School Principal Interns' Perceived Level of Preparedness for Technology Leadership

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The purpose of this study was to explore differences in perceived level of technology leadership preparation for students of three different online graduate level leadership preparation programs offered at a regional university in southeast Texas. Four hundred seventy-one students responded to the Principal Technology Leadership Assessment (PTLA) survey and three open-response questions asking students which activities they found beneficial, what they would change, and what they would add to program content related to understanding the International Society for Technology (ISTE) Education Standards for Administrators – Visionary Leadership, Digital Age Learning Culture, Excellence in Professional Practice, Systemic Improvement, and Digital Citizenship (ISTE, 2014, 2018). Study findings indicated there was no statistically significant relationship between the items in each domain and the type of program in which respondents participated. Additionally, there was no statistically significant difference between programs and their performance in two of the five domains: Preparedness to Create a Digital Learning Culture and Digital Citizenship. Additionally, student responses to the three open-response type questions indicated suggestions that may be of interest to Educational Preparation Programs (EPP) concerned with meeting current technology instructional practices as part of an administrative degree or certificate program.

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Technology has become ubiquitous in today's world. The use of technology in society and education is becoming more prevalent and impacts all aspects of individual lives (Hakansson Lindqvist, 2019). Without question, technology has a pivotal role in the teaching and learning of today's youth and in their future careers, as well as school reform. But, as technology use has become more prevalent in our nation's schools, many principals and university principal preparation programs find themselves in an uncomfortable dilemma. Principals face leadership pressures about what digital learning approaches to take and colleges of education are challenged with preparing future principals to embrace the potential of technology in teaching and learning. With the many roles of a principal, it is crucial that they are prepared with the skills and knowledge necessary to be technology leaders (Brockmeier, Sermon, & Hope, 2015).

The actions of school principals can be powerful multipliers of effective teaching and leadership (Manna, 2015; Richardson, Flora, & Bathon, 2013) and the principal's leadership is second only to the classroom teacher among all school-related factors that contribute to what students learn at school (Louis, Leithwood, Wahlstrom, & Anderson, 2010). As a result, the focus on technology leadership for current and future leaders is of great importance. This study is aimed at graduate candidates' perceived level of leadership preparedness of teaching, learning, and leading with technology. Only when these three aspects of schooling are considered simultaneously will educational technology impact the pedagogy (teaching), achievement (learning), and policy (leading) in schools (Grissom, Matani, & Woo, 2018).

A plethora of empirical studies have been conducted on the use of technology in education. There are examples of technologies used to enhance education and many examples of technology assisting teachers in advancing teaching and learning through higher-order thinking, and not regurgitation (Delgado, Wardlow, McKnight, & O'Malley, 2015; McKnight et al., 2016). Additionally, Evers, Van der Heijden, and Kreijns (2016) suggested that technology professional development should be further examined. But, in the midst of all the advancements and research, there is a shortage of conceptualization and empirical evidence around the perceptions of principal interns' preparedness of teaching, learning, and leading with technology (Schrum, Galizio, & Ledesma, 2011). And, school leaders face multiple challenges as they educate children in an increasingly technology-focused world (Kurtz, 2018).

Framework

The International Society for Technology in Education (ISTE) Standards for Administrators (2009) is the framework for this study. The ISTE standards are considered the *gold standard* framework for technology competencies for administrators (Arafeh, 2015). The purpose of the standards was to define what school leaders should know and be able to do to use technology effectively in teaching and learning. The standards also establish the benchmark for evaluating skills and knowledge school administrators and leaders need to support digital age learning, implement technology, and transform the instructional landscape (ISTE, 2018).

Purpose of the Study and Research Questions

The purpose of this study was to explore differences in perceived level of technology leadership preparation graduates of three different online graduate level leadership preparation programs offered at a regional university in Southeast Texas based on the five ISTE 2014 Standards for

Administrators – Visionary Leadership, Digital Age Learning Culture, Excellence in Professional Practice, Systemic Improvement, and Digital Citizenship (ISTE, 2014). The three programs were Master of Educational Administration, Master of Educational Technology Leadership, and a Principal Certification-only program. The 2014 ISTE Standards for Administrators were used in this study instead of the 2018 ISTE Standards for Education Leaders because the 2014 standards were the most current ISTE standards available when the participants began their programs of study.

The study was guided by the following research questions:

1. What is the perceived technology leadership preparedness level according to graduates from three different online graduate level leadership preparation programs offered at a regional university in Southeast Texas?
2. How do the types of programs differ in perceived technology leadership preparedness for graduates from three different online graduate level leadership preparation programs offered at a regional university in Southeast Texas?
3. What aspects of preparation programs were perceived to be most important for technology leadership preparedness according to graduates from three different online graduate level leadership preparation programs offered at a regional university in Southeast Texas?

Review of the Literature

McLeod and Richardson (2011) suggested that schools should have leaders who are prepared to lead as technology leaders. Researchers found that principals are the key to effective learning outcomes from the use of technology in schools (Anderson & Dexter, 2015; Brockmeier, Sermon, & Hope, 2015). Technology administrators have to be knowledgeable and responsive to rapidly changing technology and instructional needs (Hughes, 2018; Richardson et al., 2013). The review of the literature discusses educational technology standards and principals as digital leaders.

Technology Standards

General leadership standards define the expectations, provide specificity of key behaviors, and competencies of a successful school leader (NELP, 2018). Additionally, leadership standards are viable when districts actually use them to shape how they select, hire, train, and evaluate school leaders (Mendels & Mitgang, 2013). In 2001, the International Society for Technology in Education (ISTE) convened a group of stakeholders, including the National Association of Secondary School Principals (NSSA), National Association of Elementary School Principals (NAESP), America Association of School Administrators (AASA), National School Board Association (NSBA), North Central Regional Educational Laboratory, state departments of education, and university faculty, among other interested parties (Schrum et al., 2011). Led by ISTE, this team decided there was a need to promote "the idea that knowledge, practice, and specific skills were needed for administrators to be ready to support the appropriate use of technology in a school" (Schrum et al., 2011, p. 242). The technology standards were first published in 2002 as ISTE National Educational Technology Standards for Administrators (NETS-A).

In 2009, ISTE updated the NETS-A to the ISTE Standards for Administrators to take into account the widespread function of technology within the work-place and the necessity for

administrators to create learning environments. The ISTE Standards for Administrators consist of five technology leadership standards and 21 indicators that give more specific descriptions of the overall standard, thus providing administrators with a guide to achieving the standard.

The operational definitions for the five technology leadership standards are as follows:

Visionary leadership. ISTE (2014) Standard 1-Visionary Leadership focused on ways educational administrators inspire and lead the development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization. This includes collaboration with stakeholders to inspire and facilitate a shared vision of purposeful change maximizing the use of digital-age resources to meet and exceed learning goals; support effective instructional practice; and maximize performance of district and school leaders. Furthermore, visionary leaders must engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans aligned with a shared vision. This includes advocacy on local, state and national levels for policies, programs, and funding to support implementation of a technology-infused vision and strategic plan (ISTE, 2014).

Digital age learning culture. ISTE (2014) Standard 2 – Digital Age Learning Culture emphasized the need for educational administrators to create, promote, and sustain a dynamic, digital-age learning culture providing a rigorous, relevant, and engaging education for all students. The impetus is to ensure implementation of instructional innovation using technology that is focused on continuous improvement of digital-age learning. The standard outlines expectations for administrators to model and promote frequent and effective use of technology for learning; provide learner-centered environments equipped with technology and learning resources to meet the individual, diverse needs of all learners; and ensure effective practice in the study of technology and its infusion across the curriculum (ISTE, 2014). To extend this concept, administrators are expected to promote and participate in local, national, and global learning communities that stimulate innovation, creativity, and digital age collaboration.

Excellence in professional practice. ISTE Standard 3 – Excellence in Professional Practice established the responsibility of Educational Administrators to promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources to allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration. This is accomplished through facilitation and participation in learning communities that stimulate, nurture and support administrators, faculty, and staff in the study and use of technology. Administrators should promote and model effective communication and collaboration among stakeholders by using digital age tools; stay abreast of educational research and emerging trends regarding effective use of technology; and encourage evaluation of new technologies for their potential to improve student learning (ISTE, 2014).

Systemic improvement. ISTE (2014) Standard 4 – Systemic Improvement described the need for educational administrators to provide digital age leadership and management to continuously improve the organization. To do this, the effective use of information and technology resources to lead purposeful change and maximize the achievement of learning goals through the appropriate use of technology and media-rich resources is necessary. Specifically, administrators should collaborate to establish metrics, collect and analyze data, interpret results, and share findings to improve staff performance and student learning. With these core concepts in mind, administrators must recruit and retain highly competent personnel who use technology creatively and proficiently to advance academic and operational goals; establish and leverage strategic

partnerships to support systemic improvement; and establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching, and learning (ISTE, 2014).

Digital citizenship. ISTE (2014) Standard 5 – Digital Citizenship charged educational administrators to model and facilitate understanding of social, ethical and legal issues, and responsibilities related to an evolving digital culture to ensure equitable access to appropriate digital tools and resources to meet the needs of all learners. Leaders are directed to promote, model, and establish policies for safe, legal, and ethical use of digital information and technology; promote and model responsible social interactions related to the use of technology and information; and model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools (ISTE, 2014).

In 2018, ISTE released new standards for educational leaders highlighting key areas of impact. The current standards target the competencies and mindset required for leaders to leverage technology to transform learning, teaching and leading. The characteristics of effective technology leaders, which includes a focus on equity, digital citizenship, and visionary planning, are defined in the ISTE (2018) standards. The expected outcomes are meant to empower leaders to support teachers' use of technology in innovative ways to enrich teaching and learning. The educational leader is viewed as a system designer possessing the capacity to build teams and systems to implement, sustain and continually improve the use of technology to support learning. Further, strong technology leaders are connected learners modeling and promoting continuous professional learning for themselves and others.

Principals as Digital Leaders

For the country's over 90,000 public schools, principals play a pivotal role in determining how well technology is used in schools. With society becoming more and more reliant on technology, it is incumbent upon leaders to stay up-to-date with the latest technologies, respond to technology problems, decide what technology to buy, decide how digital tools can be used for teaching and learning, navigate pressures from technology companies and vendors – while managing the other responsibilities of a campus principal in order to create school cultures that are transparent, relevant, meaningful, engaging, and inspiring (Herold, 2018). Grady (2011) described the principal's role as a technology leader by providing a list of technology leadership tasks. These tasks include:

- Establish the vision and goals for technology.
- Carry the technology banner.
- Model the use of technology.
- Support technology use in the school.
- Engage in professional development opportunities that emphasize the use of technology and integration of technology in student learning.
- Provide professional development opportunities for teachers and staff that emphasize the use of technology and integration of technology in student learning.
- Secure resources to support technology use and integration in the school.
- Advocate for technology use that supports student learning.
- Be knowledgeable and supportive of national technology standards and promote attainment of the standards in the school.

- Communicate the uses and importance of technology in enhancing student learning experiences to the school's stakeholders.

Grady further emphasized the importance that principals model effective technology use. In addition, Grady added that leaders of technology encourage the use of technology in classroom instruction.

Sheninger (2019) identified Seven Pillars of Digital Leadership–specific areas embedded in the culture of schools that can be improved or enhanced through the use of technology. The pillars present a framework from which any leader can begin to harness the power of technology to change professional practice and initiate sustainable change. The Seven Pillars of Digital Leadership include: (a) student engagement, learning, and outcomes; (b) learning environment and spaces; (c) professional growth and learning; (d) communications; (e) public relations; (f) brandings; and (g) opportunity. Context for leaders to lead in different ways, necessary because of societal shifts and the increased demand on technological fluency, is described in the Pillars of Digital Leadership. The Pillars are also aligned to the ISTE Standards for Education Leaders (ISTE, 2018) and frameworks for school improvement in the twenty-first century.

Today, the world is a student's classroom because of the connectedness and ubiquitous nature of mobile devices. With this in mind, it behooves principal preparation programs to assess student perceptions of technology leadership preparation. Preparing principal candidates to lead digital technology implementation supports instructional shifts from traditional to new pedagogies which enables student-created content to be shared outside the traditional classroom and supports creation of engaging learning environments (Hakansson Lindqvist, 2019). It is critical school leaders are prepared to lead the development of engaged learning environments using digital tools and resources to create deeper learning experiences for professionals and students (Fullan & Quinn, 2016).

Methodology

A cross sectional survey method was used to investigate student perceptions of technology leadership preparation from two different master's and one certificate program offered online from a regional university in Southeast Texas. The university offers three online programs leading to principal certification. A 30-hour Master of School Administration degree with certification, a 36-hour Master of Educational Technology Leadership degree with certification and a non-degree, 18-hour Certification-only program. All students complete the same introductory course, four core courses, and a final capstone course. The school administration students take four additional administration courses and the educational technology leadership students take six additional educational technology courses. Students from all three programs follow the same 260-hour internship requirements.

Population and Participants

The defined population for this study were online graduate students enrolled in their capstone course, EDLD 5398 Internship for Principals between July and December 2018 at a regional, doctoral granting university in Southeast Texas. The students enrolled in this course were pursuing a Master of School Administration degree, Master of Educational Technology Leadership degree or enrolled in the Principal Certification-only program. The enrollment of the university is approximately 14,700. The research population targeted for this study was 811 online graduate

students who were enrolled in the capstone course during the second summer and three Fall semesters. The students were surveyed in the last week of the final capstone course of their respective program. Of the 811 students, 471 students completed the survey for a response rate of 58% - Master of School Administration (n = 285), Master of Educational Technology Leadership students (n = 27), Principal Certification-only students (n = 156). Three respondents did not provide gender information; only one respondent did not provide remaining demographic information. Data displayed in Table 1 indicate the participants demographic information by program type.

Table 1
Participants' Demographic Information

	Program Type			
	PC	EA	ET	Total
	n(%)	*n*(%)	*n*(%)	*n*(%)
Gender				
Male	23(4.7)	82(28.8)	9(33.3)	114(24.4)
Female	133(85.3)	203(71.2)	18(66.7)	354(75.6)
Age				
Twenties	7(4.5)	46(16.1)	7(25.9)	60(12.8)
Thirties	66(42.0)	129(45.3)	11(40.7)	206(43.9)
Forties	53(33.8)	93(32.6)	5(18.5)	151(32.2)
Fifty+	31(19.7)	17(6.0)	4(14.8)	52(11.1)
Ethnicity				
White	83(52.9)	198(69.5)	12(44.4)	293(62.5)
Black/AA	37(23.6)	35(12.3)	4(14.8)	76(16.2)
Hispanic	30(19.1)	43(15.1)	10(37.0)	83(17.7)
Asian	1(0.6)	2(0.7)	0(0.0)	3(0.6)
American Indian or Alaska Native	2(1.3)	1(0.4)	0(0.0)	3(0.6)
Native Hawaiians and Other Pacific Islanders	0(0.0)	1(0.4)	0(0.0)	3(0.6)
Two or more	4(2.5)	5(1.8)	1(3.7)	10(2.1)
Level/Location				
Elementary	54(34.4)	112(39.2)	9(33.3)	175(37.2)
Middle	31(19.7)	60(21.0)	7(25.9)	98(20.9)
HS	41(26.1)	91(31.8)	6(22.2)	138(29.4)
K-12 (All Inclusive)	7(4.5)	10(3.5)	1(3.7)	18(3.8)
Central Office	22(14.0)	12(4.2)	3(11.1)	37(7.9)
Other	2(1.3)	1(0.3)	1(3.7)	4(0.9)
School Location				
Urban	54(34.4)	75(26.2)	9(33.3)	138(29.4)
Suburban	75(47.8)	137(47.9)	11(40.7)	223(47.4)
Rural	28(17.8)	74(25.9)	7(25.9)	109(23.2)
Current role on your campus				
Teacher	59(37.8)	137(47.9)	15(55.6)	211(45.0)
Teacher Leader	30(19.2)	86(30.1)	5(18.5)	121(25.8)
Counselor	5(3.2)	0(0.0)	0(0.0)	5(1.1)
Curriculum Director/Coordinator	27(17.3)	24(8,4)	3(11.1)	54(11.5)
Campus Administrator	6(3.8)	21(7.3)	1(3.7)	28(6.0)

Campus Technology Coordinator/Specialist	2(1.3)	2(0.7)	2(7.4)	6(1.3)
Central Office Administrator	5(3.2)	3(1.0)	0(0.0)	8(1.7)
District Technology Director/Coordinator	0(0.0)	1(0.3)	1(3.7)	2(0.4)
Other	22(14.1)	12(4.2)	0(0.0)	34(7.2)
Level you would rate technology integration at your location				
Very Low	2(1.3)	2(0.7)	2(7.4)	6(1.3)
Low	16(10.2)	17(5.9)	4(14.8)	37(7.9)
Medium	64(40.8)	139(48.6)	11(40.7)	214(45.5)
High	52(33.1))	109(38.1)	9(33.3)	170(36.2)
Very High	23(14.6)	19(6.6)	1(3.7)	43(9.1)

Instrument

This study was approved by the Institutional Review Board of a regional university in southeast Texas. All participants consented to be a part of this study by agreeing to participate. A three-part structured questionnaire was used to collect the following: a) demographic information and a question regarding technology integration at the location where the respondent worked; b) the Principal Technology Leadership Assessment (PTLA); and c) open-response questions regarding specific strengths and recommendations in meeting the ISTE standards.

The Principal Technology Leadership Assessment (PTLA) is a freely available survey developed and psychometrically validated by the American Institutes for Research as part of a grant CASTLE received from the U. S. Department of Education Fund for the Improvement of Postsecondary Education (FIPSE). The current PTLA survey is aligned to the ISTE Standards for Administrators. The original 2002 PTLA was modified to align with the ISTE Standards for Administrators. The PTLA consists of 21 questions with a five-point Likert scale from "Not at all" to "Fully." The survey consists of five constructs – Visionary Leadership (Questions 1-3), Digital Age Learning Culture (Questions 4-8), Excellence in Professional Practice (Questions 9-12), Systemic Learning (13-17), Digital Citizenship (18-21).

Reliability analyses for the instrument suggested that both the subscales and overall instrument functioned reliably with high scores of internal consistency. The subscales had Cronbach's *Alpha* levels ranging from .87 (Visionary Leadership scale) to .93 (Digital Age Learning Culture scale) and overall the instrument had a Cronbach's *Alpha* of .97.

Analysis and Findings

The item responses from the PTLA were analyzed using crosstabulation tables and chi-squares for individual items in each of the five areas assessed. Additionally, a MANOVA was conducted to test if there were differences in responses for each subscale by program type. Open-response questions used to investigate the specific strengths and recommendations in meeting the ISTE standards, experiences that were not of assistance, and new experiences that should be added to the preparation program were reviewed and analyzed for themes.

Perceived Technology Preparedness by Type of Program

To investigate the perceived technology leadership preparedness level by graduates from the three different programs, an item-level analysis was conducted with crosstabs and chi-square in SPSS.

The crosstabs allowed researchers to see response patterns for each item and chi-square tested if there was an association between the responses and type of program from which the participants graduated. Based on the chi-squares, there was no statistically significant relationship between the items in each domain and the type of program in which respondents participated. Tables 2-6 show the number and percentage of respondents from each program and how they answered each item for each domain.

Table 2
Item Responses by Program Type for Visionary Leadership
N=471

Item	Program Type		
	PC (*N*= 158) *n*(%)	EA (*N*=286) *n*(%)	ET (*N*=27) *n*(%)
1. Facilitate a change that maximizes learning goals using digital resources.			
Not at All	--	1(0.7)	--
Minimally	11(7.0)	21(7.3)	--
Somewhat	61(38.6)	95(33.2)	5(18.5)
Significantly	68(43.0)	140(49)	18(66.7)
Fully	18(11.4)	29(10.1)	4(14.8)
2. Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans.			
Not at All	--	3(1.0)	--
Minimally	8(5.1)	19(6.6)	--
Somewhat	55(34.8)	101(35.3)	7(25.9)
Significantly	75(47.5)	130(45.5)	15(55.6)
Fully	20(12.7)	33(11.5)	5(18.5)
3. Promote programs and funding to support implementation of technology-infused plans.			
Not at All	2(1.3)	5(1.7)	--
Minimally	18(11.4)	28(9.8)	2(7.4)
Somewhat	50(30.6)	98(34.3)	9(33.3)
Significantly	67(42.4)	124(43.4)	13(48.1)
Fully	21(13.3	31(10.8)	3(11.1)

Table 3
Item Responses by Program Type for Digital Age Learning Culture
N=471

Item	Program Type		
	PC (*N*= 158) *n*(%)	EA (*N*=286) *n*(%)	ET (*N*=27) *n*(%)
4. Ensure instructional innovation focused on continuous improvement of digital learning.			
Not at All	--	2(0.7)	--
Minimally	10(6.3)	19(6.6)	--
Somewhat	54(34.2)	91(31.8)	4(14.8)
Significantly	75(47.5)	139(48.6)	17(63.0)

Fully	19(12.0)	35(12.2)	6(22.2)
5. Model and promote the frequent and effective use of technology for learning.			
Not at All	2(1.3)	3(1.0)	--
Minimally	8(5.1)	10(3.5)	--
Somewhat	41(25.9)	79(27.6)	3(11.1)
Significantly	83(52.5)	135(47.2)	17(63.0)
Fully	24(15.2)	59(20.6)	7(25.9)
6. Provide learning environments with technology and learning resources to meet the diverse needs of all learners.			
Not at All	1(0.6)	1(0.3)	--
Minimally	10(6.3)	15(5.2)	--
Somewhat	40(25.3)	75(26.2)	6(22.2)
Significantly	83(52.5)	147(51.4)	15(55.6)
Fully	24(15.2)	48(16.8)	6(22.2)
7. Ensure effective practice in the study of technology and its infusion across the curriculum			
Not at All	3(1.9)	4(1.4)	--
Minimally	10(6.3)	20(7.0)	--
Somewhat	52(32.9)	92(32.2)	7(25.9)
Significantly	73(46.2	132(46.2)	15(55.6)
Fully	20(12.7)	38(13.3)	5(18.5)
8. Promote and participate in learning communities that stimulate innovation, creativity, and digital collaboration			
Not at All	1(0.6)	4(1.4)	--
Minimally	9(5.7)	15(5.2)	1(3.7)
Somewhat	34(21.5)	75(26.2)	1(3.7)
Significantly	80(50.6)	135(47.2)	13(48.1)
Fully	34(21.5)	57(19.9)	12(44.4)

Table 4

Item Responses by Program Type for Excellence in Professional Practice

N=471

Item	Program Type		
	PC (*N*= 158) *n*(%)	EA (*N*=286) *n*(%)	ET (*N*=27) *n*(%)
9. Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration.			
Not at All	2(1.3)	1(0.3)	--
Minimally	9(5.7)	22(7.7)	1(3.7)
Somewhat	54(34.2)	92(32.2)	7(25.9)
Significantly	65(41.1)	125(43.7)	14(51.9)
Fully	28(17.7)	46(16.1)	5(18.5)
10. Facilitate and participate in learning communities that stimulate and support faculty in the study and use of technology.			
Not at All	1(0.6)	2(0.7)	--

Minimally	9(5.7)	19(6.6)	--
Somewhat	45(28.5)	81(28.3)	6(22.2
Significantly	75(47.5)	132(46.2)	14(51.9)
Fully	28(17.7))	52(18.2)	7(25.9)
11. Promote and model effective communication and collaboration among stakeholders using digital-age tools.			
Not at All	1(0.6)	1(0.3)	--
Minimally	7(4.4)	12(4.2)	--
Somewhat	43(27.2)	71(24.8)	7(25.9)
Significantly	69(43.7)	142(49.7)	12(44.4)
Fully	38(24.1)	60(21.0)	8(29.6)
12. Prepared to stay up-to-date on educational research and emerging trends of effective use of technology and encourage new technologies for potential to improve student learning.			
Not at All	1(0.6)	3(1.0)	--
Minimally	10(6.3)	21(7.3)	--
Somewhat	49(31.0)	78(27.3)	4(14.8)
Significantly	72(45.6)	134(46.9)	14(51.9)
Fully	26(16.5)	50(17.5)	9(33.3)

Table 5
Item Responses by Program Type for Systematic Improvement
N=471

Item	Program Type		
	PC (*N*= 158) *n*(%)	EA (*N*=286) *n*(%)	ET (*N*=27) *n*(%)
13. Lead purposeful change to reach learning goals through the use of technology and media-rich resources.			
Not at All	--	3(1.0)	--
Minimally	6(3.8)	18(6.3)	--
Somewhat	59(37.3)	95(33.2)	7(12.9)
Significantly	74(46.8)	138(48.3)	15(55.6)
Fully	19(12.0)	32(11.2)	5(18.5)
14. Collaborate to establish metrics, collect and analyze data, and share findings and results to improve staff performance and student learning.			
Not at All	4(2.5)	2(0.7)	--
Minimally	11(7.0)	18(6.3)	--
Somewhat	39(24.7)	65(22.7)	8(29.6)
Significantly	83(52.5)	147(51.4)	14(51.9)
Fully	21(13.3)	54(18.9)	5(18.5)
15. Recruit highly competent personnel who use technology to advance academic and operation goals.			
Not at All	5(3.2)	11(3.8)	--
Minimally	10(6.3)	27(9.4)	1(3.7)
Somewhat	51(32.3)	84(29.4)	8(29.6)
Significantly	66(41.8)	116(40.6)	12(44.4)

Fully	26(16.5)	48(16.8)	6(22.2)
16. Establish and leverage strategic partnerships to support systemic improvement.			
Not at All	5(3.2)	5(1.7)	--
Minimally	14(8.9)	22(7.7)	3(11.1)
Somewhat	59(37.3)	99(34.6)	9(33.3)
Significantly	64(40.5)	121(42.3)	9(33.3)
Fully	20(12.7)	39(13.6)	6(22.2)
17. Establish and maintain a robust infrastructure for technology to support management, operations, teaching, and learning.			
Not at All	5(3.2)	5(1.7)	--
Minimally	17(10.8))	24(8.4)	3(11.1)
Somewhat	60(38.0)	103(36.0)	5(18.5)
Significantly	60(38.0)	121(42.3)	16(59.3)
Fully	16(10.1)	33(11.5)	3(11.1)

Table 6
Item Responses by Program Type for Digital Citizenship
N=471

Item	Program Type		
	PC (*N*= 158) *n*(%)	EA (*N*=286) *n*(%)	ET (*N*=27) *n*(%)
18. Ensure access to appropriate digital tools and resources to meet the needs of all learners.			
Not at All	1(0.6)	3(1.0)	--
Minimally	3(1.9)	12(4.2)	--
Somewhat	55(34.8)	70(24.5)	3(11.1)
Significantly	68(43.0)	141(49.3)	16(59.3)
Fully	31(19.6)	60(21.0)	8(29.6)
19. Promote, model, and establish policies for safe, legal, and ethical use of digital information and technology.			
Not at All	--	2(0.7)	--
Minimally	3(1.9)	7(2.4)	--
Somewhat	44(27.8)	55(19.2	3(11.1)
Significantly	73(46.2)	145(50.7)	14(51.9)
Fully	38(24.1)	77(26.9)	10(37.0)
20. Promote and model responsible social interactions related to the use of technology and information.			
Not at All	1(0.6)	1(0.3)	--
Minimally	7(4.4)	12(4.2)	--
Somewhat	43(27.2)	71(24.8)	7(25.9)
Significantly	69(43.7)	142(49.7)	12(44.4)
Fully	38(24.1)	60(21.0)	8(29.6)
21. Model and facilitate the development of a shard cultural understanding and involvement of global issues through communication and collaboration tools.			

Not at All	--	1(0.3)	--
Minimally	2(1.3)	8(2.8)	--
Somewhat	37(23.4)	54(18.9)	2(7.4)
Significantly	76(48.1)	135(47.2)	13(48.1)
Fully	43(27.2)	88(30.8)	12(44.4)

Although there were no meaningful relationships based upon the findings from the chi-squares, an interesting observation from the crosstabulations was that very few graduates from the educational technology program responded with *Not at All* or *Minimally* for the majority of items. An exception was for the Systematic Improvement domain, in which graduates from all programs had respondents indicating a minimal demonstration of behaviors measured.

Differences in Preparation by Program

Another question guiding the study was whether or not there was a difference between the types of programs and participants perceived preparedness for technology leadership. To answer this question, grand means were calculated for each of the five domains measured to create the dependent variable, and a MANOVA was used to test for programmatic differences.

Based upon the analysis, there was a statistically significant difference between programs and their performance in two of the five domains: *Preparedness to Create a Digital Learning Culture* and *Digital Citizenship.* For the statistically significant difference between program types and preparation to create a digital learning culture [$F(2, 471)= 3.16$, $p=.04$, $\eta_p^2=.01$], a Bonferroni post hoc analysis showed statistically significant differences between the preparedness of the Ed Tech program ($N= 27$, $M= 3.10$, $SD= .52$) and both the Principal Certification program ($N= 158$, $M= 2.73$, $SD= .72$) and Ed Admin program ($N= 286$, $M= 2.74$, $SD= .75$). For the statistically significant difference between program types and preparation to create digital citizens [$F(2, 471)= 3.41$, $p=.03$, $\eta_p^2=.01$], once again a Bonferroni post hoc analysis showed statistically significant differences between the preparedness of the Ed Tech program ($N= 27$, $M= 3.23$, $SD= .57$) and the Principal Certification program ($N= 158$, $M= 2.88$, $SD= .71$). Despite the statistically significant differences, it should be noted that the magnitude of the effect for programmatic differences, as measured by the partial eta squared, was quite small.

Of greater practical significance was that the Ed Tech program was the only program to have grand means greater than or equal to 3 (i.e., *Significantly Prepared*) in any of the domains measured. Participants in the Ed Tech program had grand means greater than or equal to 3 in *Preparedness to Create a Digital Learning Culture* ($N= 27$, $M= 3.10$, $SD= .52$), *Excellence in Professional Practice* ($N= 27$, $M= 3.03$, $SD= .58$), and *Digital Citizenship* ($N= 27$, $M= 3.23$, $SD= .57$). Participants in the Principal Certification and Educational Administration programs had averages that ranged between 2.6 to 2.8. The two domains that had the lowest grand means for all the programs were preparedness for *Visionary Leadership* and *Systematic Improvement*.

Most Important Aspects of Preparation Programs for Technology Leadership

In order to determine what aspects of the preparation programs were perceived to be the most meaningful in preparing candidates for technology leadership, three open-response questions were asked in which participants could reflect upon their entire program of study. Respondents were also asked to list experiences throughout their program that assisted in progress toward meeting

the ISTE technology standards, experiences that were not of assistance, and new experiences that should be added to the preparation program. The review and analysis of the open-response questions resulted in four major themes. In order to be included as a major theme, the concept, key idea, or observation represented by the major theme had to be expressed in some depth by multiple participants to the extent that it appeared to be a common assumption.

Responses indicated that a comprehensive understanding of the standards for technology leadership (ISTE) was essential to help guide choices of readings, research, and internship activities. Standards not only gave students the 'bigger picture' but also the underlying meaning of course assignments and internship activities.

A second theme that emerged was students found that researching, observing, and interviewing experienced practitioners and experts in technology integration was essential to their understanding and ability to apply concepts and tools for instruction and administration. Most often cited beneficial experiences included:

- Interviewing/shadowing district and school technology directors/specialists.
- Observing/interviewing competent classroom teachers integrating technology.
- Observing/interviewing students skilled in the use of new technologies.
- Following technology experts on Twitter.
- Viewing TED Talks lectures.

The third theme found was that students not only wanted to know about technology but to use new and different programs and tools in coursework and intern activities. Responses indicated the appreciation for freedom and flexibility in presenting course assignments and interacting with peers. Most often cited beneficial experiences included:

- Use of online chats and discussion boards.
- Video messaging.
- Web Conferences.
- Google Drive for group case studies.
- Video, PowerPoint, spreadsheets.
- Animoto, Prezi, Flipgrid, Facebook, etc.

The final theme found indicated the crucial need for new entry-level administrators to understand and have the ability to take a leadership role in technology. Most often cited beneficial experiences included:

- Review and critique school/district technology policy, plans, and budgets.
- Steps principals take to select and purchase technology and attain buy-in for integration.
- Survey teachers for what technology applications are effective, what is lacking, and what is needed.
- Lead a professional learning community or book study on technology integration.
- Design a technology integration professional development activity for faculty.
- Share responsibility for the school website and social media plan.

Conclusions, Implications, and Recommendations

When educational leadership faculty recognize the importance of technology preparation and foster technology integration in their principal preparation programs, it is time to assess what the programs have achieved in preparing future educational leaders. The overall findings of this study indicated that regardless of the type of educational leadership preparation program (30-hour

Master of School Administration, 36-hour Master of Educational Technology Leadership or 18-hour Principal Certification-Only program) there was no statistically significant relationships between the items in each domain and the type of program in which respondents participated. The two ISTE domains with the lowest means were preparation of *Visionary Leadership* and *Systematic Improvement.* However, there was a statistically significant difference between programs and their performance in two of the five ISTE Standard domains: *Preparedness to Create a Digital Learning Culture* and *Digital Citizenship.* There was a statistically significant difference between the preparedness of the Educational Technology Leadership program and the Education Administration program in the *Preparedness to Create a Digital Learning Culture* and *Digital Citizenship.* Also, there was a statistically significant difference between the preparedness of the Ed Tech program and the Principal Certification program in the *Preparedness to Create a Digital Learning Culture* and *Digital Citizenship.* It should be noted that the differences may be due to the different course completions and overall, the magnitude of differences was quite small. More important was that for all programs, the two domains that had the lowest means were preparedness for *Visionary Leadership* and *Systematic Improvement.* Program developers need to recognize the program alignment to technology standards and continue to update courses in these areas for the benefit of the candidates. Also, a review of the four themes identified in this study provide useful information to individuals charged with designing educational preparation program content.

The implications for principal preparation programs are to find ways to address each of the standards. It is recommended that programs adhere to the new ISTE standards (ISTE, 2018) or standards from other national or state organizations. Program goals should be established, and plans developed to challenge aspiring administrators to higher standards. Regardless of the respected standards used, students desire a framework of expectations for technology and a basis for understanding the purpose of assigned course and intern activities. Preparation programs are advised to find ways to stay abreast of new technology innovations. This can be from faculty involvement in professional technology organizations, technology consultants, guest speakers, or the use of practitioner advisory groups made up of school district technology directors or specialists. Program and course reviews involving technology preparation must occur every semester for any standards adopted.

Implications for future school principals include the need for them to excel in professional practice and stay up-to-date with emerging trends of technology. Future principals must become visionary leaders and promote an environment that empowers educators to enhance student learning through digital resources (Anderson & Dexter, 2015; ISTE, 2014).

Based on student comments, it is highly recommended that preparation programs consider greater use of activities anchored in real-life practice. For example, allow students to submit assignments in multiple formats and allow for a certain degree of freedom in the use of technology tools, given the wide range of student experience and expertise. Additionally, programs should utilize a variety of student-to-student and professor-to-student communication tools and programs. This would allow for traditional preparation program courses (e.g., law, finance, etc.) to also be a source of experiential learning in technology.

The National Educational Technology Plan (U.S. Department of Education, 2017) is written to reflect that "technology is a powerful tool for transforming learning" (p. 3) and describes that successful implementation relies on strong leadership capable of creating a shared vision. A final implication of this study is that regardless of having a technology specialist or director, the principal is ultimately responsible for many aspects of technology integration. It is imperative to prepare candidates for the role of the principal in collaborative leadership, personalized student

learning, technology infrastructure, technology staff development, budgeting, purchasing, evaluation, and modeling the appropriate and effective use of technology. The larger takeaway from this study is that if educational leadership programs want to develop visionary educational leaders who can lead technology-infused schools, then principal preparation programs cannot ignore aligning coursework with the technology standards.

The study has several limitations: student respondents participated in three different graduate programs at one university, responses were based on their perceptions and likely influenced by their participation in an existing program, students in the Educational Technology Leadership program take technology focused courses in their program, and ISTE Standards for Administrators were used as these were current standards when students surveyed began their program.

Although this study was conducted in one educational leadership program in Southeast Texas, results of the study have broader implications. Other educational leadership programs nation wide could perform a similar study and the results of those studies compared to similar studies. Future research should be conducted by university educational preparation programs in other states and geographical areas of the country in order to compare study findings. As this study was a quantitative, non-experimental study, it is recommended that future studies include an experimental approach in examining similar data at another university. Future research should examine leadership preparation of online graduate students based upon the most current ISTE Standards applicable to students throughout their program course of study. Finally, while focus is placed on preparing educational administrators to be technology leaders, attention needs to focus on technology readiness of faculty members who participate in delivering the preparation programs as well.

References

Anderson, R. E., & Dexter, S. (2015). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly, 41*(1), 49-82.

Arafeh, S. (2015). Educational technology leadership for education leaders: An integrated technology model. In N. M. Haynes, S. Arafeh, & C. McDaniels (Eds.). *Educational leadership: Perspectives on perspectives on preparation and practice* (pp. 253-269). Lanham, MD: University Press.

Brockmeier, L. L., Sermon, J. M., & Hope, W. C. (2015). Principals' relationship with computer technology. *National Association of Secondary School Bulletin, 89*(643), 45-63.

Delgado, A. J., Wardlow, L., McKnight, K., & O'Malley, K. (2015). Educational technology: A review of the integration, resources, and effectiveness of technology in K-12 classrooms. *Journal of Information Technology Education: Research, 14,* 397-416.

Evers, A., Van der Heijden, B., & Kreijns, K. (2016). Organizational and task factors influencing teachers' professional development at work. *European Journal of Training and Development, 40*(1), 36-55. http://dx.dor.org/10.1108/ejtd-03-2015-0023

Fullan, M., & Quinn, J. (2016). *Coherence: The right drivers in action for schools, districts, and systems.* Thousand Oaks, CA: Corwin.

Grady, M. L. (2011). *Leading the technology-powered school.* Thousand Oaks, CA: Corwin.

Grissom, J. A., Matani, H., & Woo, D. S. (2018). Principal preparation programs and principal outcomes. *Education Administration Quarterly, 55*(1), 73-115.

Hakansson Lindqvist, M. (2019). School leaders' practices for innovative use of digital technologies in schools. *British Journal of Educational Technology, 50*(3), 1226-1240. doi:10.1111/bjet.12782

Herold, B. (2018, April 17). *What principals really think about tech.* Retrieved from Education Week website: https://www.edweek.org/ew/articles/2018/04/18/what-principals-really-think-about-tech.html

Hughes, L. (2018). What your technology administrator needs you to know. *Texas Association of School Administrators Professional Journal, 33*(4), 20-22.

International Society for Technology in Education (ISTE). (2014). *ISTE standards for administrators.* Retrieved from the ISTE website: https://id.iste.org/docs/pdfs/20-14_ISTE_Standards-A_PDF.pdf

International Society for Technology in Education (ISTE). (2018). *ISTE standards for education leaders.* Retrieved from the ISTE website: https://www.iste.org/standards/for-education-leaders

Kurtz, H. (2018). School leaders and technology: Results from a national survey. *Education Week Research Center.* Bethesda, MD: Editorial Projects in Education.

Louis, K. S., Leithwood, K., Wahlstrom, K., & Anderson, D. (2010). *Learning from leadership: Investigating the links to improved student learning.* Retrieved from Wallace Foundation website: https://www.wallacefoundation.org/knowledge-center/pages/investigating-the-links-to-improved-student-learning.aspx

Manna, P. (2015). *Developing excellent school principals to advance teaching and learning: Considerations for state policy.* Retrieved from the Wallace Foundation website: https://www.wallacefoundation.org/knowledge-center/Documents/Developing-Excellent-School-Principals.pdf

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of Research on Technology in Education, 48*(3), 194-211.

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

Mendels, P., & Mitgang, L. D. (2013). Creating strong principals. *Educational Leadership, 70*(7), 22-29.

National Policy Board for Educational Administration (NPBEA). (2018). *National Educational Leadership Preparation (NELP) Program Standards - Building Level*. Retrieved from: www.npbea.org

Richardson, J. W., Flora, K., & Bathon, J. (2013). Fostering a school technology vision in school leaders. *NCPEA International Journal of Educational Leadership Preparation, 8*(1), 144-161.

Schrum, L., Galizio, L., & Ledesma, P. (2011). Educational leadership and technology integration: An investigation into preparation, experiences, and roles. *Journal of School Leadership, 21*(2), 241-261.

Sheninger, E. (2019). *Digital leadership: Changing paradigms for changing times.* (2nd ed.). Thousand Oaks, CA: Corwin.

U.S. Department of Education. (2017). *Reimaging the role of technology in education: 2017 national education technology plan update.* Retrieved from https://tech.ed.gov/files/2017/01/NETP17.pdf