports the critical role that school leaders' play in supporting teachers in implementing technology, and to assist school leaders in determining how they can implement instructional technology on their campuses successfully, research should be conducted to better understand the principal's technology leadership role and what school leaders can do to help their students meet the ultimate goal of student achievement (Germeroth et al., 2018; Sterrett & Richardson, 2020; Vu et al., 2018). Without this research, superintendents may not be prepared to hire and/or train leaders to embrace instructional technology at their schools,

which could mean students fail to learn how to use the learning platform they can expect to use throughout their lifetime.

Research Purpose and Questions

The purpose of this study is to examine technology leadership and teachers' perceptions of the principal's technology leadership role. The research questions to be addressed are:

R1: What are principals doing as technology leaders?

R2: What are the teachers' perceptions of the principal's role as technology leader?

R3: What are the similarities and differences between what principals are doing as technology leaders and teachers' perceptions of the principal's role as technology leader?

R4: What are the perceptions of principals and teachers concerning the principal's technology leadership role?

Definition of Key Terms

Instructional Technology: Utilizing various forms of technology such as multimedia, software, computers, video/web conferencing, social networks, blogs, and wikis to support learning (Jeffries, 2018).

Instructional Technology Self-Efficacy: People's beliefs in their ability to utilize technology to performs tasks (Bandura, 1986; Jeffries, 2018).

Self-Efficacy: People's beliefs in their abilities to perform or execute a required action (Bandura, 1986).

School Leaders: Leaders who establish a clear vision and mission, communicate goals and objectives, develop accountability measures, build the capacity of their staff, promote

a positive school culture, determine and monitor high standards for student achievement, and collaborate with the families and communities they serve (Hitt & Tucker, 2016).

Student Achievement: This term refers to the improvement in student performance and/or the success rate of students on public examinations (Burke & Sass, 2013).

Technology Leadership: A leader who provides opportunities for educators to develop in technology, implements technology in the classroom, and makes technology a priority to improve student achievement (Anderson & Dexter, 2005).

Conclusion

This chapter establishes a need to examine technology leadership and teachers' perceptions of the principal's technology leadership role. An overview of the study, research purpose and questions, and definitions of key terms related to my research were also reviewed. The next chapter will include a literature review of the topics discussed throughout this study.

CHAPTER II:

REVIEW OF LITERATURE

To implement instructional technology effectively, school leaders must play an active role in leading instructional technology initiatives on their campuses (Sterrett & Richardson, 2020). According to Asio & Bayucca (2021), school administrators must increase their ability to utilize instructional technology if they expect teachers and students to use them in the classroom. By seeking professional development opportunities, leaders become more knowledgeable and confident, which can impact how technology is implemented on a campus (Sheperd & Taylor, 2016). Furthermore, highly effective school leaders have the ability to increase their staff's instructional technology self-efficacy by providing them with the necessary resources and reinforcing the idea that "school stakeholders can make a difference" (Smith et al., 2020, p. 12). Such influential leaders not only improve self-efficacy, but they also improve school climate, which can be a catalyst for student achievement (Smith et al., 2020).

Research shows that the most effective leaders embrace innovative technology, use it alongside their teachers, and collaborate to support one another in learning new forms of technology (Sterret & Richardson, 2020). Research also suggests that as leaders initiate changes, they can have a positive influence on how they are implemented and improve the school climate (Smith et al., 2020). While there is a plethora of research that supports these findings, there is a lack of research on instructional technology leadership and perceptions of the technology leadership role. This study will examine the technology leadership and teachers' perceptions of the principal's technology leadership role. This chapter will review previous research that has been conducted leadership and vision; teaching and learning; productivity and professional practice; support,

management, and operations; assessment and evaluation; and social, legal, and ethical issues as they relate to my topic of study.

Leadership & Vision

In order for instructional technology to effectively enhance students' learning, it must be initiated and supported by school leaders (Raman et al., 2019). Furthermore, research supports the idea that leadership is the most essential factor in effective school change, including change brought about by instructional technology (Gosmire & Grady, 2007). Awareness of technology leadership roles and responsibilities is critical in implementing technology in a school setting (Raman et al., 2019). This section will examine teacher perceptions of technology leadership and technology leaders' philosophy assumptions.

Leadership plays an important role in how effectively technology is integrated in an educational setting, and in an effort to learn more about how teacher perceptions align with this theory, a study was conducted in Spain to learn more about this topic (Moreira et al., 2018). The purpose of this study was to evaluate how Information and Communication Technology (ICT) coordinators who lead technology programs at school affect the attitudes and perceptions teachers have towards integrating technology in their classrooms. A total of 5,161 primary and intermediate teachers from various regions in Spain participated, and the teachers who were chosen were in the process of implementing the School 2.0 ICT program at the time of this study. A 32-question multiple-choice questionnaire (from the Spanish Institute of Educational Technology) was used to collect data for this research. The questionnaire was organized into six parts to collect data on the participants, ICT in schools, functions of the ICT coordinator, perceptions of the need of the ICT coordinator, and possible assessments for ICT programs utilized (Moreira et al., 2018).

The results of this study indicate that ICT coordinator positions are becoming more critical roles, and teachers value their leadership in in order to promote ICT in school settings. Teachers in this study considered ICT coordinators experts in technology, as they provide resources, technical support, and professional development. The roles of ICT coordinators mentioned by teachers include facilitating technology reform, providing a support system for teachers who are having issues with utilizing technology, and acting as mediators to ensure schools meet all ICT policy requirements (Moreira et al., 2018).

While some research suggests that principals as technology leaders have a significant impact on the integration of technology in schools, other studies suggest that is not always the case. In an effort to determine how principals' technology leadership affects the ways in which teachers integrate technology in schools, a total of 47 principals and 375 teachers from Malaysian schools were randomly selected to participate in a study in October of 2019 (Raman et al., 2019). Data were collected for this quantitative study through questionnaires completed by both principals and teachers. The mean and standard deviations for the principal's questionnaire were analyzed based on scores of the five constructs (Visionary Leadership, Digital age Learning Culture, Excellence in Professional Practice, Systematic Improvement, and Digital Leadership), while descriptive data analysis was used to examine the level of technology integration among teachers. The data were then analyzed by the researchers using inferential statistics and statistical software programs (Raman et al., 2019).

The results of the study indicated that overall, principals had a high mean level in technology leadership, and the mean score for teachers' technology integration was notably high as well. This research also revealed that the five constructs of the ISTE - Standards for Administrators (2014) did not have a positive effect on the integration of technology by teachers. In other words, a principal's technology leadership could not

accurately predict how the teachers in the study integrated technology, and there was not a relationship between technology leadership and the use of technology by teachers in the classroom (Raman et al., 2019).

While technology leadership may not have had a significant impact in the previous study, Thannimalai and Raman (2018) conducted another study that proves otherwise. The purpose of this research was to determine the level of principals' technology leadership and its five constructs (Visionary Leadership, Digital Age Learning Culture, Excellence in Professional Practice, Systemic Improvement, and Digital citizenship in schools) as well as the relationship between principals' technology leadership and teachers' technology integration. In addition, the effect of professional development on the integration of technology was also investigated. Systematic random sampling was carried out to select 90 principals and 645 teachers from secondary schools in Kedah, Malaysia in a cross-sectional survey. The *Principals Technology Leadership Assessment* (PTLA) and the *Survey of Technology Experiences* were administered to principals, while the *Learning with ICT: Measuring ICT Use in the Curriculum* instrument was administered to teachers who participated in the research (Thannimalai & Raman, 2018).

The findings of the study showed that there was a significant relationship between principals' technology leadership and teachers' technology integration. Furthermore, professional development had a significant effect on the relationship between

the two variables. From this study, research proves that principals should participate in professional development on information and communication technology (ICT) so that they can become effective technology leaders. In addition, principals will be better prepared to motivate teachers to integrate technology in the classroom and prepare students for their future careers (Thannimalai & Raman, 2018).

While technology is now an important platform in education today, researchers have found that there is a lack of research on school leaders' beliefs in implementing technology in schools (Webster, 2017). A study relevant to the integration of instructional technology was conducted to examine the technology philosophy assumptions of K-12 technology leaders, investigate how these assumptions impact decisions made for technology in schools, and explore whether technological determinist assumptions are present (Webster, 2017). A total of 31 technology leaders from 19 school districts located throughout Virginia participated in the research. This was a qualitative study using grounded theory methods, and data were collected using interviews and a written questionnaire (Webster, 2017).

Based on the data collected, three philosophy of technology views were common: "Technology is a tool, technological change is inevitable, and technological optimism" (Webster, 2017, p. 27). Participants in the study felt that technology is now a valuable tool for education, it is the new norm that educators must learn to embrace, and technology will have a positive impact on the future of education. Based on these viewpoints, leaders felt that educational goals and curriculum should drive technology, technology must become a part of education today, and technology must be used ethically. The researcher for this study concluded that as educational technology leaders respond to their desire to prepare students for a future that will inevitably include technology, keeping up with technology tends to be the primary concern of educational leaders. From this research study, we now know that philosophy of technology assumptions matter and better prepare leaders to make meaningful decisions regarding technology (Webster, 2017).

Teaching & Learning

Research indicates that instructional technology provides students with new and creative ways to engage and motivate students, and it allows teachers to easily differentiate instruction to personalize student learning (Alenzi, 2016; Conner, 2017; Hallinger et al., 2017). In order for teachers to understand how to utilize instructional technology effectively however, professional development (PD) must be provided to teachers so they are aware of the resources available to them and best practices for how they should be used. This section will further examine the current literature on the influence of professional development on instructional technology.

To learn more about the effects of professional development, a study was conducted by three researchers to determine the critical components of professional learning activities for successful technology integration (Yurtseven et al., 2019). The study focuses on learning about the core features of effective professional development and flipped PD that can be utilized to prepare teachers to integrate technology in their classrooms. For this study, a review of current literature was examined through online research, focusing on key terms such as teacher training, teaching with technology, and teacher technology PD. After reviewing over 500 articles, bibliographies, and dissertations which were identified based on key terms, 32 articles were utilized in this literature review, including empirical studies, theoretical works, research reports, and books that were relevant to this study (Yurtseven et al., 2019).

Based on this extensive literature review, core features of effective professional development were identified. According to the research articles studied, successful PD activities are relevant and related to teachers' content areas, and time is allotted for teacher reflection, exploration, and evaluation of new technology. Furthermore, productive PD activities are extended over periods of time to ensure that teachers are able

to grasp and internalize concepts taught, and necessary resources such as time, support, and technology are provided for effective implementation. Implications that were noted include learner-centered PD, allowing time for teachers to reflect on student work to determine how technology would benefit them. In addition, PD should provide ways for teachers to gather data directly from students by involving them in the learning process. Finally, the flipped model was studied, and best practices include providing online modules and videos in order to personalize teachers' learning, face-to-face trainings led by district mentors and teacher leaders, and time for classroom application for teachers to apply what they've learned (Yurtseven et al., 2019).

Researchers recognize the importance of professional development that meets the technology needs of adult learners; therefore, a study was conducted to design and implement a PD program for technology integration and evaluate the impact it had on teachers in a public education setting (Alemdag et al., 2019). For the purpose of this study, a PD program was created using the technological pedagogical content knowledge (TPACK) framework, and a total of 10 teachers located in the district of Anakara in Turkey participated. This was a qualitative study in which thematic coding was used to determine how the PD program contributed to the teachers and what characteristics made it effective. Prior to implementing the PD program, a needs assessment was conducted via interviews and focus groups to determine the needs of the teachers that participated in the study. Based on the results of the assessment, it was determined that teachers would need support with providing technology instruction that was learner-centered, user-friendly, and embedded follow-up practice activities for students (Alemdag et al., 2019).

The PD program was designed based on those specific needs, and it was implemented with the 10 participants over a six-hour time frame. Data sources for this study included a teacher participant form, lesson plans, interviews, and reflective writing

by participants, and thematic coding analysis was used to evaluate the program's impact. Based on this analysis, two main themes emerged: contributions of teachers and effective characteristics of the PD program. The teachers shared that the program increased their understanding of TPACK as well as improved their teaching practices by providing them with the tools necessary to integrate technology in their lesson plans and daily instruction. Furthermore, the teachers shared that the effective characteristics of the program included the ability to take an active role in their learning, collaborate with their colleagues, and participate in hands-on activities (Alemdag et al., 2019).

While it is well known that professional development supports teachers with content knowledge and instructional strategies, little is known about the efficacy of professional development when teaching mathematics with technology integration. To learn more about this topic, a mixed methods study was conducted in Germany to determine how a professional development program affected teacher beliefs, self-efficacy, and frequency of technology use for mathematics instruction (Thurm & Bazal, 2020). At total of 39 secondary teachers participated in the PD program, and a control group was used to compare data. The PD consisted of a four-day training spread out over 10 months, allowing time for implementation and reflection between sessions. The four trainings consisted of an introduction to teaching mathematics with multi-representational tools, ing tasks, classroom design and implementation, and utilizing assessment and documentation. Data sources included pre- and post-tests, questionnaires, and interviews from both the experimental and control groups. A Likert-scale was used to analyze data, and the method of propensity was used to reduce selection bias (Thurm & Bazal, 2020).

The results of the study indicated that technology was viewed more favorably by teachers following the PD, while beliefs remained unchanged by the control group; however, both groups still felt that technology integration would never replace hands-on

experiences that are necessary for student learning. It did not appear that the PD program influenced technology self-efficacy, as there was an increase in self-efficacy noted in both the experimental and control groups. Furthermore, the results of the questionnaire did not indicate notable changes in the beliefs about the nature of teaching and learning mathematics (epistemological beliefs). In regards to technology use however, there was in increase in technology usage to support multiple representations by teachers who participated in the PD program when compared to the control group. These results indicate that the PD program did positively influence the beliefs and the use of instructional technology by teachers (Thurm & Bazal, 2020).

Another study took a closer look at how extenuating circumstances influenced a need to implement technology within a school district that lacked other options. Fort McMurray Catholic School District (FMCSD), a district located in Canada, had recently experienced a forest fire which burned most of their paper-based materials (Thiel, 2017). Although this was a tragic event, it did give the district the opportunity to take advantage of their instructional technology; therefore, a mixed methods study was conducted to find ways to support the district's teachers in acquiring the necessary skills for technology integration. A total of 42 teachers participated in the study, and data were collected using a Google form survey. The survey included both multiple choice and open-ended questions, allowing for both quantitative and qualitative data to be collected and analyzed. The research questions asked teachers to share instructional technology they were currently using, teachers' perceptions on the benefits and affordances of technology, and features of professional learning (PL) they feel would support them with better integrating technology in their classroom instruction (Thiel, 2017)

The results of the study indicate that teachers were utilizing technology in various ways, however they were using it to substitute paper-based instruction rather than

enhance or create new opportunities that would not be possible otherwise. According to the data, only 50% of teachers were using technology to create, just 43% were using it to share, and only 38% used it for collaboration. Additional data showed that 35% of teachers said they were comfortable with online instruction, 25% said they relied on online resources, and 25% acknowledged an advantage from increased availability of online resources. Regarding what PL training features teachers preferred, they desired relevant, hands-on learning that allowed for collaboration. Based on these results, the researchers suggest PL that incorporates 21st century skills and activities that allow for collaborative experiences. Sessions should be grade and/or subject relevant, and teachers should have access to resources and guidance from experts. Finally, the support of leadership is paramount for the PL to have a positive impact on teacher implementation (Thiel, 2017).

Productivity & Professional Practice

It is well known that school leaders play an important role in facilitating and supporting technology integration, however many leaders have not received the PD necessary to support them in this role (Lindqvist, 2019; Richardson & Sterrett, 2018). School leaders who fail to understand their roles as technology leaders may not have the knowledge to use technology to improve teaching and learning (Christensen et al., 2018). This section will further examine the current literature on productivity and the professional practices of school leaders in the roles as technology leaders.

Technology has become an important part of society, and the role of leaders in utilizing and implementing technology in schools today has become a focus in educational reform. To learn more about this topic, a study was conducted by Lindqvist and Pettersson, and the purpose of their research was to “explore how school leaders understand digitalization and the digital competencies needed in leading for digitalization

in Swedish schools" (2019, p. 218). A total of 32 Swedish administrators participated in the study, and data were collected using learning reflections and semi-structured interviews. Learning reflections were based on two-open ended questions that focused on learning administrators' understanding of digitalization and the professional development they felt would best support them as technology leaders. Semi-structured interviews were conducted with eight principals, and questions were related to the themes that were discovered when conducting the learning reflections (Lindqvist & Petterrson, 2019).

Data were coded, analyzed, and categorized according to Leithwood and Riehl's four functions of leadership, as reconceptualized by Dexter (2008). In regards to *setting the direction*, administrators saw the value in using technology to prepare students for the future, they understood that they must engage technology in all subject areas, and they value the fact that digitalization allowed them to complete their jobs more efficiently. When it came to *developing people*, administrators acknowledged the importance of receiving technology PD, and they felt that teachers and students should provide input so they receive the support they need. In terms of *developing the organization*, technology resources must be available for teachers and administrators, and they should be used to facilitate meetings and communicate. Finally, in regards to *developing technology and learning*, administrators see a need to focus on content and extend their knowledge beyond just instructional technology through PD and collaboration. The study concludes with implications stating that resources, time, and PD are important in supporting administrators with implementing technology in schools (Lindqvist & Pettersson, 2019).

In response to the emphasis that has been placed on instructional technology today, the North Carolina (NC) board of education approved and integrated the Digital Learning Competencies for Teachers (DLCT) and the Digital Learning Competencies for School Administrators (DLCSA). These frameworks were designed to provide educators

with guidance on what is expected of them when utilizing technology, and a study was conducted to gain a better understanding of perceptions of NC administrators on the DLCSA and its effectiveness (Ellis et al., 2021). For this mixed methods study, data were collected through a web-based questionnaire, followed by semi-structured interviews which were meant to deepen the analysis of the quantitative data. A total of 21 administrators completed the questionnaire, and six took part in the follow-up interviews. The research questions focused on administrator perceptions of DLCT and DLCSA and best practices for assessing digital competencies of teachers. Content validity of the questionnaire and surveys were established by researchers and school administrators (Ellis et al., 2021).

Results were reported according to the five focus areas of the DLCSA: vision and strategy, content and instruction, human capacity and culture, personal growth and connectedness, and community. Based on the data, the majority of administrators stated that they had advocated to put technology integration plans in place, however many still lacked funds and training to implement plans effectively. While more than half of the administrators felt they had significantly provided necessary resources to support the digital competencies of their staff, most respondents did not feel they had done enough for personal growth, with 61% stating they had not reflected, shared, or model

ed technology usage. Interviews were able to further uncover that administrators lacked understanding of the competencies, lacked technology skills, and they needed support in the form of modeling and examples. The findings of the study support the need for a new digital learning certificate for educational leaders that provides school leaders with opportunities to learn about effective technology leadership (Ellis et al., 2021).

The use of technology continues to increase in schools, and administrators' support is critical in the successful implementation of a technology enhanced learning

environment. In an effort to learn more about school leaders' practices that foster the use of digital technologies for teaching and learning, a study was conducted following a 1:1 initiative that was implemented in Sweden (Lindqvist, 2019). Research was conducted using a case study approach in which three school leaders from two upper secondary schools participated in interviews following the three-year implementation period. The purpose of the study was to "explore, analyze, and discuss school leaders' conditions for technology-enhanced learning (TEL)" (Lindqvist, 2019, p. 1228). Research questions focused on the possibilities and challenges of school leaders' practices for utilizing technology and how it relates to TEL. Content analysis was used to code and categorize school leader interviews, and cross checking and triangulation were used to verify the validity of the study (Lindqvist, 2019).

The results of the study uncovered that technology integration requires students to view technology as a tool, and teachers must find new ways to engage students through the use of instructional technology. Leaders also noticed the need to support teachers with collaboration, as many were hesitant or did not view this as an opportunity to share, and they need to foster an environment that felt safe for teachers to try new things. All three leaders recognized the need to prioritize technology leadership, and they understood the importance of their personal growth in utilizing technology to serve as role models among their staff. Based on this research, implications for developing technology leaders were shared using the ecology of resources model (Luckin, 2010). The researchers concluded that effective technology leadership practices include supporting teachers with opportunities to collaborate, especially among subject-areas, and providing PD. To put these practices in place effectively, this will require the growth of the leader, which will mean they need to attend PD on how to lead the charge and successfully support technology integration in schools (Lindqvist, 2019).

An important role of superintendents is to provide school leaders with the support they need to ensure they are utilizing best practices such as instructional technology. To learn more about the superintendent's role and their views on technology leadership, a study was conducted by Richardson and Sterrett which focused on understanding how superintendents' perceptions on this topic have evolved over time (2018). This study was comprised of two groups of participants, one which included 11 of the top 100 eSchoolNews Tech-Savvy Superintendents from 2001-2010, and the second group included 14 superintendents who received the same recognition, but between the years of 2011-2014. A qualitative approach was used to collect data for this study, and telephone interviews were conducted which focused on 14 questions about their technology leadership role. Interview questions were developed through public solicitation, and protocols were then finalized after receiving input from five experts in the field of educational leadership and three superintendents (Richardson & Sterrett, 2018).

The data collected from the two groups was compared to determine how the conversations about technology leadership had changed over time. The results indicate that establishing a clear vision was key to both groups' successes, with the first group focusing on buy in from the principals and board, while the second group focused on getting buy in from teachers and parents. The discussions on infrastructure have matured, as group one talked about investing in the initial rollout of technology initiatives, and group two discussed sustaining funding to continue to upgrade. Both groups viewed the use of technology to communicate as a challenge; however, group one referred to using technology to communicate information with the district and campus leaders, while group two discussed communication with teachers, parents, and the community using social media. Both groups acknowledged the importance of PD for leaders and teachers, but in different ways. Group one used PD to embrace the use of technology, while group two

used PD to show individuals how to use technology for teaching and learning. These findings indicate that shifts between the two groups were about second-order changes that focused on teaching and learning technology itself (Marzano & Waters, 2009). The recommendation that was made as a result of this study was leadership preparation for effective technology integration (Richardson & Sterrett, 2018).

Support, Management, & Operations

Funding is an essential part of incorporating technology in schools because it allows districts and campuses to purchase resources such as computers, wi-fi capabilities, software programs, and other interactive tools (Bass, 2021; Keane & Keane, 2019). Furthermore, support services such technical support, administrative support, peer collaboration, and in-service opportunities improve self-efficacy and motivate teachers to utilize technology in their classroom (Chiu, 2022; Liao et al., 2021; Ozgur, 2020). This section will further examine the current literature on support, management, and operations provided by school leaders, and their influence on student achievement, technology integration, and teacher motivation and self-efficacy.

Instructional technology resources are often purchased with government funds, and to learn more about this funding's impact student achievement, a study was conducted by researchers in California (Bass, 2021). The researchers gathered data for this study through information provided by California Education Technology K-12 Voucher funding, which provides funds to eligible schools with technology vouchers which can be used to purchase hardware and software products. Schools that had a population of 40% free or reduced meals qualified for the voucher and received $50.80 per pupil. The goal of the voucher was to "improve technology access and assist California schools with implementing and supporting education technology" (Bass, 2021, p. 2). A regression discontinuity difference-in-difference (RD-DD) was implemented

allowing comparisons across schools based on their student demographics. The study also used a difference-in-difference (DD) design to study the effects of the voucher eligibility and usage on school-level student proficiency (Bass, 2021).

Results of the study indicate that voucher eligibility had no significant effect on student proficiency, while voucher usage had a positive impact on math and science scores which increased by 3.4%. Data also showed no evidence of voucher eligibility or use affecting the number of internet connected classrooms or the number of computers per student. Upon further review, this is because campuses already had these resources in place along with maintenance funds within their current budget. Furthermore, research showed that technology voucher funds were used to buy more computers and software programs. When reviewing technology expenditures at these campuses, most schools said they used funding from the voucher without additional funding. It was discovered that district technology funds were often reallocated to other school inputs and were replaced by the vouchers. Therefore, this data is unable to disentangle which school input led to improved student proficiency. This study speaks more to the effects of school resources in general and the positive impact they have on student achievement (Bass, 2021).

Technology continues to change society today, therefore it is important that schools prepare students to use technology to prepare them for the future. That being said, in 2007, the Australian Labor Party created the Digital Education Revolution (DER) policy, which aimed to provide all students in grades 9-12 with access to a computer. A study was conducted using a case study approach which allowed the researchers to focus on the impact of one school's implementation of the Australian Federal Government's DER over the course of three years (Keane & Keane, 2019). To collect data for the study, semi-structured were conducted with 17 staff members, including the principal, assistant principal, and other staff members, which provided perspectives on the 1:1 program.

Observation data and relevant documents were also used to learn about how the school moved to a 1:1 campus. Once this data were gathered, content analysis was used to determine units for cross-checking, and cross referencing was used against information gathered from the interviews (Keane & Keane, 2019).

As a result of the DER, the school's infrastructure changed dramatically, and money was used to support the technology initiatives implemented. Over the course of 10 years, the school achieved and maintained a 1:1 device ratio, with devices upgrading to laptop computers. The DER also had a profound effect on strategic development plans over time which now include specific technology goals and plans for how it will be used. With more technology came the understanding of the importance of PD. The school now provides technology trainings and workshops and they offer the services of an E-learning Coordinator to offer individual support. Following the DER, teachers are more confident in their ability to use technology, and they use it change the way they teach, rather than substitute paper and pen. With the initial implementation of this initiative, parents and students were uncomfortable with technology and its use in schools; however, both groups now embrace these tools as new ways to communicate and prepare for the future. In conclusion, the DER created profound changes to this school, and while the funds have ceased, this initiative has changed the way they teach and utilize technology (Keane & Keane, 2019).

While technology has become an important part of society today, it can create a feeling of stress for those who are not comfortable using it, also known as technostress (Ozgur, 2020). This often occurs among educators who are burdened with the challenge of keeping up with instructional technology as they are expected to implement innovative practices that continue to change rapidly. While the causes of technostress have been studied extensively, there is a lack of research on the how to alleviate such stress for

teachers. To learn more about this topic, a study was conducted in Turkey, and a total of 349 high school teachers participated in the research. This study was conducted through statistical structural equation modeling (SEM), and the causal relationships among variables that are believed to relieve technostress are examined (Ozgur, 2020).

Data for this study was collected using the Teacher Technology Questionnaire (TTQ), which included the subscales of Overall Support (OS) and Technical Assistance (TA). The instrument was used to measure the perception of support services offered to teachers, and responses were rated by participants using a five-point Likert scale. Results of the study indicate that as age increases, so does stress. Furthermore, school support helps alleviate technostress, and the finding revealed that support from administration, family, colleagues, and society as a whole reduces the stress level of teachers. In addition, it was also revealed that Technological Pedagogical Content Knowledge (TPACK) has a significant relationship with technostress. Data showed that an "increase in the TPACK reduced the level of stress regarding the use of technology" (Ozgur, 2020, p. 6). The findings of this study support the idea that knowledge and support services are an important part of helping teachers feel comfortable with integrating technology in schools today. It is recommended that teachers attend in-service trainings, and they should be provided opportunities to collaborate, technical support, and other support services in order for them to embrace technology and utilize it effectively in the classroom (Ozgur, 2020).

As defined by the self-determination theory (SDT), teachers' persistence in their teaching practices is strongly associated with their autonomous motivation (Chiu, 2022). In order to gain a better understanding of how teachers can become motivated to embrace technology and persistent with implementing it effectively in the classroom, a research study was conducted in Hong Kong, and a total of 122 teachers from two secondary

schools participated (Chiu, 2022). The study incorporated a sequential explanatory mixed-methods design, and data were gathered through pre-, post- , and delayed questions, as well as interviews over the course of 22 months. The study aimed to investigate how the support of leaders, experts, and peers encouraged and sustained the low- and high- quality technology integration practices of teachers. Research questions focused on learning about the perceived satisfaction and quality of technology integration over time and teachers views of the proposed school learning support (Chiu, 2022).

The study developed a school learning support intervention which had three components: leader learning support which utilized the help of principals and mid-managers, expert learning support which incorporated external assistance from universities and educational service providers, and peer learning support which relied on the support offered within groups of teachers. The study was comprised of an experimental and control group. A total of 62 teachers from one group received the support, and the other 60 teachers did not. Results indicate that the proposed support had a significant effect on teachers' perceived autonomy, competence, and relatedness, resulting in high-quality technology integration practices. Based on these results, it can be implied that leader, expert, and peer support motivated teachers to utilize technology in their classroom to incorporate student-centered instruction. This data leads the researchers to believe that insufficient support can be a major barrier with incorporating technology; therefore, schools should provide support funds that allow teachers to choose their own technology, provide individual consulting services, conduct workshops and trainings, and give teachers opportunities to collaborate (Chiu, 2022).

Assessment & Evaluation

The assessment and evaluation of technology in schools ensures that it is used in a way that improves operations and the instructional practices of teachers (Alarcon et al.,

2020; Bowman et al., 2020; Syahidi et al., 2019). Furthermore, instructional technology and technology resources should be assessed to determine if they are effective tools that improve student learning and ultimately, student achievement (Bass, 2021; Khalif, 2017; Macaruso et al., 2020). This section will further examine the current literature on the assessment and evaluation of technology that supports operations, teacher evaluations that evaluate components of technology, professional development on instructional technology, and the instructional practices that support technology integration.

As technology advances, it has changed the way that people communicate. Rather than rely on printed newsletters or handouts, organizations, including schools, now use webpages as their primary source of sharing information. To learn more about the effectiveness of websites as promotional tools for schools, a case study was conducted to evaluate school website at the SMK Muhammadiah 1 Banjarmasin using the WebQual 4.0 and Importance-Performance Analysis (IPA) methods (Syahidi et al., 2019). Data for this study was gathered using 130 online and paper-based questionnaires, and they aimed to learn about the expectations of website visitors and user ratings of performance using a five-point Likert scale. Quality of the website was determined using WebQual 4.0 which gathers data from three dimensions on user satisfaction: usability quality, information quality, and interaction quality. Furthermore, IPA was used to rank elements of the visitor feedback and prioritize areas of need to improve customer satisfaction (Syahidi et al., 2019).

The results of the study were measured by the level of importance (expectations) as well as the level of performance (actual) using the data processing software, Structural Equation Modeling (SEM) 2.0. According to the data, there was an overall gap for all three dimensions. This implies that that the website is not meeting users' expectations, and that improvement is needed in all three areas: usability, information, and interaction.

The biggest gap was noted in the usability dimension, which indicates that users felt the website was unattractive, not as expected, and needed improvement to meet visitors' satisfaction. In addition, the data were able to determine that user satisfaction of the website is based on usability, information, and service interaction, in that order. Following the study, the researchers reiterated that websites are an important part of current day communication, and they suggested that schools post relevant and up-to-date information. Information should maintain student privacy, the website should allow visitors to interact with the teachers and staff, and it should be easy for all users to navigate (Syahidi et al., 2019).

Now that teachers are expected to use technology in their classroom instruction, it makes sense that this would be part of a teacher's evaluation (Alarcon et al., 2020). This would allow teachers to have a clear understanding of what is expected of them, as well as give administrators a way to inform teachers of areas they need to improve in this area. To find out more about this topic, study was conducted in Spain and Latin America, and 509 teachers participated in the study (Alarcon et al., 2020). The research sought to build on the European Framework for the Digital Competence of Educators (DigCompEdu) to develop and validate an assessment tool that includes two new areas that are aligned to this framework. These two new areas refer specifically to the teachers' digital environment and the extrinsic digital engagement of students (Alarcon et al., 2020).

Data were collected using the DIGIGLO, a 29-item questionnaire designed to assess digital competencies of educators, with each item rated on a six-point Likert scale. The results of the study show that DIGIGLO is in fact a reliable and valid tool for assessing the digital proficiencies of teachers. Confirmatory factor analysis supported the assessment tool which included the six areas from the DigCompEdu as well as the two new areas that relate to environment and engagement, "loading on a single second-order

factor" (Alarcon et al., 2020, p. 2415). Cronbach's alpha was above .90 in all eight areas; therefore, the internal consistency was high for this tool and was satisfactory for the questionnaire overall. Based on the results of this study, this instrument was considered a suitable tool for assessing the digital competencies of educators. Recommended uses include self-assessment or an evaluation tool, allowing users to identify areas that teachers need to improve regarding instructional technology (Alarcon et al., 2020).

Professional development is a tool that is often used to help teachers grow in their ability to implement instructional technology. In an effort to learn more about the effectiveness of such PD programs, a study was conducted to assess technology PD as it relates to instructional technology in schools (Bowman et al., 2020). The study focused on learning if PD exposure predicted the quality of technology use in the classroom for both lower and higher cognitive tasks. Furthermore, the study aimed to discover if second-order barriers, such as ability and value beliefs, predict the use of technology in schools. A total of 724 sixth- to twelfth grade teachers from 17 schools across a midwestern state located in the United States participated in the study. Data were collected using an online survey which asked for potential barriers to technology integration, including PD, and teacher beliefs about the value of technology, using a five-point Likert scale. To assess and compare the barrier on teachers' technology integration practices, a hypothetical model was tested and structural equation modeling (SEM) was used (Bowman et al., 2020).

The results of the study indicate that teachers' ability and perceived self-efficacy towards integrating technology in the classroom are directly affected by exposure to professional learning opportunities. This in turn relates to teachers' actual use of technology to effectively incorporate technology, confirming that PD programs that are designed to improve teachers abilities are in fact working. Furthermore, the study also

shows that there is a close relationship between PD exposure and teachers' value beliefs. Researchers imply that providing teachers with PD that increases their ability to integrate technology in meaningful ways as well as the belief that technology integration can make a difference in education allows for successful integration initiatives. In addition, research showed that there is also a relationship between exposure to PD and value beliefs. This data implies that the way teachers value technology affects the way they view PD and integrate it in the classroom, which has a stronger impact on the effects of technology integration then ability; therefore, PD should focus on ensuring that teachers understand the value of PD, which will then improve their ability to use it and ultimately the integrate technology in the classrooms (Bowman et al., 2020).

Technology has made it possible for teachers to embrace new ways of teaching students that supports teachers in their instruction in the classroom. To learn more about this topic, a study was conducted to learn about the benefits of blended learning to enhance reading instruction in the classroom (Macaruso et al., 2020). Blended learning allows teachers to combine teacher-led instruction with technology tools in the classroom. The effects of blended learning using a program called Core5 were studied among 2217 kindergarten through fifth grade students who attended three charter school (treatment group), and the results of their learning were compared to a control group of 1504 students who attended three different schools and received standard, teacher-led instruction only. To support the implantation of the blended learning program, teachers in the treatment group participated in Lexia's Implementation Support Service Package (ISP) which prepared teachers to launch the program, review data, and use the instructional materials provided. The research aimed to learn if Core5 effectively supports reading development of students when compared to others, as well as if potential

benefits of blended learning differ among grade levels and ethnic groups (Macaruso et al., 2020).

Data were collected using a pre- and post- test with the Northwest Evaluation Association (NEWA) Measure of Academic Progress (MAP) Reading test as well as program records. An analysis of covariance (ANCOVA) was used for data analysis. The results of the study indicate that the treatment group produced significantly higher post-test scores than the control group. These findings support the idea that blended learning using the Core5 program is an effective instructional strategy for teaching reading instruction. Furthermore, the study did not indicate a significant difference among grade or ethnic group when implemented blended learning. While differences were noted among grade levels and ethnic groups, it could not be concluded that they were a result of blended learning. Based on the results of this study, researchers were able to conclude that blended learning supports teachers with reading instruction in a way that effectively personalizes and differentiates instruction for students (Macaruso et al., 2020).

Technology Self-Efficacy

Self-efficacy can be defined as "…peoples judgments of their capabilities to organize and execute courses of action required to attain designated types of performance" (Bandura, 1986, p. 391). According to Cobanoglu and Yurek (2018), the success of school administrators depends on their self-efficacy beliefs in addition to the required abilities they must have as school leaders. This section will examine the influence of school leaders' self-efficacy on teacher self-efficacy, factors that influence teachers' instructional technology self-efficacy, school leaders' impact on teachers' instructional technology self-efficacy, and school leaders' technology self-efficacy.

It is well documented that teachers have the most direct influence on student achievement; however, global research supports the idea that school leaders impact

student achievement more directly by building the capacity of their teachers (Hallinger, 2017). In 2018, a study was conducted in China that focused on understanding how leaders can best support teachers in developing self-efficacy and effectively teaching students (Liu & Hallinger, 2018). Furthermore, this study investigated the effects of instructional leadership on teacher learning. Survey data were collected from 3,414 eighth grade teachers and 186 middle school principals from Quingdao, China. This study was conducted using a cross-sectional survey design, and the data were analyzed in terms of full scale and dimensional-level scores (Liu & Hallinger, 2018).

The findings from this study support the idea that instructional leadership has a significant impact on teacher self-efficacy. When school leaders facilitate opportunities for teachers to learn their craft and motivate them to collaborate, teachers feel more confident in their abilities as educators. In effect, teachers feel inspired to "make a difference," they work together to reach high standards set by school leaders, and student achievement ultimately results from this form of instructional leadership. The results of the study also suggest that the self-efficacy of both principals and teachers is a critical component in effective educational practices (Liu & Hallinger, 2018).

In an effort to understand the influence of school leaders' self-efficacy, a study was conducted to better understand how the self-efficacy of principals impacts teachers' self-efficacy (Hallinger et al., 2017). A total of 111 principals and 345 teachers who worked at primary campuses in Iran participated in this study, and data were collected using principal and teacher questionaries. A cross-sectional survey design was used in this study, and various Likert scales were used to collect survey data on principal instructional leadership, principal self-efficacy, teacher collective efficacy, and teacher commitment. The surveys were translated from English to Farsi, and back translation was used to ensure that the results of the study were accurate. The data were then analyzed

using structural equation model (SEM) and confirmatory factor analysis (Hallinger et al., 2017).

The findings of this study showed that principal instructional leadership, principal self-efficacy, teacher collective efficacy, and teacher commitment share a significant relationship. Furthermore, it was discovered that principal's instructional leadership and their self-efficacy affect teacher efficacy and commitment. Leaders who are confident in their abilities are better prepared to articulate their vision, provide resources, and support teachers as needed which ultimately affects the self-efficacy and commitment of teachers. In considering how this data can be used, this study suggests that leaders attend or participate in trainings or professional development that will encourage them to believe that they can help make a difference in the schools they lead (Hallinger et al., 2017).

To learn more about the reasons that some teachers use technology as a part of their classroom instruction while others do not, despite having the technology necessary to teach their students, research was conducted on this topic (Alenzi, 2016). This research was conducted in a large suburban school district located in Saudi Arabia. The participants in this study were K-12 teachers who were identified by the district coordinator of professional development as either "exemplars" at empowering students to use technology in the classroom or teachers who do not routinely use technology as a part of classroom instruction. This study was based on a survey which asked the participants questions regarding commonly cited technology obstacles: resources, professional development, support, and efficacy. The results of the survey were used in conjunction with data collected via interviews and observations. All survey, interview, and observation data were coded, categorized, and then themed into overarching categories (Alenzi, 2016).

Results revealed that the obstacles differ between the exemplars and typical teachers who participated in this study. While exemplar teachers felt unsupported when attempting to implement new technology or innovations in their classrooms, the typical teachers (who did not use technology routinely) needed more support at the basic operational level. Exemplar teachers noted a lack of resources, especially at the high school level, while typical teachers identified time and a lack of comfort with technology as obstacles. This study further supports the idea that teacher self-efficacy is an important factor in implementing instructional technology in schools (Alenzi, 2016).

To better understand the influence that school leaders have on teachers' implementation of instructional technology, a study was conducted by researchers to determine whether the proximal variables from the Integrated Model for Behavior Prediction (IMBP), such as self-efficacy, attitude, and subjective norm, are influenced by school leadership to use digital learning materials (DLM) (Vermeulen et al., 2014). For this quantitative study, a total of 772 teachers from the Netherlands were included, and data were collected using two questionnaires. The data were organized and used to develop a correlation matrix of the variables studied. Structural equation modeling (SEM) was then used to analyze the data and test the causal relationships between the variables that were studied (Vermeulen et al., 2014).

The results of this study indicate that the intention of teachers using DLMs is influenced by many variables. "The findings showed that the strongest relationships appeared between professional development activities and the three proximal variables, self-efficacy, attitude and subjective norm" (Vermeulen, et al., 2014, p. 1020). No direct relations between the proximal variables and the leadership dimensions were found except when comparing transformational leadership and its impact on information and communication technology (ICT) policy. In summary, this study indicates that proximal

variables, as well as other factors directly influenced by school leaders such as school culture, climate, norms, and values, play a critical role on teachers implementing DLMs (Vermeulen et al., 2014).

Additionally, a study was conducted in Turkey to learn more about school leaders' technology self-efficacy, and a total of 320 school administrators agreed to participate (Unal et al., 2015). The research purpose was to determine school administrators' technology leadership self-efficacy levels and how it differed in terms of "school level, professional seniority and participation in IT in-service programs" (Unal et al., 2015, p. 195). Data were collected using the technology leadership self-efficacy scale, and each of the 21 questions were rated on a five-point Likert-type scale that described how relative the statements were to the participants (Unal et al., 2015).

The results of the study showed that, overall, school administrators have high technology leadership self-efficacy. Among the sub-dimensions identified for this research, school leaders had the highest technology leadership self-efficacy in the sub-dimension of Visionary Leadership followed by Excellence in Professional Practice; however, there was not a notable difference between school administrators' technology leadership self-efficacy and sub-dimensions according to school level. Another important finding was school administrators who were more experienced in their profession also had higher technology self-efficacy. Based on the data gathered, this was because these leaders are more experienced with implementing change such as providing resources, providing staff development, and preparing for the necessary support needed to implement a new project such as technology integration. The results of the study also indicate that professional development was effective in helping school administrators develop their technology leadership self-efficacy when compared to school administrators who did not participate (Unal et al., 2015).

Summary of the Findings

School leaders understand that technology is changing the way students learn, and it must be embraced and used to drive instruction (Webster, 2017). School leadership can directly influence the performance of teachers and their self-efficacy, which impacts teachers' abilities to implement new instructional strategies such as instructional technology (Liu & Hallinger, 2018; Moreira et al., 2018). On the contrary, studies also reveal that a principal's level of technology leadership does not always accurately predict how and the extent to which teachers integrate technology (Raman et al., 2019). Regardless, school leaders must develop a clear vision that allows stakeholders to understand the expectations for integrating technology (Webster, 2017).

In order for teachers to integrate technology effectively, professional development should be relevant, allow time for reflection, exploration, and the evaluation of new technologies, and resources such as time, support, and technology should be provided (Thiel, 2017; Yurtseven et al., 2019). Furthermore, PD programs must allow teachers to take an active role in their learning, collaborate with colleagues, and participate in hands-on activities (Alemdag et al., 2019). In addition, the results of these studies indicate that the use of professional development positively impacts teacher self-efficacy and increased technology integration (Thurm & Bazal, 2020).

The professional development of school leaders allows them to set the direction for how technology is implemented at their campuses, understand how to support teachers, and serve as role models for those who are expected to integrate technology (Lindqvist, 2019; Lindqvist & Pettersson, 2019). Through professional development opportunities, leaders develop an accurate understanding of what their campus or teachers may still lack in order to provide resources or additional PD support (Ellis et al., 2021). Over time, how superintendents have supported campus leaders and teachers has changed

from providing PD on embracing the use of technology to focusing on using technology for teaching and learning (Richardson & Sterrett, 2018).

To implement technology in a way that benefits students, the purchase of resources such as computers, wi-fi, software programs, and other interactive tools is essential, and often times government funds are allotted for such expenditures (Bass, 2021). Technology resources allow for schools to implement initiatives such as 1:1 devices, which provides opportunities for teachers to instruct and students to learn in new and meaningful ways (Keane & Keane, 2019). In addition to funding, school leaders must provide support services to their teachers to ensure that technology is implemented as expected and alleviate technostress (Chiu, 2022; Ozgur, 2020).

The assessment and evaluation of technology is intended to improve the operations and practices of schools, and the evaluation of school websites can be used to ensure information is communicated effectively (Syahidi et al., 2019). Assessment tools are also used to evaluate the benefits of instructional technology resources and activities, as well as determine the effectiveness of professional development for technology integration (Bowman et al., 2020; Macaruso et al., 2020). Finally, it is important to assess the teacher evaluation tools that are used to ensure they incorporate the expectation of technology integration (Alarcon et al., 2020).

Lastly, the instructional technology self-efficacy of teachers determines the extent to which technology is implemented in the classroom, and teachers note that lack of confidence, resources, and professional development are obstacles they face when utilizing technology in their classrooms (Alenzi, 2016). School leaders can, in fact, have an impact on teacher technology self-efficacy; however, this can be attributed to leaders developing a positive school culture, norms, and values, as well as establishing professional communities that allow teachers opportunities to learn about instructional

technology among their peers (Vermeulen et al., 2014). According to Unal et al., (2015), more experienced school leaders tend to have higher levels of technology leadership self-efficacy because they understand the importance of providing resources, support, and staff development to implement instructional technology.

Theoretical Framework

The theoretical framework for this study is based on the Leader-Member Exchange (LMX) theory. According to Graen and Uhl-Bien (1995), the LMX is based on the belief that there are differences in the qualities of the relationships between leaders and members. This theory is based on the concept that effective leadership processes occur when leaders and their subordinates develop relationships in which both parties benefit from the partnership (Graen & Uhl-Bien, 1995). These relationships are based on the interactions between leaders and members, and a series of exchanges between them enhances the relationship dynamics (Basu & Green, 1997).

The quality of these dyadic relationships is defined as either high or low-quality, depending on the interactions between leaders and subordinates (Jha & Jha, 2013). According to Jha and Jha (2013), high-quality relationships are based on respect, trust, and a sense of obligation between the two parties. In contrast, low-quality relationships are based on tasks and job-requirements with exchanges based on a top-down dynamic between the leaders and their members. (Jha & Jha, 2013). Ultimately, the level of the quality of the dyadic relationship can be used to predict the outcomes of individuals, groups, and organizations (Graen & Uhl-Bien, 1995).

Given that principals are leaders in their schools that supervise teachers, and the quality of the principal-teacher relationship affects the teacher's roles and functions in a school, LMX theory may be applied to principal-teacher relationships. As the research above has stated, principals have a considerable impact on technology integration and

how it affects teachers' instructional practices (Bass, 2021; Keane & Keane, 2019; Raman et al., 2019; Yurtseven et al., 2019). Moreover, researchers have also suggested that the principal-teacher relationship should emphasize trust, respect, and collaboration (Sahlin, 2022; Zheng et al., 2016). Furthermore, LMX theory supports the process of role development through a series of exchanges between leaders and members.

Conclusion

The literature review above provides a framework for the constructs included in this study regarding leadership and vision; learning and teaching; productivity and professional practices; support, management, and operations; assessment and evaluation; and social, legal, and ethical issues. The following chapter will describe the methodology to be used by the researcher during the current study. This chapter will include an overview of the research problem, research purpose and questions, research design, population and sample, instrumentation, data collection procedures, data analysis, privacy and ethics considerations, and limitations for this study.

CHAPTER III:

METHODOLOGY

The purpose of this study was to examine the principal's role as technology leaders and teachers' perceptions of principals' technology leadership role in a school setting. This mixed methods study collected survey and interview data from a purposeful sample of public-school campus principals and teachers within districts located in Region IV in southeast Texas. Survey data were analyzed using frequencies, independent t-tests, and percentages. In addition, principals and teachers were interviewed to learn more about their perceptions, and an inductive coding process was used to look for themes that emerged from the principal and teacher interviews. This chapter presents an overview of the research problem, operational definitions of the theoretical constructs, the purpose of the research and the corresponding research questions, the research design, the population and sampling of the participants, instrumentation, how the data were collected and analyzed, ethical considerations, and the limitations of the study.

Overview of the Research Problem

Technology continues to change the way students learn, communicate, and even stay safe during a pandemic that requires social distancing (Mukhopadhyay et al., 2020). While teachers play an important role in the use of instructional technology, school leaders are essential in implementing instructional technology effectively (Turan, 2002). School leaders must take an active role in the planning and implementation of instructional technology for teachers to embrace this learning platform (Germeroth et al., Sterrett & Richardon, 2020; Vu et al., 2018). While there is a plethora of research to support the important role school leaders play in implementing instructional technology initiatives, there is limited research on the perceptions of the school leader's role and responsibilities as a technology leader (Germeroth et al., 2018; Sterrett & Richardson,

2020; Vu et al., 2018). To establish a culture that supports instructional technology, this study aims to examine technology leadership and teachers' perceptions of the school leader's technology leadership role. Without this research, superintendents may not be prepared to hire and/or train school leaders to embrace instructional technology at their schools. In effect, teachers would not be prepared to utilize instructional technology, and students would not be prepared to use technology as a learning platform in the future (Shibukawa & Taguchi, 2019).

Operationalization of Theoretical Constructs

This study consists of six theoretical constructs, five of which based on Technology Leadership Competencies, and one which is included to address an emerging theme from the qualitative data. Technology Leadership Competencies refer to the technology inclinations, activities, skills, and abilities school leaders should have according to the International Society of Technical Educators' (ISTE) National Educational Technology Standards for Administrators (NETS-A). Drafted in 2002, the NETS-A is the result of a team of educators and technology leaders from across the U.S. working with the U.S. Department of Education to determine what technology standards are of greatest importance to educational administrators as it relates to the following dimensions: (a) Leadership and Vision; (b) Learning and Teaching; (c) Productivity and Professional Practice; (d) Support, Management, and Operations; and (e) Assessment and Evaluation; (Anderson & Dexter, 2005; ISTE, 2002; PTLA, 2006). Technology Leadership Competencies will be measured using the *Principal Technology Leadership Assessment* (PTLA). The sixth construct is Technology Self-Efficacy. This construct is included in this study to address a theme that emerged during the inductive coding process of the qualitative data.

Research Purpose, Questions, and Hypothesis

The purpose of this study is to examine technology leadership and teachers' perceptions of the principal's technology leadership role. The study addressed the following research questions:

R1: What are principals doing as technology leaders?

R2: What are the teachers' perceptions of the principal's role as technology leader?

R3: What are the similarities and differences between what principals are doing as technology leaders and teachers' perceptions of the principal's role as technology leader?

R4: What are the perceptions of principals and teachers concerning the principal's technology leadership role?

Research Design

For this study, the researcher used a mixed-methods design which consisted of both quantitative and qualitative data collection and analysis. By collecting both forms of data, this design allowed for a thorough and in-depth analysis of the quantitative results, provided insight from the personal experiences of both principals and teachers, and provided opportunities for triangulation of the data. A purposeful sample of principals and teachers throughout Region IV were solicited to complete the *Principal Technology Leadership Assessment* (PTLA), which assessed principals' technology leadership competencies and teachers' perceptions of the principals' technology leadership competencies. In addition, interviews were conducted with principals and teachers to provide a deeper analysis of how both groups perceive the principal's technology leadership role in a school setting. Quantitative data were analyzed using descriptive

statistics (frequencies and percentages) and independent t-tests, while qualitative data were analyzed using an inductive coding process.

Population and Sample

The population of this study consisted of all principals and teachers identified by the Texas Education Agency (TEA) as serving public schools within the 48 independent school districts of Region IV during the 2020-2021 school year. There were a total of 3,979 school leaders (principals and assistant principals) in public schools located in the Region IV area and a total of 1,356 campuses principals within the targeted area during this time. Furthermore, there were 74,989 teachers (elementary and secondary) in the identified public schools within the districts of Region IV. For this study, only public-school principals and teachers that provide regular instruction will be included in data collection. The 48 independent school districts are located within seven counties in the southeastern region of Texas (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, and Waller).

Table 3.1 displays the number of school leaders, campuses principals, and teachers and from each school district within Region IV according to the 2020-2021 Texas Performance Reporting System (TPRS). According to this data, the largest district within Region IV is Houston ISD, with approximately 11,809 total administrators and teachers combined, and 274 campuses. The smallest district within the region is Damon ISD with approximately 12 total administrators and teachers who work on one campus. The ratio of administrators to teachers are similar among all the campuses, averaging 1:19. The ratio of principals to teachers is also similar for all 48 schools, averaging 1:54. The data also indicates that, on average, the ratio of principals to teachers is slightly higher in smaller districts of Region IV such as Needville ISD (1:54), when compared to larger districts such as Houston ISD (1:41), which have slightly lower ratios of principals

when compared to teachers. A purposeful sample of elementary and secondary principals and teachers from the 48 school districts were solicited to participate in this study.

Table 3.1

School Leaders, Teachers, and Campuses/Principals in Each School District by County

Region IV County	School Leaders (n)	Teachers (n)	Campuses/Principals (n)
1. Brazoria County			
Alvin ISD	86	1,825	32
Angleton ISD	27	440	8
Brazosport ISD	58	875	19
Columbia-Brazoria	13	204	5
Danbury ISD	5	63	3
Pearland ISD	72	1,318	23
Sweeny ISD	8	136	3
Damon ISD	1	12	1
Totals	270	4,873	94
2. Chambers County			
Anahuac ISD	6	99	3
Barbers Hill ISD	23	478	9
Totals	29	577	12
3. Fort Bend County			
Fort Bend ISD	250	5,035	80
Lamar CISD	119	2,300	46
Needville ISD	11	217	4
Stafford MSD	14	235	6
Totals	394	7,787	136
4. Galveston County			
Clear Creek ISD	120	2,543	46
Dickinson ISD	47	835	16
Friendswood ISD	21	385	6
Galveston ISD	26	469	11
Hitchcock ISD	10	115	5
Santa Fe ISD	16	262	5
Texas City ISD	33	571	14
Totals	273	5,180	103

5. Harris County			
Aldine ISD	293	4,195	77
Alief ISD	170	3,277	48
Channelview ISD	38	573	11
Crosby ISD	22	395	7
Cypress-Fairbanks	398	7,660	88
Deer Park ISD	42	815	16
Galena Park ISD	89	1,405	26
Goose Creek CISD	103	1,605	32
Houston ISD	554	11,255	274
Huffman ISD	14	226	4
Humble ISD	133	3,124	46
Katy ISD	271	5,882	70
Klein ISD	192	3,618	53
La Porte ISD	32	483	14
Pasadena ISD	194	3,753	74
Sheldon ISD	33	638	13
Spring Branch ISD	128	2,083	47
Spring ISD	134	2,258	40
Tomball ISD	56	1,173	22
Totals	2,869	54,418	962
6. Liberty County			
Cleveland ISD	35	556	12
Dayton ISD	22	345	6
Devers ISD	1	14	2
Hardin ISD	10	111	3
Liberty ISD	9	146	4
Tarkington ISD	8	139	4
Totals	85	1,311	31
7. Waller County			
Hempstead ISD	13	118	5
Royal ISD	12	187	5
Waller ISD	34	535	8
Totals	59	840	18
Totals	3,979	74,989	1,356

Participation Selection

For this dissertation, a purposeful sample of school leaders and teachers from within the 48 school districts in Region IV were sent a cover letter soliciting their participation in the study along with modified versions of the *Principal Technology Leadership Assessment* (PTLA). The PTLA surveys collected participation data from a purposeful sample of the 123 principals and 126 teachers who work at public schools within Region IV in southeast Texas. Participants who completed the survey were invited to participate in interviews, and of the 29 principals and the 24 teachers who volunteered for interviews, five principals and five teachers were selected based on the school levels they served (small, medium, large). Principals answered questions about their role as technology leaders, and teachers answered questions about their perceptions of principals' technology leadership roles. Interviews allowed the researcher to probe further on principals' and teachers' responses from the PTLA survey. Efforts were taken to gather a sample that was demographically representative of the entire population.

Instrumentation

The *Principal Technology Leadership Assessment* (PTLA) were used as the instrument to gather data for this study (PTLA, 2006). This survey was developed by the University Council for Educational Administration (UCEA) Center for the Advanced Study of Technology Leadership in Education (CASTLE). This instrument is intended to measure the technology leadership of principals and other school leaders based on their tendencies and behaviors in the previous school year (or a fixed period of time). It is available to K-12 schools and other educational leadership programs for free, and several variations of the survey have been used to conduct research on technology leadership (PTLA, 2006).

The PTLA was developed to align with the National Education Technology Standards for Administrators (NETS-A). The development team reviewed existing surveys and assessments, reviewed relevant literature, and solicited the expertise of researchers to determine best practices in leadership assessments and item development for a technology leadership survey. The draft instrument was reviewed by ten content experts in the field of education technology and school leadership, and based on their assessment of the relevance and quality of the instrument, adjustments were made to the PTLA. The Center for the Advanced Study of Technology Leadership (CASTLE) piloted this assessment in August of 2005 and collected data from 74 school principals from seven states in the US, and based on data analysis, the survey was found to be valid and reliable (PTLA, 2006).

The PTLA survey is comprised of 35 questions pertaining to the six domains of the NETS-A performance indicators: Leadership and Vision; Learning and Technology; Productivity and Professional Practice; Support, Management, and Operations; Assessment and Evaluation; and Social, Legal, and Ethical Issues. Participants who complete the survey are expected to express their level of leadership involvement using a five-point Likert scale (1=Not at all, 2=Minimally, 3=Somewhat, 4=Significantly, 5=Fully). The modified principal PTLA had a high overall reliability with a Cronbach's alpha (α) of .94, with the individual reliability of each of the sub-scales as follows: Leadership and Vision α=0.89; Teaching and Learning α=0.84; Productivity and Professional Practices α=0.81; Support, Management, and Operations α=0.86; Assessment and Evaluations α=0.86. The additional demographic questions that will be used in this survey have not been reviewed or evaluated for usage with the PTLA survey.

For this study, the survey was modified so that it can be administered to both school leaders and teachers. Questions were left as is for the principals' survey to learn

about their technology leadership role and competencies, which include the question stem, “To what extent do you…” at the beginning of each survey question. Questions were altered for the teacher survey so that they address their perceptions of principals’ technology leadership roles and responsibilities. The question stems for their survey were modified to, “To what extend should principals…” using the same content of the PTLA survey that was given to the principals. Furthermore, the Social, Legal, and Ethical Issues sub-scale of both PTLAs were not included in the principal and teacher surveys for this study. The modified teacher PTLA had a high overall reliability with a Cronbach’s alpha (α) of 0.91, with the individual reliability of each of the sub-scales as follows: Leadership and Vision α=0.86; Teaching and Learning α=0.87; Productivity and Professional Practices α=0.81; Support, Management, and Operations α=0.83; Assessment and Evaluations α=0.86. The additional demographic questions that were used in the teacher survey were not reviewed or evaluated for usage with the PTLA survey.

Data Collection Procedures

Quantitative

Prior to data collection, the researcher gained approval from the University of Houston-Clear Lake’s (UHCL’s) Committee for Protection of Human Subjects (CPHS). Next, principals and teachers within Region IV were contacted via email with information regarding the purpose of the study and the process for collecting survey data. The researcher shared this information through a survey cover and disseminated an electronic link to access the modified versions of the *Principal Technology Leadership Assessment* (PTLA) through the use of SurveyMonkey. The purpose of the study, voluntary participation, the timeframe for completing the survey, as well as ethical and confidentiality considerations were communicated to the school leaders and teachers who chose to participate.

Survey responses were collected over a four-week period. The cover letter and links to the PTLA surveys were emailed to principals and teachers at the beginning of the four-week period, and follow-up emails were sent at the conclusion of each week for a total of three additional reminders for participants to complete the surveys. At the conclusion of the 4-week period, a total of 123 principal responses and 125 teacher responses were collected and used for this study. Upon receipt of the survey responses, the data were entered into a quantitative research software Statistical Package for the Social Sciences (SPSS) for further analysis.

All data were secured in a password-protected folder on the researcher's computer as well as a folder in Google Apps. In addition, the data were saved to a flash drive which is stored in the research's office within a locked file cabinet. This data will be maintained by the researcher for five years, which is the time required by CPHS guidelines. The researcher will destroy the content of the file once the deadline expires.

Qualitative

To collect qualitative data for this study, principals and teachers within Region IV were solicited to participate in thirty-minute, semi-structured interviews via email and as part of the data collected in the PTLA surveys. The email included the researcher's name and personal information, the purpose of the study, the expected time to complete the survey, and how their participation would contribute towards technology leadership research. As principals and teachers agreed to participate, the researcher corresponded with them via email to determine a date and time that worked best for them. The sessions were conducted via Google Meet over a three-week period, and they were recorded and transcribed for data analysis.

The interview questions were designed by the researcher and evaluated by cohort peers and university mentors prior to the interviews. The interviews consisted of 8-9

questions which were intended to probe further on data collected from the *Principals Technology Leadership Assessment* (PTLA) as well as gain insight on how principals support teachers with integrating technology. The interview questions were sent to the participants prior to the scheduled interviews via email. Principals and teachers were encouraged to review the questions in advance so they would be prepared to respond thoughtfully. The researcher explained that the data collected from the interviews would be used to learn about their perspectives of the principal's technology leadership role.

While the interviews were being conducted, some flexibility was allowed for follow-up questions when appropriate or when clarification was needed for interview questions asked or interview responses given. Following each interview, the Google Meet recordings were downloaded to the examiner's personal laptop, transcribed through the Otter software program, and reviewed by the researcher for necessary edits. Finally, the interviews were coded and analyzed for themes to determine relevant findings of the data collected.

Data Analysis

Quantitative

The data obtained from the *Principal Technology Leadership Assessment* (PTLA) were entered in the IBM Statistical Package for the Social Science (SPSS) and analyzed by the researcher using descriptive statistics and paired t tests. Research question one, *What are school leaders self-reported technology leadership competencies?*, research question two, *What are the teachers' perceptions of the school leader's technology leadership competencies?*, and research question three, *What are the similarities and differences between school leaders' technology leadership competencies and teachers' perceptions of the school leader's technology leadership competencies,* were answered

by calculating frequency distributions and percentages for school leader and teacher responses from the PTLA surveys.

To further analyze research question three, independent t-tests were used to determine if there was a statistically significant mean difference between what principals are doing and what teachers believe principals should be doing as technology leaders. The independents variables were the principals and the teachers who participated in the study. The dependent variables were the two groups' responses regarding principals' completion of the technology leadership activities and teacher perceptions of principal participation on the technology leadership activities they relate to the five survey sub-scales, which were the continuous variables. Statistical significance was measured using a p-value of 0.05, and Cohen's d and r^2 were used to calculate effect sizes.

Qualitative

The qualitative interview data collected during the study were analyzed using coding and thematic analysis. Following each interview, responses will be transcribed and codes were assigned based on the content discussed and inferences made by the researcher. The researcher assigned codes by downloading the transcribed interviews into Microsoft Word and using the notes tool to label and categorize the data (codes will be color-coded, underlined, or italicized). The codes were then reviewed to determine relevant patterns and themes within the participant responses that provided insight on principals' and teachers' perceptions of their roles as technology leaders.

Once this process was complete, the codes and themes that were identified for each were compared to determine the overarching themes that emerged from the participants' responses. The researcher then reviewed the themes and their supporting codes to determine if themes should be combined. Following this process, peers reviewed the researchers coding and thematic analysis to ensure the validity of the coding process.

Once the researcher was certain the data were valid, the research collected was used to write the results of the qualitative data with supporting statements and summarized responses from the principals and teachers.

Qualitative Validity

To ensure the validity of the qualitative analysis, several methods were employed. Content validity was established by performing member checks, peer reviews, and triangulation during the data collection and analysis phases. First, the researcher engaged in member checking by having participants review their transcripts. Member checking helped to ensure that the content and voice of the participants was accurately captured and provided a clear depiction of their responses, thus increasing the validity of the findings. Next, peer reviews were used to obtain feedback related to the interview questions asked and the coding and thematic analysis process utilized. Peer reviews were used to verify that the interview questions asked were relevant to the research questions for the study. In addition, peer reviews also helped verify that the codes and themes from the thematic coding process were aligned with the data collected and they could be used to draw conclusions about the interviews conducted. Finally, data triangulation was established by having multiple principals and teachers participate in interviews, peer reviews to validate appropriate analysis, and referencing existing literature through the literature review and as explained in the summary of chapter five. Once the *Principal Technology Leadership Assessment* (PTLA) data were collected, the researcher was also able to use triangulation to validate the data analysis by comparing these results of the survey with data collected from the interviews.

Privacy and Ethical Considerations

Prior to the collection of any data, the researcher gained approval from the UHCL's CPHS to conduct the study. The purpose of the study, voluntary participation, the timeframe for completing the survey, as well as ethical and confidentiality considerations were communicated to the principals and teachers who chose to participate in the survey cover letter. Data analysis used excluded specific district names to ensure the information remains confidential.

Similarly, individuals who participated in the teacher and principal interviews received information about the purpose of the study, the approximate timeframe for the interviews, and that participation in the interviews was voluntary. To ensure the confidentiality of the participants who are interviewed, pseudonyms were used in lieu of principal and teacher names throughout the study. Furthermore, district and campus names were excluded to protect the identities of those who participate in the study.

The data collected was kept in a password-protected folder on the researcher's computer, a digital folder in Google Apps, as well as on a flash drive which will remain securely locked in a cabinet in the researcher's office. The researcher will maintain the data for five years as required by the CPHS and school district guidelines. After the deadline has passed, the researcher will destroy all data files associated with the study.

Research Design Limitations

The research design consisted of several limitations. First, it was difficult to get principals and teachers from the targeted sample to complete the surveys. The length of the survey or its purpose may not have appealed to participants and therefore discouraged them from taking the time to complete it. Second, the principals' and teachers' demanding schedules presented a limitation in that it was difficult to find times for the researcher to meet with them for interviews. It was somewhat difficult to get individuals

to volunteer to participate, and then scheduling time for them to meet with the researcher was challenging due to their hectic work schedules. Third, data from this study can only be used to make generalizations of other regions with similar demographics. The data collected will only uncover accurate findings for the principals and teachers surveyed and interviewed, therefore generalizations are limited when considering other populations. Fourth, one must assume participants were completely honest when providing responses to the survey and interview questions. The validity of the findings is jeopardized if the participants were in fact dishonest.

Conclusions

The purpose of this study was to examine technology leadership competencies and teachers' perceptions of the school leader's technology leadership role and competencies. This chapter provides an overview of the research problem, operationalization of theoretical constructs, research purpose, questions, hypotheses, research design, population and sampling selection, instrumentation to be used, data collection procedures, data analysis, qualitative validity, privacy and ethical considerations, and the research design limitations of the study. To better understand technology leadership and how school leaders and teachers perceive this role, both quantitative and qualitative findings were essential to the study; therefore, a mixed methods design was used to analyze the technology leadership role from the perspective of both principals and teachers within Region IV. Descriptive statistics were used to analyze data collected from the surveys, and interviews were used to determine themes among principal and teachers of the technology leadership role. In Chapter IV, survey and interview data will be analyzed and discussed in further detail.

CHAPTER IV:

RESULTS

The purpose of this study is to examine technology leadership and teachers' perceptions of the principal's technology leadership role. In addition, this study explored the similarities and differences between principals' competencies as technology leaders and teachers' perceptions of what principals should be doing as technology leaders. Principal and teacher survey data were collected and downloaded into an IBM SPSS database, and the quantitative data were analyzed using descriptive statistics and independent t-tests. In addition, five principals and five teachers from Region IV participated in interviews conducted to collect qualitative data for this study, and thematic coding was used to analyze the data. This chapter presents a detailed description of the principal and teacher demographics as well as the findings of each of the four research questions for this study.

Participant Demographics

Survey Participants

Principals. Participants for this study consisted of principals identified by the Texas Education Agency (TEA) as serving in public schools within the 48 independent school districts of Region IV during the 2020-2021 school year. All principals were sent an email soliciting their participation in this study, and of the 1,356 principals who were contacted, 144 submitted survey responses. After reviewing the data collection, 21 principals' responses were deleted due to incomplete data.

The resulting principal sample consisted of 123 principals. A summary of the principals' demographics is included in Table 4.1. Female principals comprised 70.7% (n = 87) of the sample, while male participants comprised 29.3% (n = 36). Less than 1.0% reported as American Indian/Alaska Native, 2.4% (n = 3) reported as Asian, and 20.3%

(n = 25) reported as African American. Thirty-five percent (n = 43) reported to be White, 39.8% (n = 49) of the participants reported to be Hispanic, and 1.6% (n = 2) reported to be another race. Principals varied in age, with 0.8% (n = 1) between the ages of 20 and 29, 2.4% (n = 30) between 30 and 39 years old, 43.9% (n = 54) between 40 and 49, 28.5% (n = 35) between 50 and 59, and 2.4% (n = 3) indicating they were 60 years or older. Similarly, years of experience varied: 7.3% (n = 9) of participants had less than one year of experience. Thirteen percent (n = 16) had one to two years of experience, 24.4% (n = 30) had three to five year of experience, and 28.5% (n = 35) had 6-10 years of experience, 11.4% (n = 14) had 11 to 15 years of experience, and 15.4% (n = 19) had more than 15 years' experience.

Additionally, 51.2% (n = 63) of participants reported working at an elementary campus, 17.9% (n = 22) reported working at middle school campuses, and 30.9% (n = 38) reported working at a high school campus. Less than 1.0% (n = 1) of participants worked at a school with an enrollment of one to 229 students, 71.5% (n = 88) worked at school with an enrollment of 230 to 1,229 students, while 27.6% (n = 34) work at schools with an enrollment of 1,230 or more students. Regarding location, 47.2% (n = 58) of participants' schools are located in urban areas, 44.7% (n = 55) of participants' schools are located in suburban areas, and 8.1% (n = 10) of participants' school are located in rural areas. When asked about district enrollment, 6.5% (n = 8) of participants have an enrollment of one to 1,599 students, 11.4% (n = 14) of participants' districts have between 1,600 and 4,999 students, and 82.1% (n = 101) reported a district enrollment of 1,500 or more students.

Table 4.1

Principal Survey Participants

Demographics	Frequency (*n*)	Percentage (%)
Gender		
Female	87	70.7
Male	36	29.3
Race/Ethnicity		
American Indian or Alaska Native	1	0.8
Asian or Asian American	3	2.4
African American	25	20.3
Hispanic	49	39.8
White	43	35.0
Native American or other Pacific Islander	0	0.0
Another Race	2	1.6
Age Range		
18-20	0	0.0
21-29	1	0.8
30-39	30	24.4
40-49	54	43.9
50-59	35	28.5
60 or older	3	2.4
Years of Experience		
Less than one year	9	7.3
1-2 years	16	13.0
3-5 years	30	24.4
6-10 years	35	28.5
11-15 years	14	11.4
More than 15 years	19	15.4
School Level		
Elementary School	63	51.2
Intermediate/Middle School	22	17.9
High School	38	30.9

Demographics	Frequency (*n*)	Percentage (%)
School Enrollment		
1 to 229	1	0.8
230 to 1,229	88	71.5
1,230 or more	34	27.6
School Community		
Urban	58	47.2
Suburban	55	44.7
Rural	10	8.1
District Enrollment		
1 to 1,599	8	6.5
1,600 to 4,999	14	11.4
5,000 or more	101	82.1

Teachers. Participants for this study consisted of teachers identified by the Texas Education Agency (TEA) as serving in public schools within the 48 independent school districts of Region IV during the 2020-2021 school year. All eligible teachers within Region IV were sent an email soliciting their participation in this study, and of the 74,989 who were contacted, 148 submitted survey responses. Upon further review of the data collected, 23 respondents' responses were deleted due to missing data.

The resulting teacher sample consisted of 125 teachers, and a summary of their demographics are included in Table 4.2 below. Female principals comprised 80.2% (n = 101) of the sample, while male participants comprised 19.8% (n = 25). Less than 1.0% (n = 1) reported American Indian/Alaska Native, 0.8% (n = 1) reported as Asian, and 11.1% (n = 14) reported as African American. Forty-six percent (n = 58) reported to be White, 35.7% (n = 45) of the participants reported to be Hispanic, and 5.6% (n = 7) reported to be another race. Principals varied in age, with 11.1% (n = 14) between the ages of 20 and 29, 31.7% (n = 40) between 30 and 39 years old, 33.3% (n = 42) between 40 and 49, 15.9% (n = 20) between 50 and 59, and 7.9% (n = 10) indicating they were 60 years or

older. Similarly, years of experience varied: 2.4% (n = 3) of participants had less than one year of experience, 4.0% (n = 5) had one to two years of experience, 11.1% (n = 14) had three to five year of experience, 25.4% (n = 32) had 6-10 years of experience, 15.1% (n = 19) had 11 to 15 years of experience, and 42.1% (n = 53) had more than 15 years' experience. Additionally, 54.8% (n = 69) of participants reported working at an elementary campus, 17.5% (n = 69) reported working at middle school campuses, and 27.8% (n = 35) reported working at a high school campus.

Based on the data, 3.2% (n = 4) of participants worked at a school with an enrollment of one to 229 students, 67.5% (n = 85) worked at schools with an enrollment of 230 to 1,229, while 29.4% (n = 37) worked at schools with an enrollment of 1,230 or more. Regarding location, 43.7% (n = 55) of participants' schools are located in urban areas, 51.6% (n =65) of participants' schools are located in suburban areas, and 4.8% (n = 6) of participants' school are located in rural areas. When asked about district enrollment, 0.8% (n = 1) of participants have an enrollment of one to 1,599 students, 12.7% (n = 16) of participants' districts have between 1,600 and 4,999, and 86.5% (n = 109) reported a district enrollment of 1,500 or more students.

Table 4.2

Teacher Survey Participants

Demographics	Frequency (*n*)	Percentage (%)
Gender		
Female	101	80.2
Male	25	19.8
Race/Ethnicity		
American Indian or Alaska Native	1	0.8
Asian or Asian American	1	0.8
African American	14	11.1
Hispanic	45	35.7
White	58	46.0
Native Hawaiian or other Pacific Islander	0	0.0
Another Race	7	5.6
Age Range		
18-20	0	0.0
21-29	14	11.1
30-39	40	31.7
40-49	42	33.3
50-59	20	15.9
60 or older	10	7.9
Years of Experience		
Less than one year	3	2.4
1-2 years	5	4.0
3-5 years	14	11.1
6-10 years	32	25.4
11-15 years	19	15.1
More than 15 years	53	42.1
School Level		
Elementary School	69	54.8
Intermediate/Middle School	22	17.5
High School	35	27.8

Demographics	Frequency (*n*)	Percentage (%)
School Enrollment		
1 to 229	4	3.2
230 to 1,229	85	67.5
1,230 or more	37	29.4
School Community		
Urban	55	43.7
Suburban	65	51.6
Rural	6	4.8
District Enrollment		
1 to 1,599	1	0.8
1,600 to 4,999	16	12.7
5,000 or more	109	86.5

Interview Participants

Participants for this study consisted of school leaders and teachers identified by the Texas Education Agency (TEA) as serving in public schools within the 48 independent school districts of Region IV during the 2020-2021 school year. Five principals and five teachers from Region IV participated in interviews conducted to collect qualitative data for this study. Interview participants were selected based on their willingness to participate and the varied school levels they serve (elementary, middle, or high school). A summary of the participants' descriptive factors, including gender, ethnicity, years of experience, their school levels, and the district size are included in Table 4.33 and 4.34.

Table 4.3

Principal Interview Participants

Principals	Gender	Ethnicity/ Race	Age Range	Years of Experience	School Level	School Enrollment	School Community	District Enrollment
Ms. Lopez	Female	Hispanic	40-49	Less than one year	Elementary	230-1,229	Rural	5,000 +
Ms. Ramirez	Female	Hispanic	40-49	1-2	Elementary	230-1,229	Suburban	5,000 +
Ms. Johnson	Female	African American	40-49	6-10	Middle	230-1,229	Suburban	5,000 +
Mr. Gallardo	Male	Asian	50-59	6-10	Middle	230-1,229	Urban	5,000 +
Ms. Smith	Female	White	40-49	3-5	High	1,230 or more	Suburban	5,000 +

Table 4.4

Teacher Interview Participants

Teachers	Gender	Ethnicity/ Race	Age Range	Years of Experience	School Level	School Enrollment	School Community	District Enrollment
Ms. Perez	Female	Hispanic	30-39	6-10	Elementary	230-1,229	Urban	5,000 +
Ms. West	Female	African American	20-29	6-10	Elementary	230-1,229	Suburban	5,000 +
Ms. Gibson	Female	White	40-49	15 +	Middle	230-1,229	Urban	5,000 +
Ms. Garcia	Female	Hispanic	30-39	6-10	Middle	1-229	Urban	1,600-4,999
Mr. Wilson	Male	White	40-49	15 +	High	1,230 or more	Suburban	5,000 +

Research Question One

Research question one, *What are school leaders' doing as technology leaders?*, was answered by calculating frequency distributions and percentages (descriptive statistics) of principal responses from the modified *Principal Technology Leadership Assessment* (PTLA). This survey consisted of 28 questions, which were divided into sub-scales that addressed various components of technology leadership. Respondents were required to rate themselves using a Likert scale that evaluated frequency (1 = Not at all, 2 = Minimally, 3 = Somewhat, 4 = Significantly, 5 = Fully). Responses were collapsed to allow the researcher to combine responses into fewer categories and allow greater clarity in trends and patterns in the data.

The first six questions pertained to principals' participation in activities as they related to leadership and vision. Table 4.5 illustrates the results of all principal responses, and Table 4.6 illustrates the principals' collapsed responses. Questions within this sub-scale showed the most variation when compared to others throughout they survey, with none of the questions indicating that the majority of principals completed any of the activities to the same extent. A close majority (49.6%) of principals indicated that they *significantly/fully* advocate for inclusion of research-based technology practices in school improvement plans; however, only 26% of principals indicated that they *somewhat* advocated for these practices, and 24.3% of principals indicated that they did this *not at all/minimally*. While 40.6% of principals specified that they *significantly/fully* compare and align district or technology plans with other plans, 29.3% of principals stated they did this *somewhat*, and 30.1% of principals admitted they did this *not at all/minimally*. Relatively speaking, most of the principals (36.6%) shared that they *significantly/fully* engage in activities to identify best practices in the use of technology; however, 30.1% of

principals complete this activity *somewhat*, and 33.3% of principals complete this activity *not at all/minimally*.

When looking at the other three activities addressed in this question set, more of the principals specified that they take part in these activities *not at all/minimally*. Most of the principals (46.3%) indicated that they participate *not at all/minimally* in the district or school's technology planning session, while 31.7% indicated they participate *somewhat,* and only 21.9% participate *significantly/fully*. When asked to what extent principals promote participation of stakeholders in the district's technology planning process, a close majority (48.8%) indicated they do this *not at all/minimally*, 25.2% do this *somewhat*, and 26% of principals do this *significantly/fully*. When asked to what extent principals communicate information about district or school's technology planning and implementation efforts to school stakeholders, 37.4% of principals indicated they did this *not at all/minimally*, 29.3% indicated they did activity *somewhat,* and 33.3% indicated they did this *significantly/fully*.

Table 4.5

Principal Responses on Leadership and Vision (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
1. Participate in district or school's technology planning session	26.8 (n = 33)	19.5 (n = 24)	31.7 (n = 39)	13.8 (n = 17)	8.1 (n = 10)
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	16.3 (n = 20)	21.1 (n = 26)	29.3 (n = 36)	24.4 (n = 30)	8.9 (n = 11)
3. Promote participation of school stakeholders in the district's technology planning process	22.8 (n = 28)	26.0 (n = 32)	25.2 (n = 31)	21.1 (n = 26)	4.9 (n = 6)
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	16.3 (n = 20)	13.8 (n = 17)	29.3 (n = 36)	31.7 (n = 39)	8.9 (n = 11)
5. Advocate for inclusion of research-based technology practices in the school improvement plan	8.9 (n = 11)	15.4 (n = 19)	26.0 (n = 32)	39.0 (n = 48)	10.6 (n = 13)
6. Engage in activities to identify best practices in the use of technology	13.0 (n = 16)	20.3 (n = 25)	30.1 (n = 37)	28.5 (n = 35)	8.1 (n = 10)

Table 4.6

Collapsed Principal Responses on Leadership and Vision (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
1. Participate in district or school's technology planning session	46.3 (n = 57)	31.7 (n = 39)	21.9 (n = 27)
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	37.4 (n = 46)	29.3 (n = 36)	33.3 (n = 41)
3. Promote participation of school stakeholders in the district's technology planning process	48.8 (n = 60)	25.2 (n = 31)	26.0 (n = 32)
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	30.1 (n = 37)	29.3 (n = 36)	40.6 (n = 50)
5. Advocate for inclusion of research-based technology practices in the school improvement plan	24.3 (n = 30)	26.0 (n = 32)	49.6 (n = 61)
6. Engage in activities to identify best practices in the use of technology	33.3 (n = 41)	30.1 (n = 37)	36.6 (n = 45)

The next six questions pertained to principals' participation in activities as they related to teaching and learning. Table 4.7 illustrates the results of all principal responses, and Table 4.8 illustrates the principals' collapsed responses. As shown in Table 4.8, the majority of principals indicated that they completed four of the activities *significantly/fully*. According to the data, 72.3% of principals *significantly/fully* provide or make available assistance to teachers for using student assessment data to modify instruction, 65.9% of principals *significantly/fully* provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data, and 60.9% *significantly/fully* disseminate data or model best practices in learning and teaching with faculty and staff.

While a majority of principals indicated that they *significantly/fully* facilitate or ensure the delivery of professional development on the use of technology to faculty and staff (56.1%), 28.5% indicated that they only do this activity *somewhat*, and 15.5% admitted they complete this activity *not at all/minimally*. It should also be noted that while the majority of principals indicated that they participated in four of the activities *fully/significantly*, over one quarter of principals who participated in the survey indicated they completed each of these activities *somewhat*. Based on the data, 25.2% of principals *somewhat* provide or make available assistance to teachers for using student assessment data to modify instruction, 29.3% of principals *somewhat* provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data, and 34.1% *somewhat* disseminate data or model best practices in learning and teaching with faculty and staff.

The last two questions had greater variation in principal responses. While most of the principals (42.3%) *significantly/fully* provide support to teachers and staff when attempting to share information about technology practices, issues, and concerns, 40.7%

only did this *somewhat*, and still 17.1% did this *not at all/minimally*. When principals were asked to what extent they organize or conduct assessments on staff needs related to professional development on the use of technology, only 39.3% of principals indicated they did this *significantly/fully*. The other principals indicated that they did this *somewhat* (38.2%) or *not at all/minimally* (22.8%).

Table 4.7

Principal Responses on Teaching and Learning (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	1.6 (n = 2)	3.3 (n = 4)	29.3 (n = 36)	43.9 (n = 54)	22.0 (n = 27)
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	0.0 (n = 0)	2.4 (n = 3)	25.2 (n = 31)	45.5 (n = 56)	26.8 (n = 33)
9. Disseminate data or model best practices in learning and teaching with faculty and staff	1.6 (n = 2)	3.3 (n = 3)	34.1 (n = 42)	39.8 (n = 49)	21.1 (n = 26)
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	3.3 (n = 4)	13.8 (n = 17)	40.7 (n = 50)	32.5 (n = 40)	9.8 (n = 12)
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	3.3 (n = 4)	19.5 (n = 24)	38.2 (n = 47)	30.9 (n = 38)	8.1 (n = 10)
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	3.3 (n = 4)	12.2 (n = 15)	28.5 (n = 35)	46.3 (n = 57)	9.8 (n = 12)

Table 4.8

Collapsed Principal Responses on Teaching and Learning (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	4.9 (n = 6)	29.3 (n = 36)	65.9 (n = 81)
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	2.4 (n = 3)	25.2 (n = 31)	72.3 (n = 89)
9. Disseminate data or model best practices in learning and teaching with faculty and staff	4.9 (n = 5)	34.1 (n = 42)	60.9 (n = 75)
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	17.1 (n = 21)	40.7 (n = 50)	42.3 (n = 52)
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	22.8 (n = 28)	38.2 (n = 47)	39.0 (n = 48)
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	15.5 (n = 19)	28.5 (n = 35)	56.1 (n = 69)

Table 4.9 shows the principals' responses to the questions related to their productivity and professional practices, and table 4.10 illustrates the participants' collapsed responses. As shown in Table 4.10, the great majority of participants *significantly/fully* (over 80%) participate in four out of five of the productivity and professional practices activities described, making this the sub-scale that demonstrated the most alignment among participants. Based on the data, 86.2% of principals encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community. Similarly, 86.2% of principals use technology-based management systems to access student records and use technology to help them complete day-to-day tasks. Furthermore, 81.3% of principals use technology-based management systems to access staff/faculty personnel records.

Upon further review of the responses to those four questions, responses were similar in the other two collapsed categories. Between 8.9% and 12.2% of respondents indicated that they completed each of these activities *somewhat*, and between 1.6% and 7.3% of respondents indicated that they completed these activities *not at all/minimally*. The question that individuals indicated that they did most frequently was encourage and use technology as a means of communicating with education stakeholders (86.2%), including peers, experts, students, parents/guardians, and the community, with only two principals stating that they did this *not at all/minimally*.

Only one question regarding principal productivity and professional practices showed a divide among the principals. While most of the principals (43.9%) indicated that they *significantly/fully* participate in professional development activities meant to improve or expand their use of technology, 41.5% indicated that they participated in these professional development activities *somewhat*. The other 18 participants (14.6%)

indicated that they participate in these professional development activities *not at all/minimally.*

Table 4.9

Principal Responses on Productivity and Professional Practices (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
13. Participate in professional development activities meant to improve or expand the use of technology	2.4 (n = 3)	12.2 (n = 15)	41.5 (n = 51)	35.0 (n = 43)	8.9 (n = 11)
14. Use technology to help complete day-to-day tasks	0.8 (n = 1)	1.6 (n = 2)	11.4 (n = 14)	47.2 (n = 58)	39.0 (n = 48)
15. Use technology-based management systems to access staff/faculty personnel records	4.9 (n = 6)	2.4 (n = 3)	11.4 (n = 14)	48.0 (n = 59)	33.3 (n = 41)
16. Use technology-based management systems to access student records	2.4 (n = 3)	2.4 (n = 3)	8.9 (n = 11)	35.8 (n = 44)	50.4 (n = 62)
17. Encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	0.8 (n = 1)	0.8 (n = 1)	12.2 (n = 15)	44.7 (n = 55)	41.5 (n = 51)

Table 4.10

Collapsed Principal Responses on Productivity and Professional Practices (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
13. Participate in professional development activities meant to improve or expand the use of technology	14.6 (n = 18)	41.5 (n = 51)	43.9 (n = 54)
14. Use technology to help complete day-to-day tasks	2.4 (n = 3)	11.4 (n = 14)	86.2 (n = 106)
15. Use technology-based management systems to access staff/faculty personnel records	7.3 (n = 9)	11.4 (n = 14)	81.3 (n = 100)
16. Use technology-based management systems to access student records	4.8 (n = 6)	8.9 (n = 11)	86.2 (n = 106)
17. Encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	1.6 (n = 2)	12.2 (n = 15)	86.2 (n = 106)

The next six questions refer to support, management, and operations as they relate to technology. Table 4.11 illustrates the principals' responses, and Table 4.12 illustrates the principals' responses collapsed. As shown in Table 4.10, only one of six questions

showed alignment among the principal responses. The majority of principals *significantly/fully* support faculty and staff in connecting to and using district- and building-level technology systems for management and operations. Only 19.5% of principals indicated they did this *Somewhat*, and 4.9% indicated they did this *not at all/minimally*.

The other five questions in this sub-scale showed variation in the extent that principals participate in these activities. While most of the principals indicated that they *significantly/fully* allocated campus discretionary funds to help meet the needs of the school's technology needs, 29.3% indicated that they allocated campus funds toward technology *somewhat*, and 25.3% indicated they did so *not at all/minimally*. Similarly, 42.3% of principals expressed that they *significantly/fully* advocate at the district level for adequate, timely, and high-quality technology support services; however, 33.3% of principals stated they did this *Somewhat*, and 24.4% of principals did this *not at all/minimally*.

In contrast, the results of the other three questions related to support, management, and operations indicated that most principals completed these activities *somewhat* or *not at all/minimally*. When asked to what extent principals investigate how satisfied faculty and staff are with the technology support services provided by the district/school, 43.9% of principals indicated they did this *somewhat*, 31.7% indicated this did this *significantly/fully* and 24.4% indicated they did this *not at all/minimally*. In regard to pursuing supplemental funding to help meet the technology needs of the school, 35.7% of principals admitted they did this *not at all/minimally*, 33.3% of principals did this *somewhat*, and 30.9% of principals did this *significantly/fully*. When principals were asked to what extent they ensure that hardware and software replacements/upgrades were

incorporated into school technology plans, 37.4% indicated they did this *not at all/minimally*, 29.3% did this *somewhat*, and 33.3% did this *significantly/fully*.

Table 4.11

Principal Responses on Support, Management, and Operations (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	0.8 (n = 1)	4.1 (n = 5)	19.5 (n = 24)	39.8 (n = 49)	35.8 (n = 44)
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	9.8 (n = 12)	15.4 (n = 19)	29.3 (n = 36)	33.3 (n = 41)	12.2 (n = 15)
20. Pursue supplemental funding to help meet the technology needs of the school	14.6 (n = 18)	21.1 (n = 26)	33.3 (n = 41)	21.1 (n = 26)	9.8 (n = 12)
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	9.8 (n = 12)	27.6 (n = 34)	29.3 (n = 36)	20.3 (n = 25)	13.0 (n = 16)
22. Advocate at the district level for adequate, timely, and high-quality technology support services	8.1 (n = 10)	16.3 (n = 20)	33.3 (n = 41)	30.9 (n = 38)	11.4 (n = 14)
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	7.3 (n = 9)	17.1 (n = 21)	43.9 (n = 54)	25.2 (n = 31)	6.5 (n = 8)

Table 4.12

Collapsed Principal Responses on Support, Management, and Operations (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	4.9 (n = 6)	19.5 (n = 24)	75.6 (n = 93)
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	25.2 (n = 31)	29.3 (n = 36)	45.5 (n = 56)
20. Pursue supplemental funding to help meet the technology needs of the school	35.7 (n = 44)	33.3 (n = 41)	30.9 (n = 38)
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	37.4 (n = 46)	29.3 (n = 36)	33.3 (n = 41)
22. Advocate at the district level for adequate, timely, and high-quality technology support services	24.4 (n = 30)	33.3 (n = 41)	42.3 (n = 52)
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	24.4 (n = 30)	43.9 (n = 54)	31.7 (n = 39)

The remaining five questions focus on the assessment and evaluation of technology in schools. Table 4.13 demonstrates the principals' detailed responses to each of the questions, while Table 4.14 demonstrates the collapsed principal responses. As shown in Table 4.14, the majority of principals *significantly/fully* promote or model technology-based systems to collect student assessment data (61.0%), while 31.7% of principals indicate they do this *somewhat*. Similarly, 56.1% of principals *significantly/fully* promote the evaluation of instructional practices to assess their effectiveness, while 37.4% of principals expressed that they do this *somewhat*.

The last three questions had more variation among the principal responses. While a close majority of principals (47.1%) indicated that they *significantly/fully* include the effective use of technology as a criterion for assessing the performance of faculty, 35.8% of principals said they did this *somewhat*, and 17.1% of principals admitted they did this *not at all/minimally*. When asked to what extent principals assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrades, most of the principals (37.4%) indicated that they did this *somewhat*, while 33.3% did this *significantly/fully* and 29.2% did this *not at all/minimally*. Most of the principals (41.8%) also indicated that they *somewhat* evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology, with 38.5% of principals expressing they did this *significantly/fully*, and 19.7% of principals sharing the did this *not at all/minimally*.

Table 4.13

Principal Responses on Assessment and Evaluation (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
24. Promote or model technology-based systems to collect student assessment data	3.3 (n = 4)	4.1 (n = 5)	31.7 (n = 39)	38.2 (n = 47)	22.8 (n = 28)
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	1.6 (n = 2)	4.9 (n = 6)	37.4 (n = 46)	39.8 (n = 49)	16.3 (n = 20)
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	8.1 (n = 10)	21.1 (n = 26)	37.4 (n = 46)	26.8 (n = 33)	6.5 (n = 8)
27. Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	4.1 (n = 5)	15.6 (n = 19)	41.8 (n = 51)	29.5 (n = 36)	9.0 (n = 11)
28. Include the effective use of technology as a criterion for assessing the performance of faculty	4.1 (n = 5)	13.0 (n = 16)	35.8 (n = 44)	33.3 (n = 41)	13.8 (n = 17)

Table 4.14

Collapsed Principal Responses on Assessment and Evaluation (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
24. Promote or model technology-based systems to collect student assessment data	7.4 (n = 9)	31.7 (n = 39)	61.0 (n = 75)
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	6.5 (n = 8)	37.4 (n = 46)	56.1 (n = 69)
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	29.2 (n = 36)	37.4 (n = 46)	33.3 (n = 41)
27. Evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology	19.7 (n = 24)	41.8 (n = 51)	38.5 (n = 47)
28. Include the effective use of technology as a criterion for assessing the performance of faculty	17.1 (n = 21)	35.8 (n = 44)	47.1 (n = 58)

Research Question Two

Research question two, *What are the teachers' perceptions of the principal's role as technology leader?*, was answered by calculating frequency distributions and percentages (descriptive statistics) of teacher responses from the modified *Principal Technology Leadership Assessment* (PTLA). This survey consisted of 28 questions, which were divided into sub-scales that addressed various components of technology leadership. Respondents were required to rate their perceptions of principal technology leadership using a Likert scale that evaluated frequency (1 = Not at all, 2 = Minimally, 3 = Somewhat, 4 = Significantly, 5 = Fully). Responses were collapsed to allow the researcher to combine responses into fewer categories and allow greater clarity in trends and patterns in the data.

The first six questions pertained to teachers' perceptions of principal technology activities as they related to leadership and vision. Table 4.15 illustrates the results of all teacher responses, and Table 4.16 illustrates the teachers' collapsed responses. As shown in Table 4.16, the majority of teachers had similar responses to all six of the activities related to principals' leadership and vision as technology leaders, indicating they should be implemented *significantly/fully*. According to the collapsed data, 85.8% of teachers believe principals should *significantly/fully* advocate for the inclusion of research-based technology practices in school improvement plans, 81.8% of teachers believe principals should *significantly/fully* communicate information about districts or schools' technology planning and implementation efforts to school stakeholders, and 81.0% of teachers believe principals should *significantly/fully* participate in district or school's technology planning session.

A relatively smaller number of teachers believed teachers should *significantly/fully* complete two of the activities regarding leadership and vision. While

77.7% of teachers believed principals should *significantly/fully* engage in activities identify best practices in the use of technology, 17.5% of teachers felt principals should do this *somewhat*. Furthermore, 72.2% of teachers believed principals should promote participation of school stakeholders in the district's technology planning process, while 20.6% of teachers felt principals should promote such participation *somewhat*.

When looking at all of the teacher responses, some notable observations can be made. More than half of teachers (53.2%) of teachers believe principals should *significantly* participate in district or school's technology planning sessions, and 50% of teachers believe principals should *significantly* compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans. Additionally, 0.0% of teachers indicated *not at all* when they were asked to what extent principals should communicate information about district or school's technology planning and implementation efforts to school stakeholders or advocate for inclusion of research-based technology practices in the school improvement plan

Table 4.15

Teacher Perceptions of Principals' Role in Leadership and Vision (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
1. Participate in district or school's technology planning session	0.8 (n = 1)	3.2 (n = 4)	15.1 (n = 19)	53.2 (n = 67)	27.8 (n = 35)
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	0.0 (n = 0)	1.6 (n = 2)	16.7 (n = 21)	38.9 (n = 49)	42.9 (n = 54)
3. Promote participation of school stakeholders in the district's technology planning process	1.6 (n = 2)	5.6 (n = 7)	20.6 (n = 26)	40.5 (n = 51)	31.7 (n = 40)
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	0.8 (n = 1)	4.0 (n = 5)	13.5 (n = 17)	50.0 (n = 63)	31.7 (n = 40)
5. Advocate for inclusion of research-based technology practices in the school improvement plan	0.0 (n = 0)	2.4 (n = 3)	11.9 (n = 15)	43.7 (n = 55)	42.1 (n = 53)
6. Engage in activities to identify best practices in the use of technology	0.8 (n = 1)	4.0 (n = 5)	17.5 (n = 22)	44.4 (n = 56)	33.3 (n = 42)

Table 4.16

Collapsed Teacher Perceptions of Principals' Role in Leadership and Vision (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
1. Participate in district or school's technology planning session	4.0 (n = 5)	15.1 (n = 19)	81.0 (n = 102)
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	1.6 (n = 2)	16.7 (n = 21)	81.8 (n = 103)
3. Promote participation of school stakeholders in the district's technology planning process	7.2 (n = 9)	20.6 (n = 26)	72.2 (n = 91)
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	4.8 (n = 6)	13.5 (n = 17)	81.7 (n = 103)
5. Advocate for inclusion of research-based technology practices in the school improvement plan	2.4 (n = 3)	11.9 (n = 15)	85.8 (n = 88)
6. Engage in activities to identify best practices in the use of technology	4.8 (n = 6)	17.5 (n = 22)	77.7 (n = 98)

The next six questions pertained to teachers' perceptions of principal technology as they relate to teaching and learning. Table 4.17 illustrates the results of all teacher responses, and Table 4.18 illustrates the teachers' collapsed responses. As shown in Table 4.16, the majority of teachers believed principals should complete all six learning and teaching activities *significantly/fully*. A great majority of teachers (89.7%) believed principals should *significantly/fully* provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data, with 50% of teachers indicating that principals should do this *fully*. Similarly, 86.5% of teachers believe principals should *significantly/fully* provide or make available assistance to teachers for using student assessment data to modify instruction, with 54.0% of teachers indicating principals should complete this activity *fully*.

The majority of teachers also believed that principals should *significantly/fully* provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns (82.6%) and disseminate data or model best practices in learning and teaching with faculty and staff (79.4%). Additionally, 79.4% of teachers believe principals should *significantly/fully* facilitate or ensure the delivery of professional development on the use of technology to faculty and staff, and 77.8% of teachers believe principals should *significantly/fully* organize or conduct assessment of staff needs related to professional development on the use of technology. When looking at these four questions, more teachers indicated that three of these activities should be completed by principals *significantly*, while more teachers indicated that one these activities should be completed by principals *fully* (model best practices).

In reviewing the collapsed responses to all six questions, no more than 5.6% of teachers felt any of these activities should be completed *not at all/minimally*. Furthermore, 0.0% of teachers expressed that principals should *not at all* participate in

four of the six activities related to learning and teaching, and no more than 5.6% of teachers indicated that any of these activities should be completed *minimally*.

Table 4.17

Teacher Perceptions of Principal's Role in Teaching and Learning (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	0.0 (n = 0)	2.4 (n = 3)	7.9 (n = 10)	39.7 (n = 50)	50.0 (n = 63)
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	0.0 (n = 0)	3.2 (n = 4)	10.3 (n = 13)	32.5 (n = 41)	54.0 (n = 68)
9. Disseminate data or model best practices in learning and teaching with faculty and staff	1.6 (n = 2)	4.0 (n = 5)	15.1 (n = 19	37.3 (n = 47)	42.1 (n = 53)
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	0.8 (n = 1)	4.0 (n = 5)	12.7 (n = 16)	41.3 (n = 52)	41.3 (n = 52)
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	0.0 (n = 0)	5.6 (n = 7)	16.7 (n = 21)	39.7 (n = 50)	38.1 (n = 48)
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	0.0 (n = 0)	3.2 (n = 4)	17.5 (n = 22)	43.7 (n = 55)	35.7 (n = 45)

Table 4.18

Collapsed Teacher Perceptions of Principal's Role in Teaching and Learning (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	2.4 (n = 3)	7.9 (n = 10)	89.7 (n = 113)
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	3.2 (n = 4)	10.3 (n = 13)	86.5 (n = 109)
9. Disseminate data or model best practices in learning and teaching with faculty and staff	5.6 (n = 7)	15.1 (n = 19	79.4 (n = 100)
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	4.8 (n = 6)	12.7 (n = 16)	82.6 (n = 104)
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	5.6 (n = 7)	16.7 (n = 21)	77.8 (n = 98)
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	3.2 (n = 4)	17.5 (n = 22)	79.4 (n = 95)

Table 4.19 shows the teachers' responses to the questions related to their perceptions of principals' productivity and professional practices, and Table 4.20 illustrates the participants' collapsed responses. As shown in Table 4.20, the majority of

teachers agreed that principals should complete all five activities *significantly/fully*. They indicated that principals should *significantly/fully* use technology-based management systems to access student records (92.0%), and 84.2% of teachers believe principals should encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community. Teachers also indicate that principals should *significantly/fully* use technology-based management systems to access staff/faculty personnel records (82.6%), as well as *significantly/fully* use technology to help complete day-to-day tasks (81.7%).

A smaller majority of teachers felt principals should *significantly/fully* participate in professional development activities meant to improve or expand the use of technology (73.8%). A total of 26 teachers (20.6%) felt principals should complete this task *somewhat*, while 5.6% of teachers said principals should complete this activity *not at all/minimally*. Overall, teachers believed that principals should complete all five of these tasks at least *minimally*, with only 3.2% of teachers stating that teachers should *not at all* use technology-based management systems to access staff/faculty personnel records.

Table 4.19

Teacher Perceptions of Principal's Role in Productivity and Professional Practices (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
13. Participate in professional development activities meant to improve or expand the use of technology	0.0 (n = 0)	5.6 (n = 7)	20.6 (n = 26)	27.8 (n = 35)	46.0 (n = 58)
14. Use technology to help complete day-to-day tasks	0.0 (n = 0)	1.6 (n = 2)	16.7 (n = 21)	46.0 (n = 58)	35.7 (n = 45)
15. Use technology-based management systems to access staff/faculty personnel records	3.2 (n = 4)	1.6 (n = 2)	12.7 (n = 16)	51.6 (n = 65)	31.0 (n = 39)
16. Use technology-based management systems to access student records	0.0 (n = 0)	1.6 (n = 2)	6.3 (n = 8)	46.8 (n = 59)	45.2 (n = 57)
17. Encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	0.0 (n = 0)	3.2 (n = 4)	12.7 (n = 16)	42.1 (n = 53)	42.1 (n = 53)

Table 4.20

Collapsed Teacher Perceptions of Principal's Role in Productivity and Professional Practices (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
13. Participate in professional development activities meant to improve or expand the use of technology	5.6 (n = 7)	20.6 (n = 26)	73.8 (n = 93)
14. Use technology to help complete day-to-day tasks	1.6 (n = 2)	16.7 (n = 21)	81.7 (n = 103)
15. Use technology-based management systems to access staff/faculty personnel records	4.8 (n = 6)	12.7 (n = 16)	82.6 (n = 104)
16. Use technology-based management systems to access student records	1.6 (n = 2)	6.3 (n = 8)	92.0 (n = 116)
17. Encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	3.2 (n = 4)	12.7 (n = 16)	84.2 (n = 106)

The next six questions refer to teachers' perceptions of principal support, management, and operations as they relate to technology. Table 4.21 illustrates the teachers' responses, and Table 4.22 illustrated the teachers' responses collapsed. As shown in Table 4.22, the majority of teachers believed that principals should complete all six of these activities *significantly/fully*. Based on the data, 92.0% of teachers believe that principals should *significantly/fully* advocate at the district level for adequate, timely, and high-quality technology support services, with over half of teachers (58.7%) expressing that principals should do this *fully*. Similarly, 89.7% of teachers felt principals should *significantly/fully* ensure that hardware and software replacements/upgrades were incorporated into school technology plans, with 53.2% of teachers indicating that principals should do so *fully*. While 88.9% of teachers expressed that principals should *significantly/fully* investigate how satisfied faculty and staff are with the technology support services provided by the district/school, nearly half (49.2) of teachers also felt that this activity should be done *fully*.

A smaller majority of teachers felt that principals should complete the other three activities *significantly/fully*, and for two of the three activities, more teachers felt that they should be done *significantly*. According to the data, 75.4% of teachers believe principals should *significantly/fully* allocate campus discretionary funds to help meet the needs of the school's technology needs, with 39.7% of teachers stating this should be *significantly*, and 35.7% of teachers stating this should be *fully*. Additionally, 74.6% of teachers believe principals should pursue supplemental funding to help meet the technology needs of the school, while 39.7% of teachers believe this should be done *significantly*, and 34.9% believe this should be done *fully*. 88.1% of teachers believed principals should *significantly/fully* support faculty and staff in connecting to and using district- and building-level technology systems for management and operations, with

42.9% of teachers believing this should be done *significantly*, and 45.2% believing it should be done *fully*. It should also be noted that teachers believe that principals should complete four of the six activities at least *minimally*, having chosen *not at all* for only two tasks (use technology to access staff and student records).

Table 4.21

Teacher Perceptions of the Principal's Role in Support, Management, and Operations (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	0.0 (n = 0)	2.4 (n = 3)	9.5 (n = 12)	42.9 (n = 54)	45.2 (n = 57)
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	1.6 (n = 2)	1.6 (n = 2)	21.4 (n = 27)	39.7 (n = 50)	35.7 (n = 45)
20. Pursue supplemental funding to help meet the technology needs of the school	0.8 (n = 1)	4.0 (n = 5)	20.6 (n = 26)	39.7 (n = 50)	34.9 (n = 44)
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	0.0 (n = 0)	2.4 (n = 3)	7.9 (n = 10)	36.5 (n = 46)	53.2 (n = 67)
22. Advocate at the district level for adequate, timely, and high-quality technology support services	0.0 (n = 0)	0.8 (n = 1)	7.1 (n = 9)	33.3 (n = 42)	58.7 (n = 74)
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	0.0 (n = 0)	1.6 (n = 2)	9.5 (n = 12)	39.7 (n = 50)	49.2 (n = 62)

Table 4.22

Collapsed Teacher Perceptions of the Principal's Role in Support, Management, and Operations (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	2.4 (n = 3)	9.5 (n = 12)	88.1 (n = 111)
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	3.2 (n = 4)	21.4 (n = 27)	75.4 (n = 95)
20. Pursue supplemental funding to help meet the technology needs of the school	4.8 (n = 6)	20.6 (n = 26)	74.6 (n = 94)
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	2.4 (n = 3)	7.9 (n = 10)	89.7 (n = 113)
22. Advocate at the district level for adequate, timely, and high-quality technology support services	0.8 (n = 1)	7.1 (n = 9)	92.0 (n = 116)
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	1.6 (n = 2)	9.5 (n = 12)	88.9 (n = 112)

The remaining five questions focus on the teacher perceptions of principals' activities as they relate to the assessment and evaluation of technology in schools. Table 4.23 demonstrates the teachers' detailed responses to each of the questions, while Table

4.24 demonstrates the collapsed teacher responses. As shown in Table 4.24, the majority of teachers believed that teachers should complete four out of five of these activities *significantly/fully*. A majority of teachers believed that principals should *significantly/fully* evaluate the effectiveness of professional development offerings in schools to meet the needs teachers and their use of technology (82.5%) as well as *significantly/fully* promote or model technology-based systems to collect student assessment data (81.7%). Additionally, 73.9% of teachers felt principals should *significantly/fully* assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrades, and 73.8% of teachers felt principals should *significantly/fully* promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness.

Of all the 28 questions on teacher survey, only one question did not have a large majority of teachers (at least 70%) agree that the activity should be done *significantly/fully*. Only 49.2% of teachers indicated that principals should *significantly/fully* include the effective use of technology as a criterion for assessing the performance of faculty. A total of 44 teachers (34.9%) felt this should be done *somewhat*, while 15.9% of teachers thought this should be done *not at all/minimally*. This sub-set of questions showed the greatest variation in teacher results, with at least one teacher indicating that each of the activities should be done *not at all*, and between 49.2% and 82.5% indicating that the activities should be done *significantly/fully*.

Table 4.23

Teacher Perceptions of the Principal's Role in Assessment and Evaluation (%)

Survey Item	Not at all	Minimally	Somewhat	Significantly	Fully
24. Promote or model technology-based systems to collect student assessment data	0.8 (n = 1)	4.8 (n = 6)	12.7 (n = 16)	46.0 (n = 58)	35.7 (n = 45)
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	0.8 (n = 1)	3.2 (n = 4)	22.2 (n = 28)	42.1 (n = 53)	31.7 (n = 40)
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	0.8 (n = 1)	6.3 (n = 8)	19.0 (n = 24)	43.7 (n = 55)	30.2 (n = 38)
27. Evaluate the effectiveness of professional development offerings in your school to meet the needs of teachers and their use of technology	0.8 (n = 1)	1.6 (n = 2)	15.1 (n = 19)	46.0 (n = 58)	36.5 (n = 46)
28. Include the effective use of technology as a criterion for assessing the performance of faculty	4.8 (n = 6)	11.1 (n = 14)	34.9 (n = 44)	31.7 (n = 40)	17.5 (n = 22)

Table 4.24

Collapsed Teacher Perceptions of the Principal's Role in Assessment and Evaluation (%)

Survey Item	Not at all /Minimally	Somewhat	Significantly /Fully
24. Promote or model technology-based systems to collect student assessment data	5.6 (n = 7)	12.7 (n = 16)	81.7 (n = 103)
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	4.0 (n = 5)	22.2 (n = 28)	73.8 (n = 93)
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	7.1 (n = 9)	19.0 (n = 24)	73.9 (n = 93)
27. Evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology	2.4 (n = 3)	15.1 (n = 19)	82.5 (n = 104)
28. Include the effective use of technology as a criterion for assessing the performance of faculty	15.9 (n = 20)	34.9 (n = 44)	49.2 (n = 62)

Research Question Three

Research question three, What are the similarities and differences between what principals are doing and teachers' perceptions of the principal's role as technology leaders?, was answered using independent t-tests to compare the composite scores for principals and teachers for each of the Principal Technology Leadership Assessment (PTLA) sub-scales. Additionally, descriptive statistics were also used to reveal similarities and differences between principal and teacher responses. Survey responses were analyzed using IBM SPSS, and the findings for the independent t-tests and descriptive statistics are described in detail below.

The mean composite scores for each of the five sub-scales are shown in Table 4.25, and findings from the data correlate with the percentages presented in the other comparison tables throughout this chapter. Principal and teacher responses were most aligned for the productivity and professional practices sub-scale (Principals 20.2, Teachers 20.9), followed by assessment and evaluation (Principals 17.1, Teachers 19.7), and finally, teaching and learning (Principals 21.5, Teachers 25.3). The other two sub-scales revealed notable differences, including support, management, and operations (Principals 19.5, Teachers 25.7) and leadership and vision (Principal 17.3, Teachers 24.6), which indicated the greatest difference between principal and teacher responses.

Table 4.25

Principal and Teacher Sub-Scale Composites

Participant	Leadership & Vision	Teaching & Learning	Productivity and Professional Practices	Support, Management, and Operations	Assessment & Evaluation
Principal	17.3 (SD = 5.75)	21.5 (SD = 4.01)	20.2 (SD = 3.28)	19.5 (SD = 5.02)	17.01 (SD = 3.90)
Teacher	24.6 (SD = 3.84)	25.3 (SD = 3.90)	20.9 (SD = 3.065)	25.7 (SD = 3.43)	19.7 (SD = 3.60)

The composite scores were used to run independent t-tests for each of the PTLA sub-scales. First, an independent t-test was used to compare principal and teacher responses regarding leadership and vision, and the findings are shown in Table 4.26. Results of the independent t-test indicated that there was a statistically significant mean difference between the principal and teacher responses, $t(212.206) = -11.720$, $p < .001$, $d = 1.5$ (large effect size), $r^2 = 0.36$. Teacher responses regarding how often principals should complete leadership and vision activities (M = 24.6) were higher than principals indicated that they were completing them (M = 17.3). These responses suggest that teachers expect principals to complete leadership and vision activities to a much greater extent than principals reported completing them.

Table 4.26

Independent t-test: Principal vs Teacher Responses on Leadership and Vision

Group	N	M	SD	T	df	p-value	d	r^2
Principal	123	17.3	5.75	-11.720	212.206	< .001*	1.5	0.36
Teacher	126	24.6	3.84					

*Statistically significant (p < .05)

An independent t-test was used to compare principal and teacher responses regarding teaching and learning, and the findings are shown in Table 4.27. Results of the independent t-test indicate that there was a statistically significant mean difference between the principal and teacher responses, $t(247) = -7.489$, $p < .001$, $d = 0.96$ (large effect size), $r^2 = 0.43$. Teacher responses regarding how often principals should complete teaching and learning activities (M = 25.3) were higher than principals indicated that they were completing them (M = 21.5). These responses suggest that teachers expect principals to complete teaching and learning activities to a much greater extent than principals reported completing them.

Table 4.27

Independent t-test: Principal vs Teacher Responses on Teaching and Learning

Group	N	M	SD	T	df	p-value	d	r^2
Principal	123	21.5	4.01	-7.489	247	< .001*	0.96	0.43
Teacher	126	25.3	3.9					

*Statistically significant (p < .05)

An independent t-test was conducted to compare principal and teacher responses regarding productivity and professional practices, and the findings are shown in Table 4.28. Results of the independent t-test indicated that there was a statistically significant mean difference between the principal and teacher responses, $t(247) = -71.987$, $p = .048$,

d = 0.26 (medium effect size), r^2 = 0.13. Teacher responses regarding how often principals should complete productivity and professional practice activities (M = 20.94) were higher than principals indicated that they were completing them (M = 20.1). These responses suggest that teachers expect principals to complete productivity and professional practice activities to a greater extent than principals reported completing them.

Table 4.28

Independent t-test: Principal vs Teacher Responses on Productivity and Professional Practices

Group	N	M	SD	T	df	p-value	d	r^2
Principal	123	20.1	3.3	-1.987	247	.048*	0.26	0.13
Teacher	126	20.94	3.06					

*Statistically significant (p < .05)

An independent t-test was conducted to compare principal and teacher responses regarding support, management, and operations, and the findings are shown in Table 4.29. Results of the independent t-test indicated that there was a statistically significant mean difference between the principal and teacher responses, t(215.079) = -11.392, p < .001, d = 1.44 (large effect size), r^2 = 0.58. Teacher responses regarding how often principals should complete support, management, and operation activities (M = 25.68) were higher than principals indicated that they were completing them (M = 19.5). These responses suggest that teachers expect principals to complete support, management, and operations activities to a much greater extent than principals reported completing them.

Table 4.29

Independent t-test: Principal vs Teacher Responses on Support, Management, and Operations

Group	N	M	SD	T	df	p-value	d	r^2
Principal	123	19.5	5.02	-11.392	215.079	.001*	1.44	0.58
Teacher	126	25.68	3.44					

*Statistically significant ($p < .05$)

An independent t-test was conducted to compare principal and teacher responses regarding assessment and evaluations, and the findings are shown in Table 4.30. Results of the independent t-test indicated that there was a statistically significant mean difference between the principal and teacher responses, $t(212.206) = -5.657$, $p < .001$, $d = 0.72$ (medium effect size), $r^2 = 0.34$. Teacher responses regarding how often principals should complete assessment and evaluation activities (M = 19.7) were higher than principals indicated that they were completing them (M = 17.01). These responses suggest that teachers expect principals to complete assessment and evaluation activities to a much greater extent than principals reported completing them.

Table 4.30

Independent t-test: Principal vs Teacher Responses on Assessment and Evaluations

Group	N	M	SD	T	df	p-value	d	r^2
Principal	123	17.01	3.9	-5.657	212.206	< .001*	0.72	0.34
Teacher	126	19.70	3.60					

*Statistically significant ($p < .05$)

Table 4.31 illustrates a comparison of principals' and teachers' responses to the first six questions related to leadership and vision, and Table 4.32 illustrates principals' and teachers' collapsed responses. As shown in Table 4.32, principals' and teachers' responses did not align on any of the questions, as a majority of teachers believed

principals should complete all of the activities *significantly/fully*, while the majority of principals did not indicate they completed any of these activities *significantly/fully*. These distinctions were most apparent when reviewing the collapsed results, with the greatest difference shown in question one. While only 21.9% of principals indicated that they participate in their district or school's technology planning sessions *significantly/fully*, 81.0% of teachers believe that principals should do this to the same extent.

While there are few similarities between the principal and teacher responses within leadership and vision, some can be noted. According to the data, 25.2% of principals *somewhat* promote participation of school stakeholders in the district's technology planning process, and 20.6% of teachers believe principals should complete this activity *somewhat*. While 4.0% of teachers believe that principals should *minimally* compare and align district or school technology plans with other plans, 13.8% of principals indicate that they complete this task *minimally*. Regarding the extent principals advocate for inclusion of research-based technology practices in school improvement plans, 8.9% of principals claim they do this *not at all*, and teachers believed that principals should do this activity at least *minimally* (0.0% of teachers chose *not at all*). Furthermore, 39.0% of principals do this activity *significantly*, and 43.7% of teachers feel they should do this to the same extent.

Table 4.31

Principal and Teacher Responses on Leadership and Vision (%)

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
1. Participate in district or school's technology planning session	Principal	26.8	19.5	31.7	13.8	8.1
	Teacher	0.8	3.2	15.1	53.2	27.8
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	Principal	16.3	21.1	29.3	24.4	8.9
	Teacher	0.0	1.6	16.7	38.9	42.9
3. Promote participation of school stakeholders in the district's technology planning process	Principal	22.8	26.0	25.2	21.1	4.9
	Teacher	1.6	5.6	20.6	40.5	31.7
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	Principal	16.3	13.8	29.3	31.7	8.9
	Teacher	0.8	4.0	13.5	50.0	31.7

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
5. Advocate for inclusion of research-based technology practices in the school improvement plan	Principal	8.9	15.4	26.0	39.0	10.6
	Teacher	0.0	2.4	11.9	43.7	42.1
6. Engage in activities to identify best practices in the use of technology	Principal	13.0	20.3	30.1	28.5	8.1
	Teacher	0.8	4.0	17.5	44.4	33.3

Table 4.32

Collapsed Principal and Teacher Responses on Leadership and Vision (%)

Survey Item	Participant	Not at all/ Minimally	Somewhat	Significantly/ Fully
1. Participate in district or school's technology planning session	Principal	46.3	31.7	21.9
	Teacher	4.0	15.1	81.0
2. Communicate information about district or school's technology planning and implementation efforts to school stakeholders	Principal	37.4	29.3	33.3
	Teacher	1.6	16.7	81.8
3. Promote participation of school stakeholders in the district's technology planning process	Principal	48.8	25.2	26.0
	Teacher	7.2	20.6	72.2
4. Compare and align district or school technology plans with other plans, including district strategic plans, school improvement plans, or other instructional plans	Principal	30.1	29.3	40.6
	Teacher	4.8	13.5	81.7
5. Advocate for inclusion of research-based technology practices in the school improvement plan	Principal	24.3	26.0	49.6
	Teacher	2.4	11.9	85.8
6. Engage in activities to identify best practices in the use of technology	Principal	33.3	30.1	36.6
	Teacher	4.8	17.5	77.7

The next six questions pertain to principals' participation in activities as they relate to teaching and learning. Table 4.33 illustrates the results of all teacher and principal responses, and Table 4.34 illustrates the principals' and teachers' collapsed responses. As shown in Table 4.34, principals complete four of the six activities to the same extent that teachers believe they should. The majority of principals (65.9%) *significantly/Fully* provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data, and the majority of teachers (98.7%) believe they should be completing this task *significantly/fully*. According to the data, 72.3% of principals *significantly/fully* provide or make available assistance to teachers for using student assessment data to modify instruction, and 86.5% of teachers agree that principals should do this to the same extent. Finally, the majority of principals (60.9%) *significantly/fully* disseminate data or model best practices in learning and teaching with faculty and staff, which aligns with the extent that teachers believe this should be done by principals (79.4%). Principals and teachers also agreed on the amount that principals *not at all/minimally* completed three of these four tasks (5.6% or less).

Teachers did not agree with the extent that principals were *significantly/fully* completing two of the learning and teaching tasks. While 82.6% of teachers felt that principals should *significantly/fully* provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns, only 42.3% of principals stated they did this *significantly/fully*. Additionally, only 39.0% of principals indicated that they *significantly/fully* organize or conduct assessments of staff needs related to professional development on the use of technology, while 77.8% of teachers felt that teachers should do this to the same extent. In all other areas (*somewhat* and *not at all/minimally*), there were significant differences between what principals do as in contrast to what teachers believe they should be doing.

Table 4.33

Principal and Teacher Responses on Teaching and Learning (%)

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	Principal	1.6	3.3	29.3	43.9	22.0
	Teacher	0.0	2.4	7.9	39.7	50.0
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	Principal	0.0	2.4	25.2	45.5	26.8
	Teacher	0.0	3.2	10.3	32.5	54.0
9. Disseminate data or model best practices in learning and teaching with faculty and staff	Principal	1.6	3.3	34.1	39.8	21.1
	Teacher	1.6	4.0	15.1	37.3	42.1
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	Principal	3.3	13.8	40.7	32.5	9.8
	Teacher	0.8	4.0	12.7	41.3	41.3

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	Principal	3.3	19.5	38.2	30.9	8.1
	Teacher	0.0	5.6	16.7	39.7	38.1
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Principal	3.3	12.2	28.5	46.3	9.8
	Teacher	0.0	3.2	17.5	43.7	35.7

Table 4.34

Collapsed Principal and Teacher Responses on Teaching and Learning (%)

Survey Item	Participant	Not at all/ Minimally	Somewhat	Significantly/ Fully
7. Provide or make available assistance to teachers to use technology for interpreting and analyzing data	Principal	4.9	29.3	65.9
	Teacher	2.4	7.9	89.7
8. Provide or make available assistance to teachers for using student assessment data to modify instruction	Principal	2.4	25.2	72.3
	Teacher	3.2	10.3	86.5
9. Disseminate data or model best practices in learning and teaching with faculty and staff	Principal	4.9	34.1	60.9
	Teacher	5.6	15.1	79.4
10. Provide support to teachers or staff when attempting to share information about technology practices, issues, and concerns	Principal	17.1	40.7	42.3
	Teacher	4.8	12.7	82.6
11. Organize or conduct assessment of staff needs related to professional development on the use of technology	Principal	22.8	38.2	39.0
	Teacher	5.6	16.7	77.8
12. Facilitate or ensure the delivery of professional development on the use of technology to faculty and staff	Principal	15.5	28.5	56.1
	Teacher	3.2	7.5	79.4

Table 4.35 shows the principals' and teachers' responses to the questions related to productivity and professional practices of principals, and table 4.36 illustrates the

participants' collapsed responses. As shown in Table 4.36, teachers tend to agree with the extent that principals complete four out of the five tasks described. Based on the data, 86.2% of principals *significantly/fully* use technology to help complete day-to-day tasks, and 81.7% of teachers agree that principals should use technology to the same extent. A majority of principals (81.3%) *significantly/fully* use technology-based management systems to access staff/faculty personnel records, while 82.6% of teachers believe they should do Significantly/Fully. Principals indicated that they *significantly/fully* use technology-based management systems to access student records, while the majority of teachers (92.0%) believed they should use technology to the same extent. Finally, 86.2% of principals stated that they *significantly/fully* encourage and use technology as a means of communicating with education stakeholders, while 84.2% of teachers they should complete this activity *significantly/fully*. Furthermore, principal and teacher responses for all four of these questions are similar for *Somewhat* and *not at all/minimally*.

Only one of the questions indicates striking differences between principal and teacher responses. While 43.9% of principals indicated that they *significantly/fully* participate in professional development activities meant to improve or expand the use of technology, 73.8% of teachers felt they should do this to the same extent. More principals indicated that they complete this task *somewhat* (41.5%), while only 20.6% of teachers felt they should do this task *somewhat*. Fewer teachers (5.6%) felt that principals should participate in technology professional development *not at all/minimally* when compared to how many principals said they participated *not at all/minimally* (14.6%).

Table 4.35

Principal and Teacher Responses on Productivity and Professional Practices (%)

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
13. Participate in professional development activities meant to improve or expand the use of technology	Principal	2.4	12.2	41.5	35.0	8.9
	Teacher	0.0	5.6	20.6	27.8	46.0
14. Use technology to help complete day-to-day tasks	Principal	0.8	1.6	11.4	48.0	33.3
	Teacher	0.0	1.6	16.7	46.0	35.7
15. Use technology-based management systems to access staff/faculty personnel records	Principal	4.9	2.4	11.4	48.0	33.3
	Teacher	3.2	1.6	12.7	51.6	31.0
16. Use technology-based management systems to access student records	Principal	2.4	2.4	8.9	35.8	50.4
	Teacher	0.0	1.6	6.3	46.8	45.2
17. Encourage and use technology as a means of communicating with education stakeholders, and the community	Principal	0.8	0.8	12.2	44.7	41.5
	Teacher	0.0	3.2	12.7	42.1	42.1

Table 4.36

Collapsed Principal and Teacher Responses on Productivity and Professional Practices (%)

Survey Item	Participant	Not at all/ Minimally	Somewhat	Significantly/ Fully
13. Participate in professional development activities meant to improve or expand the use of technology	Principal	14.6	41.5	43.9
	Teacher	5.6	20.6	73.8
14. Use technology to help complete day-to-day tasks	Principal	2.4	11.4	86.2
	Teacher	1.6	16.7	81.7
15. Use technology-based management systems to access staff/faculty personnel records	Principal	7.3	11.4	81.3
	Teacher	4.8	12.7	82.6
16. Use technology-based management systems to access student records	Principal	4.8	8.9	86.2
	Teacher	1.6	6.3	92.0
17. Encourage and use technology as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community	Principal	1.6	12.2	86.2
	Teacher	3.2	12.7	84.2

The next six questions refer to support, management, and operations as they relate to technology. Table 4.37 illustrates a comparison of principal and teacher responses, and Table 4.38 illustrated the principals' and teachers' responses collapsed. As shown in Table 4.38, principals and teachers only showed similar responses on one of the six questions related to this sub-scale. The majority of principals (75.6%) *significantly/fully* support faculty and staff in connecting to and using district- and building- level technology systems for management and operations to a similar extent expected from teachers (88.1%). Additionally, 19.5% of principals complete this task *somewhat*, while 9.5% of teachers believe they should do so *somewhat*. Furthermore, 4.9% of principals indicated that they complete this activity *not at all/minimally*, which is similar to the extent teachers responded to this question (2.4%).

When looking at the other five activities related to support, management, and operations, there were significant differences between principal and teacher responses. While the majority of teachers (75.4%) indicated that principals should *significantly/fully* allocate campus discretionary funds to help meet the needs of the school's technology needs, only 45.5% of principals indicated that they did this task to the same extent. The majority of teachers (74.6%) also believed principals should *significantly/fully* pursue supplemental funding to help meet the technology needs of the schools, while 30.9% of principals completed this task *significantly/fully*. Only 33.3% of principals *significantly/fully* ensure that hardware and software replacements/upgrades were incorporated into school technology plans, while 89.7% of teacher believe they should do this to the same extent. Furthermore, 42.3% of principals *significantly/fully* advocate at the district level for adequate, timely, and high-quality technology support services, while the majority of teachers (92.0%) believe principals should complete this activity *significantly/fully*. Finally, only 31.7% of principals *significantly/fully* investigate how

satisfied faculty and staff are with the technology support services provided by the district/school, while 88.9% teachers felt that principals should do this activity to the same extent.

Table 4.37

Principal and Teacher Responses on Support, Management, and Operations (%)

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	Principal	0.8	4.1	19.5	39.8	35.8
	Teacher	0.0	2.4	9.5	42.9	45.2
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	Principal	9.8	15.4	29.3	33.3	12.2
	Teacher	1.6	1.6	21.4	39.7	35.7
20. Pursue supplemental funding to help meet the technology needs of the school	Principal	14.6	21.1	33.3	21.1	9.8
	Teacher	0.8	4.0	20.6	39.7	34.9
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	Principal	9.8	27.6	29.3	20.3	13.0
	Teacher	0.0	2.4	7.9	36.5	53.2

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
22. Advocate at the district level for adequate, timely, and high-quality technology support services	Principal	8.1	16.3	33.3	30.9	11.4
	Teacher	0.0	0.8	7.1	33.3	58.7
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	Principal	7.3	17.1	43.9	25.2	6.5
	Teacher	0.0	1.6	9.5	39.7	49.2

Table 4.38

Collapsed Principal and Teacher Responses on Support, Management, and Operations (%)

Survey Item	Participant	Not at all/ Minimally	Somewhat	Significantly/ Fully
18. Support faculty and staff in connecting to and using district- and building-level technology systems for management and operations	Principal	4.9	19.5	75.6
	Teacher	2.4	9.5	88.1
19. Allocate campus discretionary funds to help meet the needs of the school's technology needs	Principal	25.2	29.3	45.5
	Teacher	3.2	21.4	75.4
20. Pursue supplemental funding to help meet the technology needs of the school	Principal	35.7	33.3	30.9
	Teacher	4.8	20.6	74.6
21. Ensure that hardware and software replacements/upgrades were incorporated into school technology plans	Principal	37.4	29.3	33.3
	Teacher	2.4	7.9	89.7
22. Advocate at the district level for adequate, timely, and high-quality technology support services	Principal	24.4	33.3	42.3
	Teacher	0.8	7.1	92.0
23. Investigate how satisfied faculty and staff are with the technology support services provided by the district/school	Principal	24.4	43.9	31.7
	Teacher	1.6	9.5	88.9

The remaining five questions focus on the assessment and evaluation of technology in schools. Table 4.39 demonstrates the principals' and teachers' detailed responses to each of the questions, while Table 4.40 demonstrates the collapsed principal and teacher responses. As shown in Table 4.40, there are noticeable similarities and differences between the principal and teacher responses. Principals completed three of the five tasks to the same extent that teachers believed they should. The majority of principals (61.0%) *significantly/fully* promote or model technology-based systems to collect student assessment data to same extent as expected by teachers (81.7%), and the majority of principals *significantly/fully* promote the evaluation of instructional practices to assess their effectiveness in the same way that the majority of teachers believe they should do so (73.8%). Finally, the extent to which principals include the effective use of technology as criterion for assessing the performance of faculty is similar in all three collapsed categories for principals and teachers.

Two of the activities show significant differences between what principals are doing and what teachers believe they should be doing. While only 33.3% of principals *significantly/fully* assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade, 73.9% of teachers believe principals should do this to the extent. Furthermore, only 38.5% of principals admit that they *significantly/fully* evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology, while 82.5% of teachers expect principals to do this *significantly/fully*.

Table 4.39

Principal and Teacher Responses on Assessment and Evaluation (%)

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
24. Promote or model technology-based systems to collect student assessment data	Principal	3.3	4.1	31.7	38.2	22.8
	Teacher	0.8	4.8	12.7	46.0	35.7
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Principal	1.6	4.9	37.4	39.8	16.3
	Teacher	0.8	3.2	22.2	42.1	31.7
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	Principal	8.1	21.1	37.4	26.8	6.5
	Teacher	0.8	6.3	19.0	43.7	30.2
27. Evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology	Principal	4.1	15.6	41.8	29.5	9.0
	Teacher	0.8	1.6	15.1	46.0	36.5

Survey Item	Participant	Not at all	Minimally	Somewhat	Significantly	Fully
28. Include the effective use of technology as a criterion for assessing the performance of faculty	Principal	4.1	13.0	35.8	33.3	13.8
	Teacher	4.8	11.1	34.9	31.7	17.5

Table 4.40

Collapsed Principal and Teacher Responses on Assessment and Evaluation (%)

Survey Item	Participant	Not at all/ Minimally	Somewhat	Significantly/ Fully
24. Promote or model technology-based systems to collect student assessment data	Principal	7.4	31.7	61.0
	Teacher	5.6	12.7	81.7
25. Promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness	Principal	6.5	37.4	56.1
	Teacher	4.0	22.2	73.8
26. Assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade	Principal	29.2	37.4	33.3
	Teacher	7.1	19.0	73.9
27. Evaluate the effectiveness of professional development offerings in schools to meet the needs of teachers and their use of technology	Principal	19.7	41.8	38.5
	Teacher	2.4	15.1	82.5
28. Include the effective use of technology as a criterion for assessing the performance of faculty	Principal	17.1	35.8	47.1
	Teacher	15.9	34.9	49.2

Research Question 4

Research question four, *What are the perceptions of principals and teachers concerning the principal's role of technology leader?*, was answered using constant comparison coding of ten semi-structured interviews of principals and teachers within region IV of southeast Texas. A summary of the participants' descriptive factors, including gender, ethnicity, years of experience, their school levels, and the district size are included in Tables 4.35 and 4.36. From the interviews, responses were assigned to four common themes: (a) resources, (b) support, (c) technology self-efficacy, and (d) challenges. These themes are described in detail in following sections of this paper.

Resources

When the participating principals and teacher were asked about principals' primary roles as technology leaders, all participants felt that providing resources was an important part of their job. They each discussed technology resources they are currently using at their campus and how they are being utilized to support student learning, communication, and safety. Most of the participants interviewed also mentioned that it was important that resources are updated regularly and maintained in order to utilize technology effectively within the school. In addition, both principals and teachers felt that providing personnel to assist teachers with technology was an important part of implementing technology effectively on a campus.

Principals. All five of the participating principals felt that providing resources was a key part of their role as technology leaders on campus. As Ms. Johnson put it, "It is important to be aware of new technologies that are available and to challenge teachers to use that new technology as a supplemental tool in the classroom." Each principal stated that every student and teacher at their campus has access to their own devices, a variety of learning management systems, and an abundance of online programs to support

instruction. Four of the five principals acknowledged that this host of technology resources resulted from the need to move to remote learning due to the COVID-19 pandemic.

Some of the additional technology resources that the principals have on their campuses vary depending on the needs of the students, district support, and funding. Ms. Smith stated, “Some of the more advanced students need different tools, like the Chromebook is not enough, and so they need different specialized computers because they are doing a drafting class, so the district supports us with those resources.” Funding was also a factor in regard to what various campus leaders had on their campuses, as four of the five principals mentioned that they utilize their own school funds to purchase additional technology devices and programs. Ms. Ramirez shared that she had invested campus funds in a reading program that the teachers felt was an effective tool in their classrooms, while Ms. Johnson stated that funds are currently being put aside to purchase a sound system and marquee for her school.

Furthermore, principals discussed the importance of evaluating technology resources regularly to determine if and when maintenance or updates are necessary. Ms. Smith mentioned the need to get feedback from the staff and students often to determine the technology needs of the campus and if money should continue to be invested in specific products. She said, “I rely on my student advisory committee sometimes to bring up technology needs for the campus. They are smarter and more developed in those areas.” Ms. Ramirez said, “I need to be aware when things need to be updated,” and she works with her technology technician on campus to ensure that updates take place on devices in order for programs to be used effectively in the classroom.

Teachers. Much like the principals, teachers felt that it was important that principals provide technology resources that would help support them in the classroom.

Ms. Perez stated, “They need to show us what kind of programs are available to us that are going to help us with our students.” Four of the five teachers work at one-to-one campuses in which every student has access to their own personal device, and all five of the teachers were able to share in much greater detail than the principals the technology programs they currently have at their campuses for each of the content areas. Like the majority of the principals, three of the five teachers interviewed also credited the COVID-19 pandemic for the recent surge in technology resources.

Some of the more prominent programs that were mentioned included various learning management systems that the teachers are using in their classroom which include Schoology and Google Classroom. Summit Learning was also a program that was discussed by the intermediate and high school teachers interviewed which allows students to participate in a personalized learning program. Other instructional programs that were mentioned by the teachers included iReady, Reading A to Z, iEXCEL, and EduSmart, just to name a few. Aside from instructional resources, three teachers mentioned technology that they use to communicate with parents (such as Class Dojo and School Status, as well as with other staff members (such as Microsoft Teams and Remind). Ms. Perez also talked about the use of technology programs such as Skyward to input grades and Frontline to track student accommodations for Emergent Bilingual students. She stated, “There’s a lot of different programs that we use besides just the educational ones for kids. There are also the programs that we need as educators to be able to help us document and communicate.”

With so many resources available to teachers, four of the five teachers stated that the effectiveness of the programs was based on what teachers felt comfortable using and what they felt their students enjoyed using in the classroom. Ms. West said, “When teachers pick the apps that they want to use, it does become effective.” Two of the

teachers interviewed also stated that it's important that principals are aware of how teachers and students feel about the effectiveness of programs based on their personal input. Ms. Gibson provided an example of a program change that was made last school year and how this affected the campus culture. "The kids hated it. The teachers hated it, but it was supposed to be better." In this case, the concern was eventually brought to the attention of the principal, and the teachers were allowed to use the program that they felt was more effective for them and their students.

In conclusion, the data suggests that principals and teachers agree that a primary role for principals as technology leaders is ensuring that teachers have the necessary resources to implement technology on their campuses. While all of the principals and teachers could list many of the technology resources and programs at their schools the teachers were able to speak about them in much greater detail, suggesting that they are more familiar with the programs and how they are used. Furthermore, the majority of principals felt that effectiveness of technology resources relies on regular maintenance and updates, while the majority of teachers felt that the effectiveness of technology programs is based on how comfortable teachers are with using them and how they engage their students. These finding support the need for principals to know which technology resources need to be maintained based on which ones teachers and student feel are most effective.

Support

During my interviews, each of the principals and teachers mentioned support as an important part of implementing technology on a campus. All of the participants recognize that providing support is an important role of technology leaders, and this means providing professional development to both teachers and principals on how to integrate technology into classroom instruction. Furthermore, both principals and

teachers provided input on how they feel they can be better supported at both the campus and district level so that they can continue to grow as technology teachers and leaders.

Principals. All of the principals interviewed discussed the importance of supporting their staff by modeling the expectations for how technology should be utilized in the classroom. Mr. Gallardo stated, “What I find to be most critical as a technology leader is modeling for my teachers how to learn about technology.” Ms. Ramirez also said, “I think we need to practice what we preach, and we need to use the technology if we are able to.” Ms. Lopez felt that modeling gave leaders opportunities to set clear expectations for how teachers should use technology in their classrooms while becoming more familiar with the programs themselves.

Four of the five principals admitted that they rely heavily on other instructional and technical leaders on their campus with supporting the implementation of technology at their schools. As Ms. Ramirez put it, “I count on the team to help because as a leader I can’t do it all, so you have a support team where they’re knowledgeable and can share.” All five principals stated that they have designated coaches or personnel on their campus who they utilize to support teachers with professional development. Ms. Johnson mentioned that her digital learning and assessment specialist provides several trainings to her teachers, and she coaches them as needed on the various resources that have been made available to them. “She supports the technology implementation, resources, and she is the go-to person if I have questions.” Ms. Lopez also stated that her technology specialist provides a newsletter each month to share tips and upcoming trainings that teachers can attend if they want to receive additional support. In addition, four of the five principals mentioned that the district provides teachers with training as needed, primarily to support the rollout of new programs, and these usually take place at the beginning of the school year.

Two of the secondary principals talked at length about the use of communal learning on their campuses. Ms. Smith admitted that often times, the district programs or trainings are not effective, so she will send teachers to trainings, and they will come back and train others. “If they find something really great, they will present to each other and really steal and use ideas from each other.” Mr. Gallardo also talked about the importance of providing time for teachers to collaborate and share ideas amongst each other to improve the use of instructional technology. “We allow teams time during the week to get together and basically teach each other about new stuff so that we are all growing as a community.”

When the principals were asked how the district could support them in becoming better technology leaders, three of the five principals felt they needed more targeted training, while the other two principals wanted better funding. Ms. Lopez stated that as a new principal, she feels that the district really needed to spend time defining what is expected of her and other principals in her district as technology leaders on a campus. Ms. Ramirez stated that they receive limited trainings, and because they don’t use what they learn right away, it is ineffective. “I need them to reteach or review it again, because they just tell us about it.” She suggested that technology updates be included in her weekly principals’ meetings so that she can become more well-versed as a technology leader. Mr. Gallardo suggested a more communal approach to principal technology trainings that would allow principals to lead in training other principals on programs they use so that they can support one another with implementation. The two principals who requested district support in the form of additional funding felt that this would provide them with the flexibility to purchase additional resources that would support the specific needs of their students and staff.

Teachers. As with the principals, the majority of the teachers (four out of the five teachers interviewed) mentioned the importance of technology leaders modeling the use of technology in order to support teachers on campus; however, only one teacher, Ms. Garcia, mentioned that her principal has done this on her campus.

> I remember in the professional development meetings at the beginning of the year, our principal was actually using the technology that they were encouraging us to use, and I thought that was good because he's demonstrating that he knows how to use it himself.

Ms. West also stated that principals should incorporate technology in a way that aligns with what they expect to see in the classroom. "If you want us to have engaging lessons, then your presentation should be engaging also."

While all five teachers stated that principals should be aware of the tools and programs that teachers are using, they do not expect them to know everything, and they understand the need to delegate the task of supporting instructional technology. As Mr. Wilson put it:

> The best thing you can do is to realize that you don't know everything. Surround yourself with people that know quite a bit about technology integration, and ask them what you can do as the principal to help facilitate that.

Four out of the five teachers mentioned that there are designated instructional technology staff on their campuses who provide trainings as needed on new resources or instructional technology. Ms. Perez talked about a training that is being provided by a campus technology specialist to help prepare students for the new online state assessments. "Today, we had a training on how to make tests online. Some people attended, some people didn't. The ones who needed a refresher were able to get the support they needed so that was nice." Three of the teachers also talked about district trainings that are

offered, primarily at the beginning of the year, on how to use technology. While two of the teachers felt that they were helpful, one of elementary teachers, Ms. West, did not. She felt the training was tailored to secondary students and it was not meant to meet her specific classroom needs. Furthermore, since the training was online, it did not allow for teachers to practice implementation. Ms. West stated, "Okay, I get this is a training that we have to attend, but I'm not really going to use it."

In addition to the training that is provided by administration, three of the teachers also talked about how they are able to work together to support their continued learning with new technology resources. Ms. Garcia stated that most of the time, they are able to learn most effectively from each other as classroom teachers. Ms. Perez mentioned that she is a panel expert at her campus, and after receiving training from the district, she has been able to come back to the campus and support others with using their panels if they need it. "I'm always telling people, if you need more lessons or need to look at differentiation, come and talk to me. I have all kinds of programs I use on there." Ms. West stated that she had just been asked by her principal to help with training teachers on a new curriculum that has embedded technology integration into the lesson plans. She mentioned that this style of training often happens on her campus when new programs are implemented. After the person provides the training, she states, "that person is kind of like a spokesperson, and if anybody has any questions, they can go and ask that person."

When asked how principals could best support teachers with integrating technology in the classroom, three of the teachers mentioned the need for additional or updated resources, and the other two discussed providing teachers with more opportunities to collaborate. Ms. Garcia, who was not working at a one-to-one campus, stated that the lack of devices made it difficult to expect technology programs to be used across the board and with fidelity. Ms. West mentioned that updated devices would allow

teachers to use more of the modern programs that are being offered today. And while Ms. Gibson felt more resources would be great, she cautioned that they should be based on what teachers want, and support should be provided to teachers for implementation. Additionally, Ms. Perez, who requested support in the form of opportunities to collaborate, mentioned the idea of allowing teachers to visit other teachers' classrooms. She felt that they would teachers to learn from each other how best to use technology effectively at their campus.

In conclusion, both principals and teachers agree that a primary role of technology leaders is to support teachers on their campuses. While nearly all of the principals and teachers stated that it is important for principals to model the use of technology, only one of the teachers mentioned that her principal had modeled technology during professional development. This data suggests that perhaps principals are not familiar enough with the resources to use them themselves. This idea is further supported by the fact that principals rely heavily on their instructional leadership team members to provide technology professional development and assist teachers as needed with technology. Teachers appear to understand that principals cannot know how to do it all, but their insight suggests that principals should seek out teacher input and provide ample opportunities for teachers to continue learning about technology.

Technology Self-Efficacy.

Technology self-efficacy is based on how confident principals perceive themselves to be as technology leaders and how confident teachers perceive themselves to be with implementing technology in their classrooms. Overall, the majority of principals do not feel as confident with technology as teachers, and principals admit this is because they do not use it as much as the teachers and students do in the classroom. Some of the participants state that while they may not know everything about technology,

they are confident that they can learn about it, since technology continues to evolve at rapid pace.

Principals. When asked how confident the participants feel as technology leaders on a scale of one to 10 (with 10 being extremely confident), they all gave different answers that ranged from six to nine, and they had various explanations for why they scored themselves that way. Ms. Ramirez said she was an eight, and she says she's grown a lot as a technology leader since COIVD-19 made it necessary for instruction to move online. She also mentioned that she is comfortable with the programs she uses often, and she feels comfortable asking for help, but that she still is not confident enough with several of the resources that are available at her campus. Ms. Lopez stated that she is a seven, and she says her lack of confidence comes from her being out of the classroom for over a decade now.

> I hear about technology programs, and I can tell you about it, but I don't have a connection with it because I didn't use it myself personally. So I would say that really hits my confidence because I feel teachers may know more than me.

Ms. Johnson scored herself a nine, because while she is extremely confident in her abilities, she knows there's always room to grow. She states, "I have an engineering degree, so technology doesn't scare me." Mr. Gallardo scored himself a 7.5 because he is confident in the programs he uses currently and his ability to learn about new technology. "There are a lot of programs out there that I know nothing about, but I feel like I can learn it, and in that sense, I'm confident." The last principal, Ms. Smith, actually gave herself two scores. She said she scores herself a nine with the teachers and a six with the students. While she feels pretty confident in her ability as a technology leader, she recognizes that the students often times know a lot more about technology than her.

Teachers. When asked how confident the participants were with utilizing technology in their classrooms on a scale of one to 10 (with 10 being extremely confident), one of the teachers scored herself an eight, and the other four teachers scored themselves a ten. The teacher who scored herself an eight, Ms. West, stated that while she did not feel confident with all the various technology resources, she does feel confident in her ability to use others. She states:

> During COVID, I feel like we had to know how to use technology pretty quickly. And if you didn't, you were like, Okay, during this break, I'm going to figure out how to use this. I feel like the confidence I have really came from being forced to use technology.

Ms. Garcia gave herself a 10, and she credits her district for the training they provided her. "Looking back at my professional development, I am impressed with how well they trained me and all of the technology that has been provided to us. It has made an impact." She also states that while she may not be an expert at everything, she's not afraid to ask questions or make mistakes when it comes to using technology. The other three teachers who scored themselves a 10 consider themselves campus leaders, and they are often asked to help others with technology at their schools. Ms. Perez said her ability to use technology in the classroom increased following the COVID pandemic. Since then, her confidence has grown from a six to 10 because she sought professional development and she was given opportunities by her administrator to serve as a technology leader with interactive panels. Similarly, another Mr. Wilson stated that he felt he was a 10 because he wanted to learn about technology once his campus was forced to move online, and he went back to school to get his masters in instructional technology in an effort to learn about this new way of teaching students. Ms. Gibson stated that she rates herself a 10

because she is often asked by both campus and district administrators to help with trainings that are offered, and she support teachers who need help regularly.

In conclusion, the data suggests that teachers feel more confident with implementing technology than principals do as technology leaders. According to the principals, they are familiar with the resources, and they are confident they can learn about technology; however, they admit that they are not as well-versed with the technology as teachers because they do not use it all the time. Teachers tend to feel more confident because they have been given opportunities to lead and support others. These finding support the idea that principals must spend more time learning about the resources themselves if they want to become more competent as technology leaders.

Challenges.

Challenges is based on the reflections of both principals and teachers in regards to barriers their campus may face with utilizing technology effectively. Principals state that teacher buy-in, the range of technology proficiencies among teachers, funding, and an overabundance of resources are just some of the challenges they've encountered as technology leaders. Teachers noted some of the same issues, as well as a disconnect and/or lack of communication between principals and teachers. This section will discuss these insights in greater detail.

Principals. Two of the principals noted that challenges could often be attributed to teacher buy-in as well as their range in abilities to utilize technology that they are provided. Ultimately, principals can only do so much in terms of providing resources and training. Teachers must be willing and able to put these resources and programs in place with their students. Ms. Ramirez stated that teacher buy-in may be attributed to fear. She says, "Maybe there is a fear of not feeling as strong in technology or breaking it." She felt that she as a campus principal needed to do a better job of communicating the benefits of

technology programs to help teachers understand why they should be using them. Mr. Gallardo also noted that the range in technology proficiencies made it difficult to ensure that everyone was on the same page with technology initiatives that were being implemented at his campus. He said, "We have to move everyone along at a different pace or at a much more basic level." To make his point, he talked about how his campus had initiated a change so that all teachers would be using one common online platform. "Some people were very comfortable with it, and others were just very new to it. So it was like moving a mountain. I had to meet people at both ends."

Two of the principals talked about the need for reliable Wi Fi. Ms. Smith stated that while she awaits the opening of her new campus next school year, the building they are currently in is almost 100 years old, and it is not built to support a technology rich environment. She said:

> There's probably one plug in every room which doesn't sound like a thing, but it's a thing. It's a huge problem. Even the new wing which has sufficient electrical outlets is a cinderblock building, so the Wi Fi often drops.

Ms. Lopez also stated that the internet connection at her school often goes out, and this disrupts students' learning. "If the teacher had a plan in place or an assignment that needed to be submitted but there's no Wi Fi, it really does disrupt the learning plan that was set for the day."

Time was an issue noted by four principals, and it correlates with the overabundance of devices and tools that campuses currently have available to them. Ms. Johnson stated:

> I would offer time for implementation is always a struggle. I think teachers will have a plan in place, and then some great new technology comes out and you just don't have time to really be able to explore it.

Ms. Ramirez shared an example of a new program that is supposed to be very effective for Emergent Bilinguals, but teachers lack the time they need to use it with fidelity in the classrooms. “It’s hard for our teachers to incorporate that into their class when they have so many other things they’re required to teach.” Ms. Lopez went on to note that the amount of screen time versus direct instruction was still not clear to her as a new principal, and she struggles with determining how much time teachers should allot to students working independently on their devices. Ms. Smith noted that she felt that many of the programs that her district currently has do the same thing, so the fact that there are so many for teachers to learn about is overwhelming. She has a son who is a teacher within her district, so shared this insight based on conversations she has had with him. “Choice is good, but a lot of it does the same thing. So I would love to see program alignment that really focused on doing one, two, or five things exceptionally well before adding a new program.”

When asked how principals determine how effective technology resources are on their campus, three of the principals stated that they do not have a clear measure, and this was an area that they needed to grow in. Ms. Ramirez stated, “Well that depends on how you define effective.” She went on to say that while some programs are used often, students may still fail the quizzes that are embedded to check for understanding. Other programs are being used by teachers, but she says she has not determined how to measure if they are in fact improving student learning. Mr. Gallardo also said he didn’t have a way to evaluate effectiveness, and in reflection, he feels that he hasn’t wanted to overwhelm teachers who already feel immense pressure to use them. Even so, he states, “I think in this post-pandemic educational environment, it is even more critical to be able to determine how effective we are at using technology in an instructional and academic context.”

Another challenge that was uncovered in the interviews was a lack of professional development provided to the principals on the instructional technology devices and programs they are using on their campuses. None of the five principals had received any training this school year to help them develop as technology leaders. Mr. Gallardo mentioned that following the pandemic, there were many virtual trainings that were provided to both principals and teachers for the initial rollout of the virtual learning; however, that has tapered off over the past two years. That said, several of the principals commented that they take the initiative to learn about devices and program themselves in an effort to support their teachers. Ms. Johnson stated, "I kind of go see for myself and want to figure it out. It's kind of just my belief that I should know how something works before I pitch it to my teachers."

Teachers. Teacher interviews uncovered a variety of challenges including a lack of teacher confidence and proficiency with utilizing technology in their classrooms. Ms. Perez stated that she believes teachers may have questions, but they are nervous or maybe too embarrassed to ask. She suggested that campuses have a more inviting, non-judgmental environment that allows teachers to feel comfortable asking questions about technology. Mr. Wilson talked about the fact that some of the teachers may be resistant to change because they have not had to use instructional technology in a professional manner before. He talks about the Career and Technical Education (CTE) teachers and how they have had to learn to use technology in their classrooms, especially post-pandemic. He states, "They come to us from industry, so they need a lot of support." He goes on to talk about a construction teacher and a cosmetology teacher who have had to implement technology and relied heavily on the support of campus technology specialists.

Three of the teachers mentioned a lack of resources and outdated devices are other challenges that the campus must overcome. Ms. Garcia talked about the fact that not every student in her class has a device, which makes it difficult for her to utilize technology on a regular basis.

> We were given 15 computers, but I have 36 kids… It's weird that they invest so much resources in technology, and it's beautiful, it's wonderful, I think it's going to have a huge impact. But the kids don't have it all the time. It's going to create an impact when you can guarantee it every single day. I cannot do that."

Ms. West also mentioned the lack of updated resources. She said that some of the devices on her campus date back to 2013, and because they are so outdated, it takes longer than usual for computers to load technology programs. When talking about one of the devices on her campus, she states, "You can click on an app, walk away, go make some coffee, come back, and it's still loading." She also mentioned that a lot of her newer technology no longer functions properly, including her promethean board which she has resorted to using as a projector. She mentions that she feels bad because her kids want to use it, but they are unable to.

Additionally, two of the teachers mentioned that internet service is an issue. Ms. Gibson talks about issues related to the internet not working on campus, stating, "It always happens on the worst possible days like when we're doing online testing for the whole campus." Ms. Garcia talks about the fact that many of her students come from low-income households and they do not have internet at home, which makes it difficult to assign homework online. She says, "Parents are supportive, but they need consistent internet, but they don't necessarily have consistent income."

Three of the teachers talked about the overabundance of programs that are available to teachers, which has led many teachers to feel overwhelmed. Ms. Gibson stated:

> Teachers are already overwhelmed with some of what they do have and don't know how to use it to its optimum. They don't need another program to learn. They just need to get more comfortable with what they do have.

Teachers also stated that they need the adequate support for the programs they are expected to utilize in order for them to feel comfortable using it in the classrooms. Ms. West gave an example of an ineffective virtual training for a program that was rolled out in her district. "It was way too much information, very little practice, really fast paced. So it wasn't effective professional development to where we actually know how to utilize the program."

Finally, four of the five teachers alluded to the fact that principals are not as well versed as they should be in order to support principals effectively. Ms. Garcia suggested that principals go back into the classroom so they can become familiar with the tools that teachers are expected to use. She states, "That way they see how we're functioning and how the technology is being implemented, because you are aware of the technology being used but do you really understand how we're using it?" Ms. Gibson stated that principals need to understand what technology they have on their campuses if they truly want to support teachers. She says, "They need to know how to facilitate the use of technology and the programs that they're using in the classroom, because sometimes I don't think they do and that disconnect can be hard for teachers."

In conclusion, principals and teachers face several challenges in regard to implementing technology effectively on a campus. While principals believe that teacher buy-in is often a problem, teachers state that a lack of teacher confidence and proficiency

for technology is an issue, which may be why it is difficult for teachers to implement technology as expected. Principals also said that time is an issue that they feel their teachers have to deal with, and teachers mentioned that an overabundance of programs makes it difficult to find the time to become competent with any of them. Finally, principals are not provided opportunities to attend professional development, which explains why teachers feel that principals are not well-versed with the technology programs.

Summary of Findings

In an effort to learn more about technology leadership, modified versions of the *Principal Technology Leadership Assessment* (PTLA) were sent via email to principals and teachers who currently work in Region IV of Texas. The principal survey was completed by 123 participants, and the teacher survey was completed by 125 participants. The survey results were used to answer research questions one, two, and three. Five principals and five teachers from Region IV also volunteered to participate in semi-structured interviews. Interview data were analyzed using thematic coding, and emerging themes were used to answer research question four.

Research question one, *What are principals doing as technology leaders?*, was answered using descriptive statistics (frequencies and percentages) of responses to a modified version of the *Principal Technology Leadership Assessment* (PTLA). Based on the data, principals had similar responses when answering questions about two of the five principal technology leadership sub-scales. In regard to learning and teaching technology activities, the majority of principals complete these activities *significantly/fully*, which aligned with the principal interviews that indicated that school leaders felt that providing professional development was an important part of their technology leadership roles. They provide assistance to teachers by providing professional development for utilizing

technology, modeling best practices, and ensuring teachers know how to use technology to analyze data and modify instruction. Principals also share similar experiences on their personal productivity and professional practices, with the majority of principals indicating they complete four of the five activities *significantly/fully*. During principal interviews, participants specified that they use technology regularly to access staff and student records, communicate with stakeholders, and complete day-to-day tasks. The one area that they survey responses did not show that the majority of principals completed *significantly/fully* aligned with the area that principals revealed was something they currently lack: professional development.

In contrast, there were many areas that principals' responses varied, and this was especially true in reviewing the results of the leadership and vision questions. None of the questions indicated that principals did any of the activities specified to the same extent which included comparing and aligning technology plans and identifying and advocating for research-based practices in the use of technology. Most of the principals indicated that they did not or minimally participated in technology planning sessions, shared technology plans with stakeholders, or promoted participation of others in the planning process. This aligned with principal interview responses, as many of them stated that they do not play an active role in district and campus planning committees. When asked about technology support, management, and operations, the majority of the principals did not agree on five of the six questions asked, which discussed the allocation of campus funds, ensuring hardware and software upgrades part of improvement plans, and investigating how satisfied staff is with the support they are receiving. Similarly, the answers varied for three out of the five questions that were aligned with assessment and evaluation. The extent which principals assessed existing technology tools for upgrades, evaluated the effectiveness of technology professional development, and utilized technology as a

criterion for assessing faculty did not indicate a clear pattern or trend for principals in Region IV. This was something principals also shared during interviews, as most of them admitted they did not have clear measures for how they assessed technology resources.

Research question two, *What are teachers' perceptions of principal's role as technology leader?*, was answered using descriptive statistics (frequencies and percentages) of responses to a modified version of the *Principal Technology Leadership Assessment* (PTLA). Overall, teachers had similar responses to all questions as they related to all six of the components of technology leadership. The majority of teachers believed that teachers should *significantly/fully* engage in leadership and vision activities, which include participating and promoting participation in school and district technology planning sessions, communicating those plans with others, and advocating for best practices when implementing technology. The majority of teachers also believe principals should *significantly/fully* engage in learning and teaching practices related to technology, including modeling best practices, facilitating professional development, and conducting staff needs assessments on professional development related to the use of technology. These responses aligned with the teacher interviews, as participants stated that principals should be knowledgeable of technology, should be responsible for ensuring they have the resources they need, and should be provide teachers with the support they need to improve with implementing technology.

Regarding principal productivity and professional development practices as they relate to technology, the majority of teachers believe that principals should *significantly/fully* use technology to communicate with stakeholders and complete day-to-day tasks, as well as participate in technology professional development. Additionally, the majority of teachers agree that principals should *significantly/fully* engage in activities related to technology support, management, and operations such as allocating

supplemental funds, advocating for support services, and ensuring technology plans include the replacement/upgrades of technology. Interestingly, teachers did not say this was happening during interviews, however even principals stated that this was something they should be doing as the technology leaders on campus. Finally, the majority of teachers *significantly/fully* believe that principals should assess and evaluate the use of technology. Teachers indicated that principals should evaluate the effectiveness of technology professional development and instructional practices, as well as use technology to assess student assessment data.

Research question three, *What are the similarities and differences between what principals are doing and teachers' perceptions of the principal's role as technology leaders?*, was answered using independent t-tests and descriptive statistics (frequencies and percentages) of responses to modified principal and teacher versions of the *Principal Technology Leadership Assessment* (PTLA). Composite scores were used to run independent t-tests for each of the five sub-scales of the survey. The results indicated there was a statistically significant difference between what principals are doing and what teachers believe they should be doing in all five sub-scales.

Upon reviewing the descriptive statistics for each of the five areas, the majority of principal and teacher responses aligned for two of the five components of the technology leadership survey. In regards to learning and teaching, principals complete four of the six activities to the same extent teachers believe they should, which include *significantly/fully* providing technology professional development, modeling best practices, and providing assistance for using technology to analyze student data and modify instruction. Teachers and principal responses were also similar for four of the five questions regarding the extent that principals utilize technology for productivity and professional practices. The majority of principals *significantly/fully* use technology to

communicate with stakeholders and complete day-to-day tasks, as well as participate in technology professional development to the same extent teachers believe they should. Finally, principals complete three of the five assessment and evaluation activities to the same extent that teachers indicated they should. A close majority of principals and teachers felt it was important to *significantly/fully* use technology as a criterion to assess the performance of faculty, and the majority of principals and teachers agree with the extent that principals promote the evaluation of instructional practices and utilize technology to collect student assessment data. This survey data aligned with the principal and teacher interviews, as both groups stated that they felt it was important to use technology in various ways; however, the interviews uncovered that principals were not always completing these activities to the extent they felt they should.

Principal and teacher responses were not aligned in two of the five areas of the technology leadership survey. While the majority of teachers believe that principals should *significantly/fully* engage in all of the leadership and vision activities described, principal responses varied greatly for each of the questions, indicating that most principals actually completed three of the activities *not at all/minimally*: participate in technology planning sessions, communicate technology plans with stakeholders, and promote the participation of stakeholders in the technology planning process. Notable differences were also apparent when reviewing principal and teacher responses on technology support, management, and operations. While teachers believe that principals should *significantly/fully* participate in all six of the activities described, the majority of principals *significantly/fully* in one of them: supporting faculty and staff with using technology systems for management and operations. Responses from principals varied among the other five questions, with most principals indicating that they complete two of the activities *not at all/minimally*: pursue supplemental funding for technology needs and

include hardware and software upgrades/replacements into school technology plans. Again, the interviews revealed that princpals and teachers understand the value of including stakeholder input and maintaining resources, even though survey data indicated that this was not always occurring on campuses.

Research question four, *What are the perceptions of principals and teachers concerning the principal's role of technology leader?*, was answered using semi-structured interviews that were transcribed, coded, and analyzed used thematic analysis. The results of the qualitative analysis suggests that technology leaders and teachers agree that principals play a critical role in how technology is implemented on their campuses. In regard to resources, principals stated that they ensure staff and students have access to a host of devices and instructional programs, and they acknowledge the importance of determining how effective they are so they can maintain or update resources as needed. When asked about technology at their campuses, teachers were able to share in much greater detail the resources that they use on their campuses, which supports the idea that principals are not as well-versed as teachers are with the technology resources and need more support in this area. Furthermore, while principals felt that technology resources need to be updated regularly to be considered effective, teachers felt that the effectiveness of technology programs should be based on teacher and student input. This data suggest the need for clear expectations for how technology should be used and evaluated to determine if it is a tool should be used and maintained on campuses. While this was stated in the interviews, the survey results indicated that both groups felt that knowing how to evaluate the effectiveness of resources was important in order to determine which resources were the most effective.

Based on the data, principals and teachers also agree that technology leaders must support the implementation of technology at their campuses. The data suggests that

principals rely heavily on other instructional leaders to assist with providing support and professional development to their teachers, and they also allow time for teachers to help one another. Teachers acknowledge that principals need to delegate the technology support to others; however, they feel principals should still be knowledgeable about their needs. While principals' technology ratings for technology self-efficacy ranged from a six to a nine, nearly all of the teachers felt they were a 10, and most of them credited their confidence to the leadership roles they play on their campuses with assisting other teachers with technology. This suggests that teaches are more confident because they are more familiar with the resources and use them regularly in the classroom.

In regard to challenges, principals acknowledged barriers which include teacher buy-in, time, a lack of reliable internet, and a lack of professional development, among other things. Teachers stated some of the same things, but they reiterated that an abundance of resources is overwhelming for teachers, and this supports the idea that principals need to communicate with teachers about their needs and how they can be better supported. This data provides insight on the need for principals to receive the training they need so they can be more confident as technology leaders, they know how to determine the effectiveness of the tools they provide on their campus, and they are able to model the expectations for technology use on their campuses.

Conclusion

This chapter presented the results of the qualitative data analyses of this study. In the next chapter, this study's findings will be compared and contrasted with prior studies documented in the research literature. Additionally, the implications of this study's results will be discussed with considerations toward improving the role of technology leaders on campus and ensuring that principals are aware of how teachers feel they can be better supported with technology integration. This information should assist with

determining what actions should be taken next to better prepare technology leaders to run their campuses. In addition, further avenues for research will then be identified to continue to find ways that we can improve instructional technology in schools today.

CHAPTER V:

SUMMARY, IMPLICATIONS, AND RECCOMMENDATIONS

Technology has changed the way students learn in schools today, especially following the COVID-19 pandemic which forced many campuses to move to virtual instruction almost overnight (Reddy & Bubonia, 2020). While there are a number of factors that contribute to teachers utilizing instructional technology effectively, school leaders, and more specifically principals, must take an active role in its implementation (Alenzi, 2016; Christensen et al., 2018; Reddy & Bubonia, 2020). Currently, there is a lack of research on what teachers believe technology leaders should be doing in comparison with what principals are actually doing in their technology leadership roles (Christensen et al., 2018; Germeroth et al., 2018; Liu & Hallinger, 2018; Pautz & Sadera, 2017; Sterrett & Richardson, 2020). To learn more about the principal's technology leadership role and teacher perceptions of the principal's role as a technology leader, a study was conducted that included input from principals and teachers in Region IV of Texas public schools. Data were collected through principal and teacher surveys and interviews were conducted with a selective sample of principals and teachers that worked within the targeted area. This chapter presents a summary of the findings, implications based on the results of the research, and future research recommendations.

Summary

The purpose of this study was to examine technology leadership and teachers' perceptions of the principal's technology leadership role in a school setting. In addition, this study explored the similarities and differences between what principals are doing as technology leaders and what teachers believe they should be doing as technology leaders. Modified versions of the Principals Technology Leadership Assessment (PTLA) were used to collect data from educators throughout Region IV, and the questions in the survey

were created to align with the National Education Technology Standards for Administrators (NETS-A; PTLA, 2006).

The results of the principal survey demonstrate that while principals tend to be aligned with completing some the activities to the same extent, responses vary greatly for other activities. For example, the majority of principals are taking an active role teaching and learning activities, ensuring that teachers receive the professional development they need to integrate technology. This is consistent with findings from a study conducted by Thurm and Bazal (2020), which found that professional development positively influences the beliefs and use of instructional technology by teachers. Additionally, the majority of principals specified they *significantly/fully* complete the principal productivity and professional practices related to technology. This aligns with research conducted by Lindqvist and Petterrson (2019), in which administrators acknowledged that technology allows them to complete their jobs more efficiently.

On the contrary, many principals are not completing activities aligned with the principal leadership standards to the same extent, and especially those related to leadership and vision as well as support, management, and operations. During interviews, principals admitted that they were not clear on what was expected of them as technology leaders, and this aligns with research conducted by Metcalf and LaFrance (2013), which found that the vast majority of principals were not prepared to serve as technology leaders based on the expected NETS-A standards. Based on the results of that study, school leaders still require opportunities to learn what is expected of them so they can better lead their schools in integrating technology. Furthermore, the results of the survey indicate that only 43.9% of principals *significantly/fully* attended professional development on technology leadership, while none of the principals interviewed had attended any technology professional development in the last year. This aligns with a

study conducted by Lindqvist (2019), which found that a lack of professional development on instructional technology and programs has made it difficult for school leaders to serve as role models for the teachers they work with.

In contrast, the results of the teacher survey implicate that teachers feel principals should take an active role in all aspects of technology leadership. This is especially true when looking at the *Principal Technology Leadership Assessment* (PTLA) questions related to teaching and learning as well as support, management, and operations. Similar to the findings of a study conducted by Moreira et al., (2018), teachers believe that technology leaders play a critical role in the technology usage at a campus, and they rely on technology leaders to provide resources, technical support, and professional development. A study by Thiel (2017) also found that teachers depend heavily on the support of leadership to successfully implement new technology initiatives on campus. A later study by Keane and Keane (2019), also supports these findings. Funding provided by administration for a one-to-one initiative spearheaded support in the form of professional development which led to the effective implementation of technology in schools and a culture that embraced this new way of teaching.

While the survey results indicate that that there is a statistically significant difference between principal and teacher responses in all of the sub-scales, differences were most significant in questions related to leadership and vision as well as support, management, and operations. These finding were aligned with research conducted by Duncan (2011), which indicated that principals completed activities related to leadership and vision as well as support, management, and operations to a lesser extent than activities described in the other sub-scales. Productivity and professional practices, learning and teaching, and assessment and evaluation all had greater response rates that aligned with the findings in this study. These findings indicate a lack of communication

regarding technology plans and the need for technology funds and assessments for maintenance and upgrades. Issues related to effective collaboration and communication in technology planning is emphasized in a study conducted by Lindqvist and Petterrson (2019). Findings indicated that teachers and students should provide input on the support they need.

Furthermore, a study by Ellis et al. (2021) is also consistent with findings regarding challenges related to technology planning, funds, and maintenance. Differences noted between principal and teacher survey responses aligned with many of the challenges that were noted by both principals and teachers in interviews. While administrators had advocated to put technology plans in place, they lacked funds and training to implement those plans effectively. These findings support the need to for principals to receive more training and support with developing, communicating, and funding technology initiatives. Unfortunately, the researcher was unable to find literature on what teacher believe principals should be doing as technology leaders, especially in regards to the areas outlined in the PTLA survey. This helps demonstrate the gap in the current literature regarding teacher input in determining how principals can be better serve as technology leaders through the findings of this research.

Based on the findings from the interviews conducted for this study, principals and teachers believe that the principal technology leadership standards described in the PTLA survey adequately describe the principal's technology leadership role, with an emphasis on the importance of providing resources and ensuring adequate support and training for teachers. These findings align with research conducted by Yurtseven et al., (2019), which found that successful professional development activities allow for teacher reflection and collaboration, and necessary resources such as time, support, and technology are provided for effective implementation. This is also consistent with conclusions and findings from

Thannimalai and Raman (2018), who found a significant relationship between principals' technology leadership and teachers' technology integration, based on the implementation of NETS-A, which include providing resources and necessary support.

In their interviews, principals and teacher both agreed that technology leaders must model best practices for how teachers should utilize technology in their classrooms. Teachers expressed that they feel principals should model the use of technology that teachers are expected to use so they become familiar with the technology themselves as well as make known what is expected of teachers when they are using technology with students. These findings were consistent with those of Lindqvist (2019), who found that technology leaders must focus on personal growth in technology leadership practices to serve as role models for their staff. This is also aligned with findings from research conducted by Thurm and Bazal (2020), which studied the effectiveness of a technology professional development program that emphasized modeling tasks for teacher implementation.

Both principals and teachers expressed the need for additional support to become better with technology integration. Principals felt that they needed more professional development as well as opportunities to learn from their peers. This is consistent with research conducted by Sterrett and Richardson (2020), which found that the most effective technology leaders embrace it, use it alongside their teachers, and collaborate to support one another in learning new forms of technology. Principals also felt that they needed clear expectations regarding their roles as technology leaders, which aligns with research conducted by Alcaron et al., (2020). Because principals do not have a clear understanding of how teachers should use technology, teachers are not evaluated on how they are using it in their classrooms. Teachers expressed the need for updated resources, program alignment, and principal support. These responses are congruent with findings in

a study conducted by Chiu (2020), in which researchers found that insufficient support is a major barrier with incorporating technology. Based on those findings, the research suggests that schools provide support funds that allow teachers to choose their own technology, provide individual consulting services, conduct workshop trainings, and give teachers opportunities to collaborate.

Based on data collected during principal interviews, principals admit that they do not know everything about technology, but they showed some confidence in their ability to learn about it and lead others alongside their leadership teams. Teachers also acknowledged that they did not expect their principals to be experts in technology; however, they do expect them to be familiar with the programs and resources they are currently using in their classrooms. This aligns with the technology self-efficacy ratings that were shared by the participants that were interviewed. While principals rated themselves between six and ten in their level of confidence with technology, four of five of the teachers rated themselves a 10. Principal ratings aligned with research conducted by Dogan (2018), which found that experienced school administrators tend to have high technology self-efficacy when compared to administrators with little experience. This is because they understand their role as technology leaders and are adept at providing resources, staff development, and the support necessary for implementing change. These findings also align with research conducted by Barton and Dexter (2019), which found that teacher self-efficacy directly relates to how teachers utilize technology and the frequency of its use in the classroom, as well as research conducted by Alenzi (2016), which found that teachers who feel well supported are more confident in their abilities and are more likely to utilize technology in their classroom.

Implications

Based on the results of both the quantitative and qualitative data, there were notable gaps between what principals are actually doing as technology leaders, and what teachers believe they should be doing. It is important that principals and other school leaders are aware of this data, as it will help them to better support teachers on their campuses, who have the most direct impact on technology integration and more importantly, student achievement (Christensen,2018). The following section outlines some recommendations to help improve technology leadership, effectively prepare teachers, and develop plans that will ensure that schools have the funding and resources they need to support technology integration on their campuses.

Both principals and teachers noted a lack of resources, outdated devices or technology, and the necessary maintenance that is required for technology. As noted in one of the principal interviews, technology is constantly changing, so it is important that school leaders are maintaining updated resources and technology and are providing support for maintaining the equipment they have. Another principal noted that funding has been a barrier, as she is unable to update technology because she does not have money allotted to support technology maintenance. These responses are aligned with principal responses on the survey as the relate to support, management, and operations. A recommendation to help improve in this area is incorporating technology into the campus budget. This can be accomplished at the end of each year when campuses prepare their campus improvement plans. Other sources of funding could come from fundraisers associated with PTA, or grants that are written by campus administrators or designated staff members. Principals should also be prepared to advocate for their campus technology needs and ask for additional funding from the district. Funding is often available through state or federal programs (Ozgur, 2020); however, school leaders must

be willing to learn about these programs, prepare plans for how they will use funding they receive, and justify the need for additional resources, programs, or funding based on how the resources or programs are being utilized (Alcaron et al., 2020).

Another recommendation that could assist with the improvement of technology leadership is program evaluations. When the principals were asked how they determined the effectiveness of technology resources and programs they currently have at their campus, three out of five said that they did not have a clear way of evaluating effectiveness and this was an area of growth. The other principals and teachers mentioned that they determined effectiveness based on how much it is used, how comfortable the teachers are with utilizing specific programs or devices, and how students felt about using them program for their learning. Teachers also emphasized that while they have a variety of resources available to them, they are overwhelmed with all of the programs, and many of them do a lot of the same things. That said, school leaders must put practices in place to monitor the effectiveness of programs (Bass, 2021). Furthermore, school leaders must have a clear understanding of how they intend to determine if a resource or program is in fact effective and ensure that this is communicated with staff. Such evaluations should be put in place to assess if instructional technology and technology resources are effective tools that improve student learning and ultimately, student achievement (Bass, 2021; Khalif, 2017; Macaruso et al., 2020). Resources and program should be evaluated often, which would allow principals to focus on funding only the most effective technology devices and programs, and it would also allow teachers to know which tools they should become learn to use and use with their students.

Another strategy that school leaders may consider is developing technology committees on their campuses. Teacher and student input is one way that principals can determine what programs are effective, devices that need to be purchased or updated, and

the professional development needs of the staff (Lindqvist & Pettersson, 2019). As mentioned by a principal, the teachers and students know more about their needs than they do, so giving them an opportunity to meet regularly and share input is an important part of improving technology plans for a campus. A teacher also mentioned that parents have questions and needs related to how their children are using technology at home. By including stakeholders such as parents and community members, school leaders are able to learn about how they can also support students with issues related to internet service, devices that students may be allowed to take home, and the needs of students for specialized online instruction (Martin et al., 2018). The committee member input would help improve the decision-making process for technology plans for campuses, and it would also create buy-in, since stakeholders would feel that they are valued in the making decisions for the needs of the school.

Principals may also want to consider collecting survey data from stakeholders to improve communication between school leaders and parents, students, and staff members. In doing so, stakeholders would have a means to provide input on the programs and devices that teachers are currently using, and make decisions based on the feedback they receive (Bowman et al., 2020). Additionally, survey data would also allow all stakeholders to provide feedback, and they would be able to share their input anonymously so they feel comfortable being honest about what they share. Surveys can be created for the various stakeholder groups, so they are able to share information based on their experiences with technology. Student surveys, for example, could ask questions about the devices they are using, programs they feel are effective, and access to the internet. Teacher surveys could ask which programs teachers are using, which programs they believe are not effective, professional development that they feel would benefit them

in growing with using technology, and other support they may require with implementing technology.

Another recommendation based on the results pertains to the need for principals to support teachers by providing time for them to plan, collaborate among their teams, and attend professional development. A principal stated that he felt that teachers learn best when they are able to work with one another build their capacity as a team. One of the teachers also suggested opportunities for teachers to get to visit other classrooms and see how others effectively use tools or programs in their classrooms. Leaders need to support teachers with collaboration, as many are often hesitant or do not view planning as an opportunity to share; therefore, it is imperative that school leaders foster an environment that feels safe for teachers work together and try new things (Lindqvist, 2019). Principals may consider extended planning periods, instructional coaching, and opportunities for school leaders or other instructional leaders to model for teachers. Furthermore, principals also need to invest in their teachers' capacity by providing them with ample opportunities to attend professional development (Moreira, 2018). According to Liu and Hallinger (2018), when school leaders facilitate opportunities for teachers to learn their craft and motivate them to collaborate, teachers feel more confident in their abilities as educators.

Finally, in order for principals to be effective technology leaders, districts must invest in principals' knowledge and skills by providing them with training and opportunities for them to grow in technology integration. According to the survey data, only 43.9% of principals *significantly/fully* participate in technology professional development, and none of the five principals I interviewed had attended any technology trainings this school year. If the expectation is that principals invest in technology resources, implement instructional technology initiatives, provide training for their

teachers, and continue to improve technology integration on campuses, principals must be prepared well-equipped to lead in those areas. Principals often feel unprepared to serve as technology leaders, and they admit that they lack professional development on instructional technology resources and programs, which has made it difficult for them to serve as role models for the teachers they work with (Ellis, 2021; Lindqvist, 2019). District leaders should consider investing in their principals by providing them with opportunities to attend technology professional development regularly, and perhaps even alongside their teachers (Sterrett and Richardson, 2020.

Recommendations for Future Research

This study contributes to the current body of research by investigating the principal's technology leadership role compared to teachers' perceptions of the principal's technology leadership role within Region IV, however future research could be done to extend on this study and continue to close the gap in the literature on technology leadership. This study could be done on a larger scale to include all principals and teachers within the state of Texas or even the United States, and the results of the study could be used to determine if there are differences across states. It would also be interesting to learn how principals and teachers from the same campuses would respond to these questions, as the implications would be targeted and allow for more relevant findings and interventions for specific principals and technology programs. Finally, future research could also focus on differences in the technology leadership roles of principals at various school levels, based on years of experience, or even by gender. Moreover, similar research could also be conducted to determine if teacher perceptions vary based on these demographics.

Conclusion

Technology has become an important part of society today, and it is imperative that educators embrace this new way of delivering instruction in an effort to prepare student for the future (Reddy & Bubonia, 2020). Research supports the critical role that school leaders' play in supporting teachers in implementing technology (Germeroth et al., 2018; Sterrett & Richardson, 2020; Vu et al., 2018); however there has been a gap in the current literature regarding what teachers believe teachers should be doing to support them with technology integration in their classrooms. In an effort to assist school leaders in determining how they can implement instructional technology on their campuses successfully, this study reveals some of the disconnect between what teachers expect of technology leaders and what principals are actually doing. This research could potentially provide a significant contribution to the discussion on how principals should be supported as technology leaders, as well as how principals should support teachers in integrating technology. These findings are intended to provide school leaders with a better understanding of the principal's technology leadership role and what school leaders can do to help teachers support their students meet the ultimate goal of student achievement.

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APPENDIX A:

SURVEY COVER LETTER

September 1, 2021

Dear Principal or Teacher,

As a doctoral student at the University of Houston Clear-Lake, I am conducting a research study to examine technology leadership and teachers' perceptions of the principal's technology leadership role. At this point in the dissertation process, I have completed chapters 1, 2, and 3, and I am now looking to gather the necessary data in order to complete my study.

Because you are a principal or teacher at a public school in Region IV of Texas, I am seeking your participation in this study. The data collected from the surveys will be used for educational and/or publication purposes only, so you will not be identified by name. Your participation as a survey respondent is entirely voluntary. The individual responses will be kept confidential, but all responses will be compiled, summarized, and shared with the University of Houston Clear-Lake for the purposes of program improvement. The survey will also encourage your participation in an interview to learn about principal and teacher responses about the principal's technology leadership role.

Your cooperation is greatly appreciated and your willingness to participate in this study is implied if you proceed with completing the survey. Your completion of the survey is not only greatly appreciated but invaluable. If you have any further questions, please feel free to contact me (GarzaV8066@UHCL.edu). Thank you!

Sincerely,

Veronica J. Garza
The University of Houston Clear-Lake
GarzaV8066@UHCL.edu

APPENDIX B:

PRINCIPAL AND TEACHER TECHNOLOGY LEADERSHIP ASSESSMENT

Principal Survey Questions	**Teacher Perception Survey Questions**
Demographics	**Demographics**
1. Select your gender: o Female o Male	1. Select your gender: o Female o Male
2. What is your ethnicity/race? o American Indian or Alaskan Native o Asian or Pacific Islander o Black or African American o Hispanic or Latino o White or Caucasian o Two or more races o Prefer not to answer	2. What is your ethnicity/race? o American Indian or Alaskan Native o Asian or Pacific Islander o Black or African American o Hispanic or Latino o White or Caucasian o Two or more races o Prefer not to answer
3. Select your age range: o 18-20 o 21-29 o 30-39 o 40-49 o 50-59 o 60 or older	3. Select your age range: o 18-20 o 21-29 o 30-39 o 40-49 o 50-59 o 60 or older
4. Select the range that include your total years of experience as a principal: o Less than 1 year o 1-2 years o 3-5 years o 6-10 years o 11-15 years o More than 15 years	4. Select the range that include your total years of experience as a teacher: o Less than 1 year o 1-2 years o 3-5 years o 6-10 years o 11-15 years o More than 15 years
5. What school level do you serve as an administrator? o Elementary School o Intermediate/Middle School o Hight School	5. What school level do you serve as a teacher? o Elementary School o Intermediate/Middle School o Hight School

6. School Enrollment: o 1 to 229 o 229 to 1,229 o 1,230 or more	6. School Enrollment: o 1 to 229 o 229 to 1,229 o 1,230 or more
7. What kind of community does your school serve? o Urban community o Suburban community o Rural community	7. What kind of community does your school serve? o Urban community o Suburban community o Rural community
8. District Enrollment: o 1 to 1,599 o 1,599 to 4,999 o 5,000 or more	9. District Enrollment: o 1 to 1,599 o 1,599 to 4,999 o 5,000 or more
I. Leadership & Vision	**I. Leadership & Vision**
1. To what extent did you participate in your district's or school's most recent technology planning session? o Not at all o Minimally o Somewhat o Significantly o Fully	1. To what extent should principals participate in a district or school's technology planning session? o Not at all o Minimally o Somewhat o Significantly o Fully
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? o Not at all o Minimally o Somewhat o Significantly o Fully	2. To what extent should principals communicate information about a district or school's technology planning and implementation efforts to the school's stakeholders? o Not at all o Minimally o Somewhat o Significantly o Fully
3. To what extent did you promote participation of your school's stakeholders in the technology planning process of your district? o Not at all o Minimally o Somewhat o Significantly	3. To what extent should principals promote participation of a school's stakeholders in the technology planning process of the district? o Not at all o Minimally o Somewhat o Significantly

○ Fully	○ Fully
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	4. To what extent should principals compare and align their district or school technology plan with other plans, including district strategic plans, their school improvement plan, or other instructional plans? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully
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	5. To what extent should principals advocate for inclusion of research-based technology practices in a school improvement plan? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully
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	6. To what extent should principals 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
II. Learning and Teaching	**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	1. To what extent should principals provide or make available assistance to teachers to use technology for interpreting and analyzing student assessment data? ○ Not at all ○ Minimally ○ Somewhat

○ Significantly ○ Fully	○ Significantly ○ Fully
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	2. To what extent should principals provide or make available assistance to teachers for using student assessment data to modify instruction? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully
3. To what extent do you disseminate data or model best practices in learning and teaching with technology to faculty and staff? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully	3. To what extent do you disseminate data or model best practices in learning and teaching with technology to faculty and staff? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully
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	4. To what extent should principals 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
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	5. To what should principals organize or conduct assessments of staff needs related to professional development on the use of technology? ○ Not at all ○ Minimally ○ Somewhat ○ Significantly ○ Fully

6. To what extent did you facilitate or ensure the delivery of professional development on the use of technology to faculty and staff? o Not at all o Minimally o Somewhat o Significantly o Fully	6. To what extent did you facilitate or ensure the delivery of professional development on the use of technology to faculty and staff? o Not at all o Minimally o Somewhat o Significantly o Fully
III. Productivity & Professional Practice	**III. Productivity & Professional Practice**
1. To what extent did you participate in professional development activities meant to improve or expand your use of technology? o Not at all o Minimally o Somewhat o Significantly o Fully	1. To what extent should principals participate in professional development activities meant to improve or expand their use of technology? o Not at all o Minimally o Somewhat o Significantly o Fully
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)? o Not at all o Minimally o Somewhat o Significantly o Fully	2. To what extent should principals use technology to help complete their day-to-day tasks (e.g., developing budgets, communicating with others, gathering information)? o Not at all o Minimally o Somewhat o Significantly o Fully
3. To what extent did you use technology-based management systems to access staff/faculty personnel records? o Not at all o Minimally o Somewhat o Significantly o Fully	3. To what extent should principals use technology-based management systems to access staff/faculty personnel records? o Not at all o Minimally o Somewhat o Significantly o Fully

4. To what extent did you use technology-based management systems to access student records? o Not at all o Minimally o Somewhat o Significantly o Fully	4. To what extent should principals use technology-based management systems to access student records? o Not at all o Minimally o Somewhat o Significantly o Fully
5. To what extent did you encourage and use technology (e.g. e-mails, blogs, videoconferences) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community? o Not at all o Minimally o Somewhat o Significantly o Fully	5. To what extent should principals encourage and use technology (e.g. e-mails, blogs, videoconferences) as a means of communicating with education stakeholders, including peers, experts, students, parents/guardians, and the community? o Not at all o Minimally o Somewhat o Significantly o Fully
IV: Support, Management, & Operations	**IV: Support, Management, & Operations**
1. To what extent did you 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)? o Not at all o Minimally o Somewhat o Significantly o Fully	1. To what extent should principals 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)? o Not at all o Minimally o Somewhat o Significantly o Fully
2. To what extent did you allocate campus discretionary funds to help meet the school's technology needs? o Not at all o Minimally o Somewhat o Significantly o Fully	2. To what extent should principals allocate campus discretionary funds to help meet the school's technology needs? o Not at all o Minimally o Somewhat o Significantly o Fully

3. To what extent did you pursue supplemental funding to help meet the technology needs of your school? o Not at all o Minimally o Somewhat o Significantly o Fully	3. To what extent should principals pursue supplemental funding to help meet the technology needs of their school? o Not at all o Minimally o Somewhat o Significantly o Fully
4. To what extent did you ensure that hardware and software replacement/upgrades were incorporated into school technology plans? o Not at all o Minimally o Somewhat o Significantly o Fully	4. To what extent should principals ensure that hardware and software replacement/upgrades are incorporated into school technology plans? o Not at all o Minimally o Somewhat o Significantly o Fully
5. To what extent did you advocate at the district level for adequate, timely, and high-quality technology support services? o Not at all o Minimally o Somewhat o Significantly o Fully	5. To what extent should principals advocate at the district level for adequate, timely, and high-quality technology support services? o Not at all o Minimally o Somewhat o Significantly o Fully
6. To what extent did you investigate how satisfied faculty and staff were with the technology support services provided by your district/school? o Not at all o Minimally o Somewhat o Significantly o Fully	6. To what extent should principals investigate how satisfied faculty and staff were with the technology support services provided by your district/school? o Not at all o Minimally o Somewhat o Significantly o Fully
V. Assessment & Evaluation	**V. Assessment & Evaluation**

1. To what extent did you promote or model technology-based systems to collect student assessment data? o Not at all o Minimally o Somewhat o Significantly o Fully	1. To what extent did you promote or model technology-based systems to collect student assessment data? o Not at all o Minimally o Somewhat o Significantly o Fully
2. To what extent did you promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness? o Not at all o Minimally o Somewhat o Significantly o Fully	2. To what extent should principals promote the evaluation of instructional practices, including technology-based practices, to assess their effectiveness? o Not at all o Minimally o Somewhat o Significantly o Fully
3. To what extent did you assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade? o Not at all o Minimally o Somewhat o Significantly o Fully	3. To what extent should principals assess and evaluate the existing technology-based administrative and operations systems for modifications or upgrade? o Not at all o Minimally o Somewhat o Significantly o Fully
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? o Not at all o Minimally o Somewhat o Significantly o Fully	4. To what extent should principals evaluate the effectiveness of professional development offerings in their school to meet the needs of teachers and their use of technology? o Not at all o Minimally o Somewhat o Significantly o Fully
5. To what extent did you include the effective use of technology as a criterion for assessing the performance of faculty? o Not at all	5. To what extent did you include the effective use of technology as a criterion for assessing the performance of faculty? o Not at all

○ Minimally ○ Somewhat ○ Significantly ○ Fully	○ Minimally ○ Somewhat ○ Significantly ○ Fully
Principal Interview	**Teacher Interview**
Would you be interested in participating in a brief interview to learn about principals' perceptions of the technology leadership role? ○ Yes ○ No If you answered yes, please provide your name, email, and phone number below so I can contact you for a brief interview: _____	Would you be interested in participating in a brief interview to learn about teachers' perceptions of the principal's role as technology leader? ○ Yes ○ No If you answered yes, please provide your name, email, and phone number below so I can contact you for a brief interview: _____

APPENDIX C:

INFORMED CONSENT

Informed Consent to Participate in Research

You are being asked to participate in the research project described below. Your participation in this study is entirely voluntary and you may refuse to participate, or you may decide to stop your participation at any time. Should you refuse to participate in the study or should you withdraw your consent and stop participation in the study, your decision will involve no penalty or loss of benefits to which you may otherwise entitled. You are being asked to read the information below carefully, and ask questions about anything you don't understand before deciding whether or not to participate.

Title: **TECHNOLOGY LEADERSHIP AND TEACHERS' PERCEPTIONS OF THE SCHOOL LEADER'S TECHNOLOGY LEADERSHIP ROLE**

Student Investigator: Veronica Garza, M. Ed.

Faculty Sponsor:

PURPOSE OF THE STUDY
The purpose of this study is to examine technology leaders' competencies and teachers' perceptions of school leaders' technology leadership competencies in a school setting.

PROCEDURES
You will be asked to participate in an interview in which you will answer questions about your perceptions of the technology leadership role.

EXPECTED DURATION
The total anticipated time commitment will be approximately 30 minutes.

RISKS OF PARTICIPATION
There are no anticipated risks associated with participation in this study.

BENEFTIS TO THE SUBJECT
The is no direct benefit from your participation in this study, but your participation will help the investigator better understand school leaders and teachers' perceptions of the school leaders' technology leadership role.

CONFIDENTIALITY OF RECORDS
Every effort will be made to maintain the confidentiality of your study records. The data collected from the study will be used for educational and publication purposes; however, you will not be identified by name. For federal audit purposes, the participant's documentation for this research project will be maintained and safeguarded by the researcher for a minimum of five years after completion of the study. After that time, the participant's documentation may be destroyed.

FINANCIAL COMPENSATION
There is no financial compensation to be offered for participation in this study.

INVESTIGATIORS RIGHT TO WITHDRAW PARTICIPANT
The investigator has the right to withdraw you from the study at any time.

CONTACT INFORMATION FOR QUESTIONS OR PROBLEMS
If you have additional questions during the course of this study about the research or any related problem, you may contact the researcher, Veronica Garza, at phone number 713-553-5788 or by email at GarzaV8066@UHCL.edu.

SIGNATURES
Your signature below acknowledges your voluntary participation in this research project. Such participation does not release the investigator, institution, sponsor, or granting agency(ies) form their professional and ethical responsibility to you. By signing the form, you are not waiving any of your legal rights.

The purpose of this study, procedures to be followed, and explanation of risks or benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have any additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You are free to withdraw your consent at any time by contacting the Principal Investigator. You will be given a copy of the consent form you have signed.

Using language that is understandable and appropriate, I have discussed this project and the items listed above with the subject.

Printed name and title _____

THE UNIVERSITY OF HOUSTON-CLEAR LAKE (UHCL) COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS HAS REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH SUBJECT MAY BE ADDRESSED TO THE UHCL COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (281-283-3015). ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT UHCL ARE GOVERNED BY REQUIREMENTS OF THE UNIVERSITY AND THE FEDERAL GOVERNMENT. (FEDERALWIDE ASSURANCE # FWA00004068)

APPENDIX D:

PRINCIPICAL INTERVIEW PROTOCOL

1. What do you believe is your role as a technology leader at your campus?

2. Tell me about technology programs or resources you are currently providing at your campus.

3. How do you support your teachers with integrating those programs or resources (or technology in general)?

   What professional development or technical support do you provide to teachers and staff?

4. How do you determine how effective those programs or resources are?

5. What are some of the challenges your campus faces when utilizing technology?

6. In what ways has your district supported you as a technology leader at your campus?

   What professional development have you attended (programs/resources you mentioned)?

   How have professional development trainings assisted you as a technology leader?

7. On a scale of 1-10, how confident do you feel as a technology leader on your campus, with 10 being extremely confident? Please elaborate on your response.

8. What additional support could your district provide to help you become a better technology leader?

APPENDIX E:

TEACHER INTERVIEW PROTOCOL

1. What do you believe is the principal's role as a technology leader on a campus?

2. Tell me about technology programs or resources that are currently being provided at your campus.

3. How is your principal/campus supporting you with integrating those programs or resources (or technology in general)?

   What professional development or technical support have you received?

4. Do you believe those program or resources have been effective?

   Has that been communicated to the campus principal?

5. What are some of the challenges your campus faces when utilizing technology?

6. On a scale of 1-10, how confident do you feel with utilizing technology in your classroom, with 10 being extremely confident? Please elaborate on your response.

7. What additional support could your principal provide to help you become a better at utilizing technology in the classroom?