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UTAH ELEMENTARY SCHOOL PRINCIPALS' PREPARATION AS  
TECHNOLOGY LEADERS

by

Nathan L. Esplin

A dissertation submitted in partial fulfillment  
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Education

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UTAH STATE UNIVERSITY  
Logan, Utah

2017

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## ABSTRACT

Utah Elementary School Principals' Preparation as Technology Leaders

by

Nathan L. Esplin, Doctor of Education

Utah State University, 2017

Major Professor: Dr. Courtney Stewart  
Department: Teacher Education and Leadership

The rapidly expanding use of technology in education has brought about the need for principals to be prepared as technology leaders. Although, there is a need for principals to be prepared as technology leaders, many currently are not prepared for this role. It is crucial that principals are prepared in order ability to lead their school in successful technology integration. The primary purpose of this quantitative study was to determine the perceived level of technology leadership preparation of Utah elementary principals using the International Society for Technology in Education (ISTE) Standards for Administrators.

In addition to the study's primary purpose, the study identified the types and quantity of professional development principals are receiving and how this professional development relates to the principals' levels of technology leadership. In addition, this study concluded whether or not the perceived technology leadership preparedness level of Utah principals correlates with the number of hours spent in technology leadership

training. Furthermore, the study compared differences in technology leadership preparation levels based on principal characteristics.

Literature shows that technology leadership research is scarce. The findings from this study will help fulfill some of the need for additional technology leadership research. In addition, the findings can help educators have a better understanding of how to prepare principals to be effective technology leaders.

The data for this study were collected from 129 Utah elementary school principals using the 2009 Principals Technology Leadership Assessment (PTLA). This survey used the 2009 ISTE Standards for Administrators as the framework. The results were analyzed using descriptive statistics, Pearson correlation, *t* test, ANOVA, and qualitative coding. The findings provide evidence that Utah elementary school principals are not adequately prepared to lead as technology leaders. Furthermore, a technology leadership professional development model has been designed to further assist educators.

(162 pages)

## PUBLIC ABSTRACT

### Utah Elementary School Principals' Preparation as Technology Leaders

Nathan L. Esplin

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## DEDICATION

To my family: Katherine (Kat), Brekkan, Jace, Kody, Logan, Callie, and Cooper

3 John 1:4



## ACKNOWLEDGMENTS

I would first like to thank my family for their love and support as I pursued a doctorate degree. My wonderful wife, Katherine (Kat), has stood by me and supported me during the many years of graduate school. Thank you, Kat, for taking care of things at home while I was away. To my kids, Brekkan, Jace, Kody, Logan, Callie, and Cooper, you all are fantastic kids. Thanks for being so obedient and happy. Knowing that you were okay made it easier for me to be away when I needed to do my homework.

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Nathan L. Esplin

## CONTENTS

	Page
ABSTRACT.....	iii
PUBLIC ABSTRACT .....	v
DEDICATION .....	vii
ACKNOWLEDGMENTS .....	viii
LIST OF TABLES .....	xii
LIST OF FIGURES .....	xiv
 CHAPTER	
I. INTRODUCTION .....	1
Problem Statement .....	7
Purpose of the Study .....	8
Significance of the Problem.....	9
Research Questions .....	11
Conclusion .....	11
II. LITERATURE REVIEW .....	13
Education Standards and Technology Leadership Models .....	13
School Leadership.....	24
Technology Leadership.....	29
Professional Development .....	33
Technology Leadership Preparation .....	36
Conclusion .....	42
III. METHODOLOGY .....	44
Research Questions .....	45
Participants.....	45
Instrumentation .....	46
Data Collection .....	47
Data Analysis .....	48
Conclusion .....	51

IV.	RESULTS AND ANALYSIS.....	52
	Response Rate .....	53
	Participants.....	53
	Research Findings .....	54
	Summary of Findings.....	72
V.	DISCUSSION .....	75
	Introduction.....	75
	Technology Leadership Preparation .....	77
	Developing Technology Leadership Skills .....	80
	Technology Leadership Preparation Correlation .....	83
	Technology Leadership Preparedness for Participant Characteristics.....	85
	Discussion of Open-Ended Responses.....	86
	Implications.....	90
	Recommendations for Practical Implications .....	92
	Recommendations for Future Research .....	94
	Limitations .....	96
	Conclusion .....	96
	REFERENCES .....	98
	APPENDICES .....	106
	Appendix A: 2009 ISTE Standards for Administrators.....	107
	Appendix B: 2009 Principals Technology Leadership (PTLA) .....	110
	Appendix C: Additional Tables and Figures .....	120
	Appendix D: Permissions .....	135
	CURRICULUM VITAE.....	146

## LIST OF TABLES

Table	Page
1. Component Detail of Arafeh's Technology Leadership Model .....	23
2. Method and Analysis Design for Each Research Question .....	50
3. Descriptive Statistics for Each ISTE Standard for Administrators.....	55
4. Frequency of Technology Leadership Professional Development .....	61
5. Frequency of Technology Leadership Professional Development Hours .....	62
6. ANOVA for Level of Priority for Technology Integration .....	65
C1. Demographics of Participants .....	121
C2. Technology Leadership Preparation Level for Visionary Leadership.....	122
C3. Technology Leadership Preparation Level for Digital Age Learning Culture ..	123
C4. Technology Leadership Preparation Level for Excellence in Professional Practice.....	124
C5. Technology Leadership Preparation Level Statistics for Systematic Improvement .....	125
C6. Technology Leadership Preparation Level for Digital Citizenship .....	126
C7. ANOVA for Principals Age.....	128
C8. ANOVA for Years as an Elementary School Principal .....	129
C9. ANOVA for School Location Type .....	129
C10. ANOVA for Student Enrollment .....	130
C11. ANOVA for Highest Degree Held.....	131
C12. ANOVA for Participants University Where Administrative License Was Completed .....	132

Table	Page
C13. ANOVA for Level of Priority for Technology Integration .....	133

## LIST OF FIGURES

Figure	Page
1. Anderson and Dexter model of technology leadership.....	17
2. Davies extended model of educational technology leadership.....	19
3. Flanagan and Jacobsen role and responsibilities and goals of technology integration .....	20
4. Arafeh's technology leadership model .....	21
5. Technology leadership level for Utah Educational Endorsement.....	64
6. Technology leadership level for level of priority for technology integration....	65
7. Technology leadership professional development model.....	93
8. Technology leadership professional development detailed model .....	95
C1. Histogram of principals' visionary leadership responses with normal curve ....	122
C2. Histogram of principals digital age learning culture responses with normal curve.....	123
C3. Histogram of principals' excellence in professional practice responses with normal curve .....	124
C4. Histogram of principals' systematic improvement responses with normal curve.....	125
C5. Histogram of principals' digital citizenship responses with normal curve .....	126
C6. Principals frequency of technology leadership professional development hours.....	127
C7. Technology leadership level for principals age categories .....	127
C8. Technology leadership level for years as an elementary school principal.....	129
C9. Technology leadership level for school location type .....	130

Figure	Page
C10. Technology leadership level for student enrollment.....	131
C11. Technology leadership level for highest degree .....	132
C12. Technology leadership level for university attended .....	133
C13. Technology leadership level for level of priority for technology integration....	134
C14. Technology leadership level for Utah Educational Technology Endorsement .....	134



## **CHAPTER I**

### **INTRODUCTION**

Elementary school principals must be prepared for their role of technology leader. Principals cannot remain naïve about technology and still function as effective leaders (Mehlinger & Powers, 2002). The use of technology in both society and education is becoming more prevalent and impacts all aspects of individual lives (Acree & Fox, 2015). Consequently, providing strong technology leadership has become an essential part of the principalship. In order for principals to become competent technology leaders, they must first be prepared for this important role. However, most principals are not currently prepared for this role. With the many roles that principals must take on, it is crucial that they are also prepared with the skills and knowledge necessary to be technology leaders (Brockmeier, Sermon, & Hope, 2005).

A principal's ability to lead is critical for successful technology integration. Research has found that leadership is the single most important factor in successful technology integration (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2012). Principals need preparation in order to successfully lead schools in the use of technology. A study conducted by Dawson and Rakes (2003) discovered that with increased technology training for principals, schools make more progress in technology integration. In addition, their study suggested, "as principals become more adept at guiding technology integration, more efficient and effective technology use should become prevalent in schools" (p. 43). The principals' increased knowledge also led to more support of the teachers in their attempts to effectively use technology in their classrooms.

Theodore Creighton (2003) described technology leadership in his book *The Principal as Technology Leader*. Creighton said, “The principal as technology leader blends the goals of technology implementation into the total mix of instructional leadership” (p. 88). Creighton also mentioned that as a technology leader, principals transform attitudes, thinking, behaviors, and performance in regards to use of technology in teaching and learning.

Marilyn Grady (2011) has further described the principal’s role as a technology leader by providing a list of technology leadership tasks. These tasks included:

- 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 that it is important for principals to model effective technology use. In addition, she added that leaders of technology encourage the use of technology in

classroom instruction.

A description of technology leadership can also be found in the 2009 International Society for Technology in Education (ISTE) Standards for Administrators. These standards were first written in 2002 as ISTE National Educational Technology Standards for Administrators (NETS-A). The ISTE Standards for Administrators consists of five standards and 21 indicators. A document of these standards published by ISTE Can be found in Appendix A. The standards are:

1. Visionary leadership
2. Digital age culture
3. Excellence in professional practice
4. Systematic improvement
5. Digital citizenship (ISTE, 2014)

These standards are considered the “gold standard” framework for technology competencies for administrators (Arafeh, 2015). These standards were written to help define what school leaders should know and do to help schools use technology effectively in teaching and learning (Donlevy, 2004). They also set a standard for “evaluating the skills and knowledge school administrators and leaders need to support digital age learning, implement technology, and transform the instruction landscape” (ISTE, 2014).

In order for schools to become effective in their use of technology, teachers must be led by a principal who supports technology integration. According to West (2003), unless the vision from the principal is clear, implementation of technology in the classrooms will fall short. Furthermore, Anderson and Dexter (2005) have shown that leadership is the best predictor of effective technology integration.

The role of the principal has changed, in part, as a result of the many changes technology has caused in society as a whole. Wagner (2008) described three reasons why school leaders will need to change their goals to better align with the 21<sup>st</sup> century. He said:

First, the global economy has affected the type and nature of work that students do. Second, the availability of information has dramatically shifted. Last, media and technology have affected how young people learn from and relate to the world as well as one another. (p. 217)

The time has come for schools to have leaders who are prepared to lead future-ready citizens who are technologically savvy and globally competent (McLeod & Richardson, 2011).

Principals who are prepared to be technology leaders are key to successfully integrating technology into teaching and learning (Brockmeier et al., 2005; Dawson & Rakes, 2003; Flanagan & Jacobsen, 2003). Brockmeier et al. examined the state of school principals' relationships with technology. The study revealed that a significant percentage of principals recognized their need for professional development on technology integration. Furthermore, many principals acknowledged the value of technology, but did not feel comfortable calling themselves technology leaders. They were also unwilling to share decision-making in regards to technology. Dawson and Rakes found similar results, as they discovered that principals were not well informed about or involved in their roles as technology leaders. During their study, Dawson and Rakes also found that principals are more likely to lead schools in technology integration if they were prepared.

Future principals have the opportunity to obtain knowledge and understanding of technology leadership through a preparatory program (McLeod & Richardson, 2011).

However, very few current principals have had technology leadership training in their preparation programs or as part of job-embedded professional development (Redish & Chan, 2007; Riedl, Smith, Ware, Wark, & Yount, 1998). Mehlinger and Powers (2002) said, “Graduate school programs generally are doing a poor job in preparing school principals and superintendents to be technology leaders” (p. 218). Barnett (2004) also found that leadership programs often struggle to align their programs with the demands of actual practice, especially in the area of technology leadership. Research has also indicated that few principals use technology meaningfully to improve the effectiveness of their own work (Redish & Chan, 2007; Riedl et al., 1998).

The use of technology has increasingly replaced other ways of doing things not only in education but also in society at large: The 2010 National Education Technology Plan said:

Technology is at the core of virtually every aspect of our daily lives and work, and we must leverage it to provide engaging and powerful learning experiences and content, as well as resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. (Atkins et al., 2010, p. ix)

Technology is embedded in daily life and has changed the way the world operates.

Businesses, governments, and individuals use technology to increase productivity (Atkins et al., 2010; Willoughby, 2004). Similarly, technology can enhance teaching and learning in schools (Acree & Fox, 2005).

It is not only adults who are using technology. A 2012 survey conducted by the Pew Internet Research Project found that 95% of American teens use the Internet on a daily basis and that 80% of those teens have a desktop or laptop computer (Pew Internet

Research Center, 2014). Prensky (2001) has described current students as “digital natives.” These digital natives have been born into a world filled with technology advancements made in the 21<sup>st</sup> century, and they are fluent in and comfortable with current technology (Prensky, 2001).

With the widespread use of technology by students, the use of technology in education has become a necessity (Kozloski, 2006). Educators are seeing the necessity of and potential for using technology to increase student achievement and to improve productivity. This is reflected in the substantial increase in technology integration over the past 15 years. For instance, in 1996, the national student-to-computer ratio in public schools was 11 students per computer. By 2009, the ratio had decreased to 1.7 students per computer. Many schools are also implementing one-to-one programs and Bring Your Own Device (BYOD) programs (McLeod & Richardson, 2013).

Technology has also changed the types of jobs that are currently available. A key theme in a Pew Research Internet Project was the idea that, because of advances in technology, people will invent entirely new types of work (Smith & Anderson, 2014). Slowinski (2003) has stated that, “as the world becomes more dependent on technology, students and their parents will continue to expect a public education to include the integration of computers and the Internet” (p. 25).

Technology has shown to have positive effects on student learning. A study of current research by Valdez (2004) showed that when school leaders ensure that teachers receive adequate professional development, technical support, and classroom resources, technology impacts student achievement with an effect size range between .30 and .40.

Project Red also found that the use of technology in teaching and learning improves student achievement when used effectively (Greaves et al., 2012).

As a result of an increase in technology use in society and education, technology leadership has become an essential part of the role of the principal. Therefore, providing strong technology leadership has become one of the many requirements of a school leader. To meet this requirement, and for technology to be used effectively, schools need principals who are prepared to be technology leaders.

With the state of Utah placing an emphasis on digital learning, it has become vital that Utah principals are prepared as technology leaders. In recent years, Utah has passed several digital learning policies to further digital teaching and learning. SB 65 was passed in 2011, which according to Jeb Bush and Bob Wise (2011), puts “Utah and its students at the forefront of digital learning policy in the country.” The most recent legislation, Digital Teaching and Learning Grant Program, allocates over 10 million dollars for the next five years towards digital teaching and learning (H.B. 277 Personalized Learning and Teaching Amendments, 2016). Principals are an important piece to making these policies a success, thus, it is essential that principals are prepared to lead their schools as technology leaders.

### **Problem Statement**

Very little attention has been given to preparing principals for their role as technology leaders (Redish & Chan, 2007). As a result, many principals struggle to obtain the skills needed to achieve positive educational outcomes from the use of

technology in their schools. Very few principals have used computers with students in meaningful ways, and therefore lack the pedagogical knowledge and experience to guide teachers in effective use of technology (Flanagan & Jacobsen, 2003). Additionally, Rivard (2010) claimed, “Without basic technology competency, it stands to reason that most school leaders lack the ability to understand the various policy and planning issues related to the successful implementation of technology” (p. 10).

Most principals are not adequately prepared to be technology leaders; therefore, many principals struggle with their role as a technology leader. This absence of preparation has resulted in many principals struggling to integrate technology in meaningful ways (Flanagan & Jacobsen, 2003; Sincar, 2013). Without adequate technology leadership preparation and with an absence of basic technology competency, many school leaders lack the ability to successfully implement technology in their schools (McLeod et al., 2005; Redish & Chan, 2007).

### **Purpose of the Study**

The main purpose of this study was to determine the perceived level of technology leadership preparation of Utah elementary school principals when compared to the ISTE Standards for Administrators. The leadership role of the principal is the single most important factor affecting the successful use of technology in schools (Afshari, Baker, Luan, Samah, & Fooi, 2009). It is necessary for principals to be prepared to lead their schools as technology leaders.

Secondly, this study identified how Utah principals are developing technology



leadership skills. It also determined the types of technology leadership professional development and how much technology leadership professional development is taking place. In addition, this study concluded whether or not the perceived technology leadership preparedness level of Utah principals correlates with the number of hours spent in technology leadership training. Furthermore, the study discovered the strengths and weaknesses of current technology leadership professional development for Utah principals. Finally, the study compared differences in technology leadership preparation levels based on characteristics of gender, age, number of years as a principal, school enrollment size, highest degree earned, school type, university where the administrative license was earned, priority of technology integration, and acquisition of the Utah Educational Technology Endorsement.

### **Significance of the Problem**

Currently there is a need for more research on technology leadership. Compared to other areas of educational research, technology leadership research is scarce (Franciosi, 2012). In a study regarding the availability of technology leadership, McLeod and Richardson (2011) found only 43 journal-published studies about technology leadership from 1997-2009. The need for more research is especially crucial concerning technology leadership preparedness (McLeod & Richardson, 2013). Richardson, Bathon, Flora, and Lewis (2012) have suggested that there is a glaring lack of completed research not only on technology leadership in general but also specifically in regard to technology leadership preparation. They have encouraged researchers to conduct additional research

on preparing school administrators to be better technology leaders (p. 10). This study is a needed addition to the current research on technology leadership.

The information in this study can be significant to all those involved in educational technology, including those planning educational technology initiatives. This study discovered that Utah elementary school principals were minimally to somewhat prepared as technology leaders. Furthermore, it found specific technology leadership areas of strengths and weaknesses for principals related to the *2009 ISTE Standards for Administrators*. The principals felt most prepared in the standard of “digital citizenship” and the least prepared in the standard of “systematic improvement.”

In addition, this study identified types and quantity of technology leadership professional development that principals were receiving and how this professional development related to their levels of technology leadership. The study found that district training was the most common form of technology leadership training for Utah principals. It was also discovered that most principals are receiving a minimal amount of technology leadership professional development. This study discovered a correlation that showed a moderate relationship between the amount of technology leadership professional development the principal had received and how prepared they felt they were as technology leaders. This study also discussed how specific participant characteristics contributed to a greater level of technology leadership preparation. It was found that there was a significant difference in the technology leadership preparation level for principals who placed a high priority on technology integration as well as for those who had acquired a Utah Educational Technology Endorsement.

## **Research Questions**

In order to guide this research in addressing the problems identified the following research question was used, “What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?”

In addition, the following subquestions have brought additional clarification.

1. How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?
2. Does the perceived technology leadership preparedness level of Utah principals correlate with the number of hours spent in technology leadership training?
3. What are the differences in technology leadership preparation levels for the following characteristics?
  - a. Gender
  - b. Age
  - c. Number of years as an elementary school principal
  - d. Enrollment
  - e. Highest degree earned
  - f. School type (Urban, Suburban, Rural)
  - g. University where earned administration license
  - h. Priority of technology integration
  - i. Acquisition of Utah Educational Technology Endorsement

## **Conclusion**

Principals are the key to the effective use of technology in schools. Research has shown that the use of technology in teaching and learning can increase student achievement. Principals should be prepared for the role of technology leader in order for technology to be integrated effectively. However, research has also suggested that principals are not prepared to be technology leaders. Currently, many principals are not

receiving professional development related to technology leadership. This study found that the majority of Utah elementary school principals are not adequately prepared to be technology leaders. This study determined the perceived level of technology leadership preparation of Utah elementary school principals using the ISTE Standards for Administrators and found that the principals were minimally to somewhat prepared as technology leaders. This research is timely due to recent Utah legislation regarding digital learning and also due to the emphasis placed on digital learning throughout the United States. This study will add to the current lack of research on technology leadership and will give educators needed direction related to technology leadership preparation.

## **CHAPTER II**

### **LITERATURE REVIEW**

Technology has become more and more prevalent throughout society and throughout education (Willoughby, 2004). Schools are turning to technology to improve student achievement and to close the achievement gap (Darling-Hammond, Zieleski, & Goldman, 2014). Schools are also investing substantial amounts of money in technology. In 2013, schools in the U.S. alone spent over \$4 billion on mobile devices. In the same year, spending worldwide on K-12 classroom hardware reached 13 billion. This is expected to increase to \$19 billion by 2016 (Nagel, 2014). McLeod and Richardson (2011) suggested that the time has come for schools to have leaders who are prepared to lead as technology leaders. Research has shown that principals are the key to effective learning outcomes from the use of technology in schools (Anderson & Dexter, 2005; Brockmeier et al., 2005). It is critical that principals are prepared to lead their schools as technology leaders. However, as this chapter will show, literature has suggested that many principals lack the preparation necessary to be technology leaders. In addition to discussing research about technology leadership preparation, this chapter will also review additional literature related to technology leadership. The literature review begins with a description of educational standards and technology leadership models.

#### **Education Standards and Technology Leadership Models**

Standards help educators measure success and improve their practice. The Council of Chief State School Officers (2008), as mentioned by Rosemary Papa (2011),

defined standards as, “The knowledge and skills that should be mastered in order to achieve a level of proficiency in a particular area. Standards are also a means of setting criteria for accomplishing or judging a particular activity or event” (p. 21). The main goal of having professional standards in education is to improve educational practice (Student Learning/Student Achievement Task Force, 2011). In addition, educators are able to use standards to improve their own practice through self-evaluation using standards (Wildy, Pepper, & Guanzhong, 2010). School success has often been linked with educators mastering a set of professional standards. Professional standards also allow for more effective evaluation of teachers and administrators (Richardson et al., 2012).

The first set of standards for administrators were published over 50 years ago (Papa, 2011). These standards were standards for professional ethics. In 1994, the National Policy Board for Educational Administration (NPBEA) created the Interstate School Leaders License Consortium (ISLLC) and 2 years later released the ISLLC Standards for School Administrators. Around the same time, the Educational Leadership Constituency Council (ELCC) announced guidelines for administrators called the ELCC Guidelines. The ELCC guidelines were most applicable to universities because of their emphasis on preparing students to become administrators (Richardson et al., 2012).

The ELCC Guidelines and the ISLLC Standards both addressed technology leadership within their existing guidelines and standards. With the increasing need for principals to use technology leadership, it became evident new standards were needed that focused entirely on the technology needs of school administrators (Richardson et al., 2012).

## **ISTE Standards for Administrators**

The Technology Standards for School Administrators Collaborative (TSSA) developed the first set of standards for school administrators in regards to technology leadership. Representatives wrote these standards in 2001 from organizations such as the American Association of School Administrators (AASA), the National School Boards Association (NSBA), the ISTE, as well as from other experts in the field. These standards were written to “promote the idea that specific skills, knowledge, and practice were required for administrators to be ready to support the appropriate use of technology in a school” (Schrum, Galizio, & Ledesma, 2011, p. 242). The ISTE standards are indicators of effective leadership for technology and represent what technology leadership means to administrators. In addition, “the standards introduced indicators of what school and district leaders should know and be able to do to optimize the effective use of Information and Communications Technology (ICT) in education” (ISTE, 2012, loc 1030).

The ISTE standards began in 2002 when ISTE adopted the standards written by the TSSA Collaborative and published them as the National Education Technology Standards for Administrators (NETS-A). ISTE built upon the NETS-A standards by adding a list of essential conditions for implementing the standards. The NETS-A were refreshed in 2009 and raised the standard for school administrators (ISTE, 2012). The 2009 standards provide a framework for school leaders to follow as they transition schools from industrial- to digital-age places of learning (ISTE, 2012).

The 2009 ISTE Standards for Administrators reflect trends heard repeatedly in the

field (Sykora, 2009). Sykora said that some of these trends are, “the need for shared leadership and a culture where the transformative leader is among the stakeholders rather than above them, the value of administrators modeling digital age professional work, and support for a culture of change and risk taking” (p. 48).

A study by Anderson and Dexter (2005) was conducted to learn about technology leadership using the NETS-A standards as a framework. They found that the NETS-A Standards could be a useful tool to the education field. Anderson and Dexter said, “In short, our findings reinforce the importance and usefulness of the NETS-A Standards as guidelines for successful practice” (p. 74). The findings also suggested that further research on the implications of the NETS-A standards is warranted.

“The NETS-A also has intended that school principals should understand their roles as technology leaders, provide technological needs of all stakeholders, and fully accomplish technology integration in the educational process” (Sincar, 2013). ISTE has renamed the NETS-A as ISTE Standards for Administrators. There are five standards with several subareas under each standard. The ISTE Standards for Administrators are:

1. Visionary leadership
2. Digital age learning culture
3. Excellence in professional practice
4. Systemic improvement
5. Digital citizenship (ISTE, 2014)

Author Sousan Arafeh (2015) suggested that these standards are the gold standard framework for technology-related competencies. Several authors have also created additional technology leadership models to assist administrators as they seek to lead districts and schools.



### Anderson and Dexter's Model of Technology Leadership

Two authors who have developed a technology leadership model are Anderson and Dexter (2005). Their model of technology leadership (Figure 1) is based on the NETS-A Standards (McLeod & Richardson, 2011) and includes three main elements: infrastructure, technology leadership, and technology outcomes. Infrastructure is reciprocal with technology leadership in that they influence each other. Regarding technology infrastructure, Anderson and Dexter said;

The literature on leadership and technology tends to ignore infrastructure except to acknowledge that they are important as resources. On the other hand, the general literature on technology in education...tends to ignore leadership and focus on resources. (p. 55)

The model proposed that infrastructure has little effect on technology outcomes without the aspect of technology leadership. Thus, leadership and non-leadership approaches are integrated.

Anderson and Dexter's (2005) model of technology leadership listed several indicators under each of the three elements. Infrastructure indicators included net use, technology integration, and student tool use. Under the technology leadership element,



Figure 1. Anderson and Dexter model of technology leadership.

the authors included technology committee, school technology budget, district support, principal e-mail, principal days on technology, staff development policy, grants, intellectual property policy, and other policies. Indicators in the final element, technology outcomes, included net use for email and web, technology integration, and student tool use (Anderson & Dexter, 2005). The authors argue that technology leadership is the activity that bridges infrastructure and outcomes (Arafeh, 2015).

### **Davies' Extended Model of Educational Technology Leadership**

Davies (2010) has developed a technology leadership model that she calls the *Extended Model of Educational Technology Leadership* (Figure 2). Davies designed this model to take into account that for effective use of technology collaboration and general understanding needs to happen between members of an organization. Also included in the model are external influences that affect the organizational members. The model sought to generate common understanding among the members within an organization whose input would be beneficial in providing influence for technology use in education. The common understanding comes through discussions and interactions among the different members in the organization. In the end, the model strived to influence organizational change from central themes shared by the school leadership (Davies, 2010).

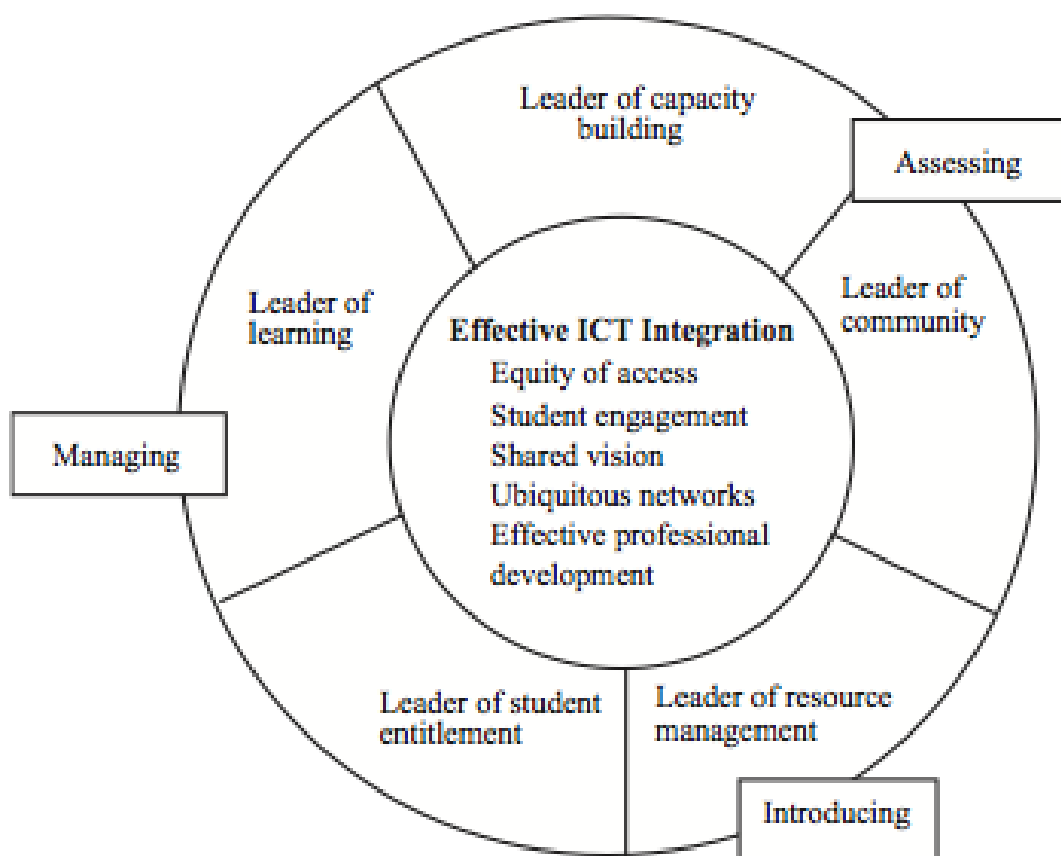
### **Flanagan and Jacobsen's Role Responsibilities and Goals of Technology Integration**

An additional technology leadership model comes from the work of Flanagan and Jacobsen (2003). This model, *Role Responsibilities and Goals of Technology Integration*



Figure 2. Davies extended model of educational technology leadership.

(Figure 3), suggested that “technology leadership is much more than resource acquisition and management.... Technology leadership has multiple dimensions given the complexity of schools as learning organizations” (Flanagan & Jacobsen, 2003, pp. 124-125). The main purpose of this model is to focus on describing roles, responsibilities, and goals of technology integration (Arafeh, 2015). Flanagan and Jacobsen’s model emphasized the goals of technology integration, which included introducing, managing, and assessing technology. The model also emphasized the roles and responsibilities in



*Figure 3.* Flanagan and Jacobsen role and responsibilities and goals of technology integration.

the accomplishing goals. They are described in terms of leadership in the following areas: learning, student entitlement, resource management, community, capacity building, and learning. The model listed five elements of effective ICT integration, which are equity of access, student engagement, shared vision, ubiquitous networks, and effective professional development (Flanagan & Jacobsen, 2003; Arafah, 2015).

### **Arafah's Technology Leadership Model**

Sousan Arafah (2015) has designed a Technology Leadership Model (Figure 4) in a response to the previously discussed models and as a way for educational leaders to

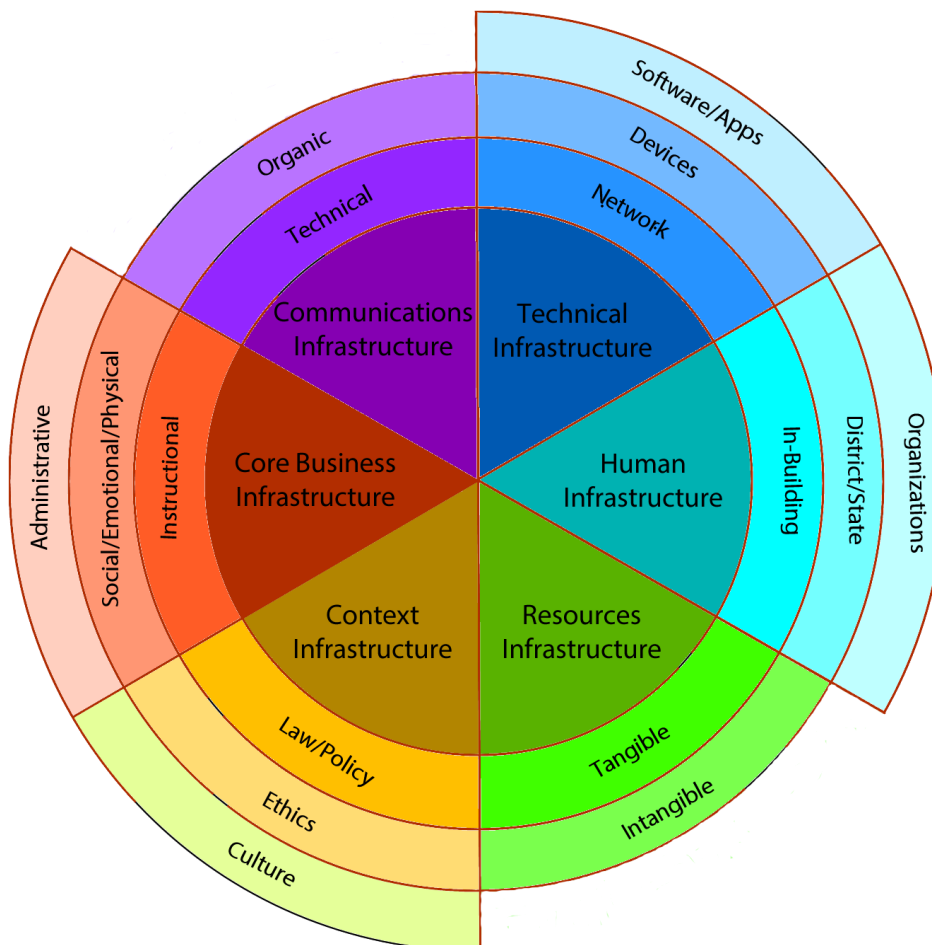


Figure 4. Arafah's technology leadership model.

successfully integrate technology. In regards to Arafah's Technology Leadership Model, Arafah has said, "The benefit of a model of this kind is that it strives to provide both a high-level and detailed view of the complex and interrelated things, processes, people, and behaviors that comprise educational technology" (p. 265). In addition, she said;

The Technology Leadership Model proposed here strives to offer a comprehensive, but simplified, map of the technology landscape educational leaders travel and must be aware of. The model is intended to be used as a guide, a conversation starter, a point of departure, and a goad. (p. 266)

This model is based on six different *infrastructure types* necessary for effective

engagement with technology: technical infrastructure, human infrastructure, resources infrastructure, context infrastructure, core business infrastructure, and communications infrastructure. Each infrastructure is subdivided into key elements and sub elements, and then all are strengthened by ongoing core and overarching practices.

Regarding her technology leadership model, Arafeh has said, “The benefit of a model of this kind is that it strives to provide both a high-level and detailed view of the complex and interrelated things, processes, people, and behaviors that comprise ‘educational technology’” (p. 265). It is Arafeh’s hope that this model “moves our understanding of technology leadership forward and contributes increased clarity for advancing and improving technology-supported educational design and delivery in the field” (pp. 267-268). Arafeh has also created a table that further articulated her technology leadership model (Table 1).

The technology leadership models that have been discussed in this chapter can help administrators play an important role in the effective use of technology in teaching and learning. The models assist principals in gaining a thorough understanding of technology’s capabilities and helps principals better understand how to take on a technology leadership role (Kara-Soteriou, 2009). Many of the items discussed in these models are the responsibility of educators other than the principal. However, it is important that the principal has an understanding of the issues they are dealing with. “In these instances, effective educational leaders delegate, rely on expertise, listen and decide based on information gathered and vetted from others (Arafeh, 2015, p. 267).

Table 1

*Component Detail of Arafeh's Technology Leadership Model*

Core & overarching practices	Infrastructure types	Key elements	Selected subelements
	Context infrastructure	Policy/legal/regulatory issues	Standards, Laws, (e.g. privacy, copyright), Policies (e.g. BYOD, Internet credentials, IP, bullying, safety)
		Ethical issues	Access, Equity, Respectfulness, Climate
		Culture issues	Federal, state, local, district policies (e.g., BYOD, Internet use, etc.), Safety
Envisioning	Technical infrastructure	Networks	Wide Area Network, Backbone/T1, Last Mile, Routers, Modems, Ethernet/Wi-Fi
Modeling		Devices	Servers, Computers/Laptops, Tablets, Phone System, Safety System
Planning		Software	Learning Mgmt. Systems/Platforms for in-school or Online/Hybrid Delivery: Moodle, WebCT, BB9 Operating Systems: Windows, OS, Linux, Apple Educational Learning Software/Applications/Apps
Advocating	Human infrastructure	In-building	Faculty, staff (district, building, admin, technical), students, parents, lawyers, building technology specialist
Supporting		District/state	SDE, District CIO, technology specialist, vendors, professional and advocacy organizations
Facilitating		Organizations	Professional & advocacy organizations (PTO, ISTE, CoSN, SETDA, etc.)
Empowering	Resource infrastructure	Tangible	Fundraising and funding/grants, Staffing, Training Non-geographic connections (local and global)
Directing		Intangible	Time, Will/Desire/Motivation
Implementing	Core business infrastructure	Instructional	Curricular technology in the content areas-Games, Assistive technology, Instructional design, Research and exploration, Assessment, Robots/AI to support learning Language technology-voice input, translation services
Evaluating		Social emotional	College and career readiness platforms (e.g.,Naviance), Inventories, Behavior supports
		Physical	Sports Technology, Haptic Interface and Feedback, Experimentation
		Administrative	Human resources, Evaluation/performance tracking, Budget, Payroll, Purchasing & inventory, PowerSchool (student information system), Surveys & Metrics
	Communications infrastructure	Technical	Email, Voice Mail/VOIP, Websites, Skype/Facetime/Google Hangout, WebEx/GoToMeeting
		Organic	Social Media, Media/Public Relations

## **School Leadership**

School leaders are essential to successful schools. In a 1977 U.S. Senate Committee Report, it was suggested that the principal is the single most influential person in a school (Marzano, Waters, & McNulty, 2005, p. 5). Marzano mentioned that effective leadership is a necessary condition for positive change in a school (Marzano, 2003). Furthermore, a report by the Wallace Foundation (2013) asserted that “the principal remains the central source of leadership influence (p. 6). Several prominent leadership theories and research have been influential to principals as they have strived to be successful leaders (Marzano et al., 2005).

### **Transformational Leadership**

Transformational leadership and instructional leadership have been the dominant leadership theories in education since the 1980s. Both theories received greater attention as educational trends focused on school reform (Hallinger, 2003). It was James MacGregor Burns who first popularized transformational leadership through his 1978 work titled *Leadership* (Northouse, 2010). Burns (1978) described transformational leadership as “when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality” (p. 20). Additionally, it is a process that changes and transforms people often through charismatic and visionary leadership (Northouse, 2010).

Bass (1990) has also written about transformational leadership. His work built on Burns’ concepts, but extended the theory to focusing more on the followers’ needs. Bass



added that transformational leadership could be applied to negative situations. Bass defined transformational leadership as happening when

leaders broaden and elevate the interests of their employees, when they generate awareness and acceptance of the purposes and mission of the group, and when they stir their employees to look beyond their own self-interest for the good of the group. (p. 19)

Furthermore, Bass and his colleagues also identified four components of transformational leadership, which are measured by a questionnaire they developed called the Multifactor Leadership Questionnaire (MLQ; Stewart, 2006).

The transformational leader often shares their leadership with others in order to create a shared vision. This shared leadership takes place as the leader seeks to build the organization's capacity to define its purpose and to support changes in practices. This is often done in a collaborative and interactive setting with students, teachers, parents, and community members. The shared leadership can also bring about negative effects as uncertainty may increase as a result of the many voices that are heard. Transformational leadership requires high tolerance from the principal for uncertainty and an ability to live with the messy process of change (Hallinger, 2003).

Having the follower perceive charisma in the leader is central to transformational leadership. Employees have a great deal of confidence and trust in charismatic leaders and want to identify with them. A charismatic leader is able to inspire employees and help them believe that they can do hard things (Bass, 1990). Leaders do this by having high expectations of their employees and then helping the employee gain self-confidence and self-efficacy (Northouse, 2010).

Transformational leadership theory continues to be a popular subject for many

researchers and educators. Leithwood and Jantzi (2000) have added to the work done by Bass, Burns, and others, by creating their own transformational leadership model using the following seven components: individualized support, shared goals, vision, intellectual stimulation, culture building, rewards, high expectations, and modeling. This model suggested that leadership should be shared among the teachers and the principal, seeking to influence people from the bottom-up rather than from the top down (Hallinger, 2003). Furthermore, in 2005, Leithwood and Jantzi provided additional insight about transformational leadership in schools using 32 empirical studies published between 1996 and 2005. They found that transformational leadership had a significant and primarily an indirect effect on student achievement and engagement in schools.

Transformational leadership can also play an important role in the effective use of technology in schools. According to Schepers, Wetzels, and De Ruyter (2005) transformational leadership can significantly determine the extent in which technology is used in schools. In addition, Wilmore and Betz (2000) indicated that the transformational leadership qualities of principals play an essential role in the implementation of technology in education. Crawford (2005) said, “This form of leadership is necessary to drive principals to the higher levels of concern and motivation needed for educational improvement” (p. 8).

Several studies on technology leadership have found that transformational leadership qualities are correlated with successful technology leadership. Tan (2010) conducted a meta-analysis of 12 empirical studies that examined the relationship between transformational leadership in schools, technology integration, and computer technology.

She found that transformational leadership was associated with a higher level of technology integration and use in schools. Hadjithoma-Garstka (2011) also conducted research on technology integration. He found that technology integration was more widespread at schools where principals used leadership qualities associated with transformational leadership, such as an emphasis on human relations, support and encouragement for followers, and communication of a common vision.

### **Instructional Leadership**

Models of instructional leadership materialized in the early 1980s growing out of the effective school's research movement. Much of the research took place in low performing poor urban schools. This research identified the principals as strong, directive, and focused on curriculum and instruction. Many policymakers strongly encouraged principals to use instructional leadership practices. Instructional leadership quickly became the model of choice for many principals (Hallinger, 2003, 2005).

Hallinger has developed the most used model of instructional leadership. This model has three dimensions of instructional leadership with ten functions aligned with the dimensions. Hallinger's model includes three dimensions: defining the school's mission, managing the instructional program, and promoting a positive school-learning climate. The first dimension, defining the school's mission, focused on the principal's role in working with staff to ensure that there is a clear focus on academic achievement, and making certain that these goals are known and supported by the school community (Hallinger, 2003).

The second dimension, managing the instructional program, concentrated on the

coordination of instruction and curriculum. This dimension requires the principal to be involved in the school's instructional development, which means that the principal must be "hip-deep in the school's instructional program" (Hallinger, 2005, p. 226).

Instructional leaders can often be found highly involved in the curriculum and development of each student's academic progress.

The third dimension, promoting the school-learning climate, is broader in scope and intent. Schools must create high standards and expectations and have a culture of continuous improvement, and the instructional leader must align these high standards with the goals and mission of the school (Hallinger, 2005).

Hallinger and Heck (1996) found that instructional leadership was the most frequently studied model of school leadership during the 1980s and 1990s. Hallinger's model of instructional leadership was the most commonly used model. During this time period, Hallinger and Heck found 110 studies that used this model. They found that the most influential aspect of instructional leadership was the principal's role in creating and promoting the school's mission. Furthermore, they also found that instructional leaders influenced the quality of school outcomes through the alignment of school structures and culture with the school's mission (Hallinger, 2005).

### **Robert Marzano School Leadership Research**

Robert Marzano and his team from McREL researched leadership to determine to what extent leadership plays a role in whether a school is effective or ineffective. The researchers examined over 5,000 articles and studies that addressed leadership in schools;

however, only 69 actually examined the quantitative relationship between the school leadership and the academic achievement of students. The researchers used a meta-analysis to analyze the effective qualities and behaviors of the principals and determined that 21 leadership qualities and behaviors positively influenced student achievement with a .25 correlation between leadership and the academic achievement of students. The five responsibilities with the highest correlation between the principals' behaviors and student achievement are:

1. Situational awareness
2. Flexibility
3. Monitoring/Evaluating
4. Outreach
5. Discipline

The researchers stated that these findings are “perhaps the most rigorous and comprehensive set of principles regarding school leadership to date” (Marzano et al., 2005).

The leadership models and theories discussed thus far all apply to technology leadership. Research has clearly indicated that leadership is an important piece to the success of a school but also critical to the success of technology integration (Anderson & Dexter, 2005; Greaves et al., 2012; Marzano et al., 2005). The next section will discuss the literature regarding technology leadership.

### **Technology Leadership**

According to Byrom and Bingham (2001), leadership is the most important factor in successful technology integration in schools. Research has clearly indicated that

schools with effective technology programs have also had strong leadership (Office of Technology Assessment, 1995). In regards to leadership, the authors of Project Red said, “Strong school-level leadership is essential to the success of a technology initiative (Greaves et al., 2012, p. 47). In a review of technology leadership literature, Anderson and Dexter (2005) discovered that “all of the literature on leadership and technology acknowledges either “explicitly or implicitly that school leaders should provide administrative oversight for educational technology” (p. 51). Technology leadership has become a necessity in the role of the principal (Trybus & November, 2013).

Afshari et al. (2009) described the importance of the principal being a technology leader. They have described technology leadership by saying, “Technology leadership involves understanding both the technologies and how they can be applied to accomplishing tasks” (p. 237). In addition, technology leadership requires principals to be aware of how technology can be used effectively in teaching and learning (Afshari et al., 2009).

Afshari et al. (2009) also declared that technology in schools would only be successful if the principal actively supports it and provides their staff with adequate professional development related to technology integration. Furthermore, Afshari et al. suggested that principals must be able to integrate technology into their daily practice and provide leadership for technology use in teaching and learning. An additional reference to technology leadership from Redish and Chan (2007) has noted that schools with leaders who practice effective technology leadership model the use of technology, support best practices in instruction and assessment and provide professional learning opportunities

for their staff.

A study conducted by Anderson and Dexter (2005) confirmed the notion that technology leadership plays a very central role in technology related outcomes. Perhaps the most important finding from the study was that although technology infrastructure is important, “for educational technology to become an integral part of a school, technology leadership is even more necessary” (p. 74). Anderson and Dexter also suggested that an improved theoretical direction is needed on how leadership and resources combine to use technology to support learning and teaching.

Furthermore, the results from this study suggested that a school’s technology efforts are threatened unless key administrators become active technology leaders. To be technology leaders, administrators must be actively involved with technology by crafting policies, using email, and spending time with technology. In addition, the study indicated that for successful technology use in a school, leaders should be involved in key technology leadership areas (i.e., leadership and vision; learning and teaching; productivity and professional practice; support, management, and operations; and social, legal, and ethical issues; Anderson & Dexter, 2005).

According to McLeod and Richardson (2013), literature on effective technology leadership is lacking. Davies (2010) has also recognized the limited amount of technology leadership research. She researched technology leadership by searching literature in Google Scholar using the phrase “educational technology” with keywords “school,” change,” and “sustainability.” Of the 30 publications that fit the phrase criteria, only 10 were articles published between 1998 and 2008. The following criteria were used

to select the studies for the literature review. “The study must either (a) provide a framework for technology leadership and/or the beliefs and behavior of technology leaders (such studies provided conceptualization of technology leadership) or (b) provide an international perspective on technology leadership” (Davies, 2010, p. 55). Twelve journal publications met the criteria and were used to understand how technology leadership is defined. Her research also found that technology leadership has yet to be clearly defined. This could be in part because of the result of changes in technology and not because of conceptual changes. Further examination demonstrated that technology leadership is about reorganization of teaching rather than the process of teaching itself.

In 2011, McLeod and Richardson conducted a study focused on understanding the current state of technology leadership research in the education field. To do this, they collected and performed content analyses on conference programs from three leading professional organizations and on the 25 most cited journals in the field of technology leadership. The study was done on research from 1997 to 2009. McLeod and Richardson discovered that there is a limited amount of research around school technology leadership in the fields of school leadership and school administration. They found only 43 articles on this topic suggesting that there is limited meaningful literature on technology leadership. The authors also concluded that there is not enough high-quality research to effectively inform best practices in technology leadership.

McLeod and Richardson (2011) gave several recommendations as a result of their research. They recommended that more educational leadership faculty should recognize the importance of technology leadership. Second, educational leadership faculty in higher



education must recognize the need to expand their current knowledge of technology leadership. Finally, the authors recommended that those researching technology leadership need to do a better job of writing research for scholarly publications. These recommendations will help bring additional research and attention to technology leadership.

Technology leadership research shows that the principal plays a crucial role in the use of technology in schools (Afshari et al., 2009; Greaves et al., 2012). Afshari et al. stated that leadership is the key component for guiding the teaching and learning process necessary for the 21<sup>st</sup> century student. Quoting Wilmore and Betz (2000), the authors suggested that, “Information technology will only be successfully implemented in schools if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change” (p. 236). Therefore, principals must be able to integrate technology into their daily practice and provide positive leadership for technology use in schools. This is much more likely to take place if the principal is prepared to lead their school as a technology leader by (Brockmeier et al., 2005).

### **Professional Development**

Principals need professional development in order to meet the demands placed on them in the 21<sup>st</sup> century (Daresh, 1998). Williams (2008) said;

A principal needs professional development, just like teachers, so that he or she can learn to embrace the role of instructional leader, stay abreast of current educational research, and gain knowledge of strategies that may improve student achievement. (p. 1)

In addition, a study by the Educational Research Service (2000) found that principals desired to improve in their expertise and personal skills, but found their current professional development lacking.

The National Staff Development Council (NSDC) has given the following definition of professional development: “The term professional development means a comprehensive, sustained, and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement” (Hirsh, 2009, p. 12). In addition to the definition by NSDC, Guskey and Yoon (2009) defined professional development as “those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students” (p. 16).

Current research regarding the effectiveness of principal professional development on the impact of student achievement is difficult to find due to the difficulty linking professional development and student learning (Guskey & Yoon, 2009). Leithwood and Levin (2008) further said, “Arriving at a credible estimate of leadership development impacts, especially on students, is a very complex task” (p. 281). Despite the differences in research, Guskey and Yoon pointed out that no educational improvement effort has ever succeeded in the absence of thoughtfully planned and well-implemented professional development.

Currently, professional development for principals comes in many forms. One common form of training is from the many education associations and organizations (Peterson, 2002). Mentoring is also a prevalent form of leadership professional

development (Zepeda, 2012). In addition, peer sharing and professional learning communities have been described as effective professional development practices (Zepeda, 2012).

The article *Learning to Lead, Leading to Learn* (Sparks & Hirsch, 2000), the NSCD discussed the important characteristics of school leadership professional development. NSCD suggested that these characteristics are long-term, carefully planned, and job embedded. The article also notes the types of professional development activities that will effectively support school leaders. These activities include peer study groups, support networks, administrator portfolios, journal keeping, team training for school improvement, and the development of professional growth plans. NSDC also supports the use of extensive coaching. Peterson suggested that the many different professional development activities should be considered when designing professional development for principals (Peterson, 2002).

The NSDC (as cited in Matthes, 2008) has described what high quality professional development programs should include: “(a) focus on student learning and specific problems practitioners face, (b) reinforce and sustain group work and collaboration among teachers, principals, and district personnel, (c) link directly with day-to-day work in real schools and classrooms, (d) sustain a consistency of focus over time, and (e) use feedback from teaching and learning to inform program development and evaluation” (Matthes, 2008, p. 19). In addition, ISLLC (as cited in Matthes, 2008) has given some recommendations for professional development for principals. They are:

1. Validates teaching and learning as the central activities of the school.
2. Engages all school leaders in well-planned, integrated, career-long learning to

- improve student achievement.
- 3. Promotes collaboration to achieve organizational goals while meeting individual needs.
- 4. Models effective learning processes, and incorporates measures of accountability that direct attention to valued learning outcomes. (p. 20)

These recommendations also apply to technology leadership professional development.

### **Technology Leadership Preparation**

A review of technology leadership literature by Brockmeier et al. (2005) suggested that principals who are prepared to act as technology leaders are key to technology integration into teaching and learning. However, research has also suggested that principals are not prepared for the role of technology leader. As a result, many have struggled to develop both the human and technical resources necessary to achieve Information and Communications Technology (ICT) outcomes in their schools (Flanagan & Jacobsen, 2003).

According to Levin and Schrum (2012), most principals struggle when it comes to the challenging work of creating and maintaining technology-rich learning environments. “Without basic technology competency, it stands to reason that most school leaders lack the ability to understand the various policy and planning issues related to the successful implementation of technology” (Rivard, 2010, p. 10). In addition, very few principals have used computers in meaningful ways with children, and therefore lack the required pedagogical vision and experience to guide teachers. Principals are increasingly being required to assume leadership responsibilities in areas where they have received little training, such as technology leadership (Flanagan & Jacobsen, 2003).

An investigation by Brockmeier et al. (2005) sought information about principals and their relationship with computer technology. In this study, principals responded that they needed professional development in assessing computer technology's influence on student achievement (85%), using computer technology to collect and analyze data (85%), integrating computer technology into the curriculum (84%), using computer technology in their work as a principal (80%), and using computer technology to facilitate organizational change (80%). Principals also indicated less need for professional development in understanding ethical issues related to computer technology (69%), in understanding legal issues related to computer technology (69%), in understanding legal issues related to software licensing (67%), and in learning how to protect students from inappropriate materials on the internet (67%). This research revealed that a significant percentage of principals realized they have a need for professional development on how to facilitate technology's integration into teaching and learning.

In addition, the results indicated that almost 50% of principals are unwilling to give decision making about technology over to teachers. According to the authors, this being the case, principals must be prepared to be technology leaders in the school. The authors believed that the challenge facing principals is not a failure to recognize the capabilities of technology, but a lack of expertise necessary to be technology leaders who are able to facilitate technology's integration (Brockmeier et al., 2005).

Flanagan and Jacobsen (2003) have also brought to light the need for principals to be prepared as technology leaders. They believed that "if school principals are to

effectively inspire and lead a staff in integrating technology across the curriculum, then professional development opportunities must be available for principals to develop these skills and dispositions” (p. 140). Furthermore, a study by Sincar (2013) showed that principals continue to face the challenge of a lack of technology leadership training. According to Sincar, “All participants stated that they needed training about the use of technology in both administration and education” (p. 1281).

Brockmeier et al. (2005) suggested that without a thorough understanding of computer technology’s capabilities, principals would not be ready to provide the technology leadership needed for effective technology integration. This leads to a challenge in many school districts where “too many principals do not have the adequate skills, dispositions, training or developmental experiences in integrating technology into the curriculum” (Garcia & Abrego, 2014, p. 13). A similar challenge was also pointed out by a large-scale national study called Project Red.

Project Red identified nine key factors to effective technology implementation. One of these nine factors was principal training where principals are trained in teacher buy-in, best practices, and technology-transformed learning (Greaves et al., 2012). The Project Red authors said, “Professional learning has been the most frequently overlooked component of technology integration since schools began using technology” (Greaves et al. 2012, p. 41). The authors also suggested that leading a technology-transformed school calls for different skills from those needed in a traditional industrial-age school. These skills require leaders to transform traditional beliefs and to give support to teachers who must rework traditional teaching practices (Greaves et al., 2012).

A study by Hope, Kelley, and Kinard (1999) further demonstrated the lack of training principals have received on technology leadership. They surveyed 14 principals to find out their computer technology professional development needs. Results showed that 50% of the principals had not received training that prepared them to facilitate teachers' integration of computer technology into the curriculum. Furthermore, 50% of the principals revealed that they had not participated in staff development experiences that helped them select appropriate hardware and software for instruction. Finally, the principals indicated that they were too busy with the demands of being a principal to devote the time necessary to participate in technology leadership training.

Hope et al. (1999) extended their research on technology leadership by seeking to clarify whether principals had experienced professional development that enabled them to facilitate the combination of technology integration and fulfill the role of technology leader (Brockmeier et al., 2002). Fifty-six principals from eight districts in North Florida participated in the study. The following was revealed from the research.

- 50% of principals responded negatively to their being perceived as the school's technology leader.
- 58% of principals responded negatively to participating in professional development that demonstrated how to integrate computer technology into the curriculum.
- 50% of principals indicated that they were unable to apply the capabilities of computer technology to their presentations (Brockmeier et al., 2002).

From this study, Hope et al. (1999) gave several recommendations regarding technology leadership professional development. They recommended that school districts focus more attention on technology leadership professional development for principals. This professional development should be designed to help principals become familiar

with computer applications and how they can facilitate teacher's integration of technology into their practice.

Hope et al. (1999) also mentioned that it is not likely that computer technology will enhance the learning environment and alter student outcomes unless principals have a clear vision of the role technology can have. In addition, the authors said, "An understanding of the capabilities, limitations, and benefits of computer technology must precede this vision of what technology can do" (p. 480). Therefore, it is essential that districts begin to provide professional development for principals on technology leadership.

An additional study by Hope and Brockmeier (2002) determined the extent of professional development that principals had received to help them pursue computer technology in their work and to facilitate teachers' integration of technology in the classroom. In this study of 242 principals it was discovered that 83% of the principals wanted to participate in professional development related to using technology in their work. It was also found that a significant number of principals had not engaged in professional development related to the use of technology. The authors concluded that principals must have an understanding of computer technology before they can facilitate its integration into schools.

In addition to not receiving technology leadership training while a principal, many principals did not receive adequate technology leadership training during their graduate work. Creighton (2003) suggested that university principal preparation programs are not adequately providing the necessary skills and dispositions required to be technology



leaders. Mehlinger and Powers (2002) stated, “Graduate school programs generally are doing a poor job in preparing school principals and superintendents to be technology leaders” (p. 218).

A study by Schrum et al. (2011) investigated what is required of new administrators during their licensure preparation in regards to technology leadership. The majority of principals in the study responded that they had no specific instructional technology course in their licensure preparation program. In addition, the authors suggested that teacher education programs are teaching teachers how to use technology, but the same level of preparation is not being given to prepare administrators. This is problematic because unless these teachers have the support of their administrator, they may be unable to successfully use technology.

Schrum et al. (2011) implied that the lack of technology preparation in university administration licensure programs might not completely be the fault of the graduate programs. It appears that to obtain administrative credentials states do not require school leaders to demonstrate knowledge and skills related to technology leadership. Institutions teach what is required of them by their state and because technology leadership is not required it is often left out of leadership programs.

The need for principals to be prepared as technology leaders will continue to be crucial. McLeod (2011) said:

We know, simply from projecting current trends forward, that in the future our learning will be even more digital, more mobile, and more multimedia than it is now.... We thus need school leaders who can begin envisioning the implications of these environmental characteristics for learning, teaching, and schooling. We need administrators who can design and operationalize our learning environments to reflect these new affordances. We need leaders who are brave enough to create

the new paradigm instead of simply tweaking the status quo and who have the knowledge and ability to create schools that are relevant to the needs of students, families, and society. (p. 4)

McLeod and Richardson (2011) suggested that the time has come for schools to have leaders who are prepared to lead as technology leaders. The role of the principal as a technology leader is crucial to ensure that technology is used effectively in teaching and learning (Afshari et al., 2009; Greaves et al., 2012).

The degree to which principals are prepared to be technology leaders is not completely clear (Brockmeier et al., 2005). In an article written by McLeod, Bathon, and Richardson (2011) they discussed three intersections of technology and school leadership. The third intersection of technology and school leadership is preparing school administrators to be better technology leaders. Out of the three domains, the third, preparing school administrators to be better technology leaders, is the most significant. They suggested that research on this domain is scarce. The authors also suggested that further research is needed on preparation of technology leaders. This study will contribute to the area of preparing principals to be technology leaders.

### **Conclusion**

Technology in schools is becoming increasingly more essential as students are frequently entering the job market with the need for digital competencies. However, without schools providing these opportunities, students will find themselves unprepared for the modern workplace (McLeod et al., 2011). Being a strong technology leader has become one of the many requirements of an effective principal (Redish & Chan, 2007).

Schrum et al. (2011) suggested that “administrators need to know how technology can promote learning, be appropriately situated as both a topic of and a support to the curriculum, and support whole-school improvement” (p. 244). “It is no longer possible for administrators to be both naïve about technology and be good school leaders” (Mehlinger & Powers, 2002, p. 218). Several authors and organizations have developed standards and models for technology leadership to assist principals in their role as a technology leader. However, despite the need for principals to be prepared as technology leaders, most principals currently are not prepared for this role.

In addition, Richardson et al. (2012) have suggested that there is a glaring lack of research done not only on technology leadership in general but also with technology leadership preparation. They have encouraged researchers to conduct additional research on preparing school administrators to be better technology leaders.

### **CHAPTER III**

### **METHODOLOGY**

The rapidly expanding use of technology in education has brought about the need for principals to be prepared as technology leaders. Although there is a need for principals to be technology leaders, many are not prepared for this role. The purpose of this quantitative study was to determine the perceived level of technology leadership preparation of Utah elementary school principals using the ISTE Standards for Administrators. Permission to conduct this study was granted by the Utah State University Internal Review Board (IRB; see Appendix D).

Second, this study identified how Utah principals are developing technology leadership skills. The types of professional development and how much professional development is taking place were also discovered. In addition, the study determined the correlation of the perceived technology leadership preparedness level of Utah principals with the number of hours spent in technology leadership training. Lastly, the study compared differences in technology preparation levels based on characteristics of gender, age, number of years in current position, number of years as a principal, school enrollment size, school type, highest degree earned, and those who have earned a Utah Information Technology Endorsement.

The sample population for this study came from 129 Utah elementary school principals. The 2009 PTLA survey was used to collect data regarding the principal's technology leadership preparation. Descriptive statistics, linear correlation, *t*-test, ANOVA, and qualitative coding were used to analyze the data.

## **Research Questions**

In order to guide this research in addressing the problems identified the following research question was used, “What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?”

In addition, the following subquestions have brought additional clarification.

1. How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?
2. Does the perceived technology leadership preparedness level of Utah principals correlate with the number of hours spent in technology leadership training?
3. What are the differences in technology leadership preparation levels for the following characteristics?
  - a. Gender
  - b. Age
  - c. Number of years as an elementary school principal
  - d. Enrollment
  - e. Highest degree earned
  - f. School type (Urban, Suburban, Rural)
  - g. University where earned administration license
  - h. Priority of technology integration
  - i. Acquisition of Utah Educational Technology Endorsement

## **Participants**

The target population for this study consisted of Utah elementary public school principals. According to the 2015-2016 Utah Educators Directory there were 533 elementary public school principals in Utah. A sample size of 224 was used for this study. This is based on a confidence level of 95%. A simple random sample was used to select the participants for the study. A total of 129 principals participated in the study for a response rate of 58%.

### **Instrumentation**

The 2009 PTLA survey was used to question principals about their perception of preparedness on the 21 technology leadership skills from the ISTE Standards for Administrators. These skills are listed as subsets under the five ISTE Standards for Administrators. The survey can be found in Appendix B.

The 2009 PTLA is based on the NETS-A 2009 standards. These standards are now referred to as ISTE Standards for Administrators. Each question for the 21 technology leadership skills is based on a 5-point Likert scale. The five choices include not at all, minimally, somewhat, significantly, and fully. The survey asks one question for each leadership skill for a total of 21 questions. Additional questions were added to this survey in order to more effectively answer the study's research questions.

The 2009 PTLA gets its origins from the 2002 PTLA. The original version was created by the Center for the Advanced Study of Technology Leadership in Education (CASTLE) at the University of Kentucky. The survey is psychometrically validated by the American Institutes for Research (AIR). The goal in developing the PTLA was to produce a short, multiple-choice assessment to measure the school technology leadership of a principal.

The survey was piloted by 74 principals in August of 2005. Descriptive statistics were run to examine the quality of the data. The majority of the items on the PTLA demonstrated appropriate functioning. The mean for items was approximately 3 ("Somewhat") on the 5-point scale. The standard deviation was approximately 1 and the responses showed appropriate distribution (i.e., near normal). The reliability of the survey

is high with a Cronbach's alpha of 0.95. Item-test correlations indicated that each item contributes to measurement of the PTLA construct. The range of item-test correlations is  $r = 0.39$  to  $0.80$ , with seven items correlated less than  $0.50$ . The PTLA instrument appears to measure the desired construct of school technology leadership (Anandan, Cederquist, & McLeod, 2005).

The updated PTLA was written in a similar format as the original PTLA and groups each questions based on the ISTE Standards for Administrators subscales. The 2009 PTLA was written to better align with the updated ISTE Standards for Administrators. Both surveys also use the same rating scale for participant responses (Metcalf, 2012). The 2009 PTLA survey was piloted with five principals. Based on results from the pilot, changes were made to the survey were made to improve clarity. Permission to use the 2009 PTLA survey with minor changes was granted by the author. This permission can be found in Appendix D.

An additional section, titled *Section One: Demographics and Professional Development*, has been added to the survey. This section helped answer the subquestions of this study. Section two of the survey is titled *ISTE Standards for Administrators*. Section two asks the respondent questions related to the five ISTE Standards for Administrators. These questions use a five-point Likert scale. Section three has three open-ended questions and was added to help further answer the research questions.

### **Data Collection**

The 2009 PTLA survey was emailed to the 224 participants using their school

email account. Email addresses were obtained from the 2015-2016 Utah Educational Directory. Two follow-up emails and a postcard reminder were sent to remind participants about the study. A phone call reminder was also used following the final email. Qualtrics Survey software was used to administer the survey. The data was imported from Qualtrics to Statistical Package for Social Sciences (SPSS) version 22 for analysis. Non-responses were left blank in SPSS. Pairwise deletion was selected in SPSS for non-responses.

### **Data Analysis**

The data was analyzed using descriptive statistics including frequency, mean, and standard deviation. Linear correlations, *t*-test data, and ANOVA's were used to determine if relationships existed among results.

The central research question in this study was, *“What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?”* The responses from section two of the survey were analyzed to answer this question. Using descriptive statistics from each ISTE Standards for Administrators, the survey data showed the principals' perceived technology leadership preparedness level.

Research question 1 asked, *“How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?”* Section 1, question 9 from the survey helped answer research question one by asking principals to share the amount of technology professional development they had received in several



different types of professional development. Descriptive statistics indicated how much time principals spent in specific types of technology leadership training.

Research question 2 asked, “*Does the perceived technology leadership preparedness levels of Utah principals correlate with the number of hours spent in technology leadership training*”? A linear correlation was used to determine the strength of the relationship using the composite mean of the principal’s responses to the questions in section two of the survey (technology leadership level) and the amount of hours they spent in technology leadership professional development.

Research question 3 asked, “*What are the differences in technology leadership preparation levels for the following characteristics*”?

- a. *Gender*
- b. *Age*
- c. *Number of years as an elementary school principal*
- d. *Enrollment*
- e. *Highest degree earned*
- f. *School type (Urban, Suburban, Rural)*
- g. *University where earned administration license*
- h. *Priority of technology integration*
- i. *Acquisition of Utah Educational Technology Endorsement*

A *t* test and a one-way ANOVA were used to analyze research question 3. A *t* test was used to determine if there was a significant difference in the principal’s gender and perceived technology leadership preparedness level. A *t* test was also used to determine if there was a significant difference in the technology leadership preparedness level between principals who had acquired a Utah Educational Technology Endorsement and those who did not have an endorsement. A one-way ANOVA helped determine if there was a difference in the participant’s technology leadership preparation level for the

remaining characteristics, which are age, number of years as an elementary school principal, enrollment, highest degree earned, school type, university where administrative license was earned, and the priority placed on technology integration. The characteristic grouping served as the independent variable and the composite mean for the ISTE Standards for Administrators (technology leadership level) served as the dependent variable. Table 2 describes the statistical analysis that was used to answer each research question.

Table 2

*Method and Analysis Design for Each Research Question*

Question	Method	Analysis
What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?	Survey	Descriptive
1. How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?	Survey	Descriptive
2. Does the perceived technology leadership preparedness levels of Utah principals correlate with the number of hours spent in technology leadership training?	Survey	Linear correlation
3. What are the differences in technology preparation levels for the following characteristics? a. Gender b. Age c. Number of years as an elementary school principal d. Enrollment e. Highest degree earned f. School type (Urban, Suburban, Rural) g. University where earned administration license h. Priority of technology integration i. Acquisition of Utah Educational Technology Endorsement	Survey	<i>t</i> test and ANOVA

## **Conclusion**

In this chapter the researcher identified the research questions and the research design. In addition, the participants, instrumentation, and data collection were described. This quantitative research study determined the perceived level of technology leadership preparation of Utah Elementary School principals using the ISTE Standards for Administrators. From the results, it is anticipated that educators will have a further understanding of what is needed to help elementary school principals be better prepared for their role as a technology leader.

## **CHAPTER IV**

### **RESULTS AND ANALYSIS**

The main purpose of this study was to determine the perceived technology leadership preparation level of Utah elementary school principals using the ISTE Standards for Administrators. The need for principals to successfully integrate technology into teaching and learning is increasing. Principals who are prepared to be technology leaders are critical to successful technology integration.

This chapter presents an overview of the study's findings. The chapter begins with an explanation of the participants and continues with a description of the findings for each research question. Also included in this chapter is a narration of the findings from the themes gathered from the open-ended responses. The chapter concludes with a summary of the findings.

Several results were gathered that supported the central purpose. These results add additional insight to the Utah elementary school principals' level of technology leadership preparation. In addition, this study identified how Utah principals are developing technology leadership skills as determined by the amount of hours spent in specific types of professional development. The study also determined the correlation between the principals' perceived level of technology leadership preparedness and the number of hours spent in technology leadership professional development. Furthermore, the study compared principals' technology leadership preparation based on the demographics of each participant.

### **Response Rate**

The data for this study were collected using the 2009 Principals Technology Leadership Assessment (PTLA), which is based on the ISTE Standards for Administrators. The survey was emailed to 224 Utah elementary school principals. A total of 129 principals completed the survey equaling a response rate of 58%. There were 87 principals who did not respond to the research study invitation and 8 principals who opted out of the research study. Demographic data were collected for several different categories as explained below.

### **Participants**

The majority of the 129 participants were female (56%). Participant ages ranged from 30 years to 66 years with the largest subgroup consisting of participants between the ages of 36 to 45 (39%). The smallest subgroup was 35 and younger which had 10 participants (8%). The majority of participants were either new to being a principal (39% for less than five years) or had been in the profession for a large amount of time (33% for over 16 years). In addition, over half of the principals (58%), worked in schools located in suburban areas.

The participants were principals at schools with student enrollments ranging from 11 students to 1,333 students. Nearly half of the participants (47%) came from medium sized schools with student enrollments between 501-750 and only 6% of the participants came from small schools with less than 250 students.

In general, the state of Utah requires principals to hold at a minimum a master's

degree with an administrative endorsement. Because of this, the large majority of the participants (85%) had a master's degrees.

The large majority of principals (87%) in this study received their administrative license from a university within Utah. The largest amount of participants (41) received their administrative license at Utah State University.

When asked about the priority of technology integration in their schools, nearly 64% of the participants said that this was a high or very high priority. A small number of participants, 6%, had already earned their Utah Educational Technology Endorsement. Additional information regarding the demographics of this study can be found in Table C1 in Appendix C.

## **Research Findings**

### **Technology Leadership Preparation Level**

The main purpose of this study was to determine the perceived technology leadership preparation level of Utah elementary school principals using the ISTE Standards for Administrators. This level helps give greater understanding to the extent of technology leadership preparation of Utah principals. In addition, this preparation level can give greater insight into the strengths and weaknesses in the different aspects of technology leadership. This section describes in detail the findings for the research question *“What is the perceived technology leadership preparedness level of Utah principals as defined by the ISTE Standards for Administrators?”*

To help answer this question, a technology leadership preparation level was

computed for each participant using the mean score from the data collected from the five point Likert scale questions in section two of the 2009 PTLA. The technology leadership preparation level was used to help determine how prepared Utah elementary school principals were to be technology leaders. A preparation level was computed for the entire study sample, for each individual principal, and for each demographic area. In addition, a preparation level was computed for the ISTE Standards for Administrators as a whole, for each of the five ISTE Standards for Administrators, and for each of the 21 indicators within the ISTE Standards for Administrators indicators. Table 3 displays the descriptive statistics from the 2009 PTLA results for each of the ISTE Standards for Administrators.

The participants' composite technology leadership preparation level for the five ISTE Standards for Administrators was 2.92. This indicated that the Utah principals perceived themselves as minimally to somewhat prepared to be technology leaders, which suggested that many Utah principals need more technology leadership professional development in order to effectively act as technology leaders for their schools.

The principals reported being most prepared in the digital citizenship standard with a mean of 3.14. The participants perceived themselves as somewhat prepared as

Table 3

*Descriptive Statistics for Each ISTE Standard for Administrators*

Standard	<i>N</i>	Technology leadership preparation level (Mean)	<i>SD</i>
Digital citizenship	129	3.14	.80
Digital age learning culture	129	2.87	.78
Visionary leadership	129	2.86	.84
Excellence in professional practice	129	2.85	.73
Systematic improvement	129	2.84	.77

technology leaders in digital citizenship. Out of the five ISTE Standards for Administrators, the principals believed they were the most prepared to lead their schools in this area.

The other four ISTE Standards for Administrators (visionary leadership, digital age learning culture, excellence in professional practice, and systematic improvement) showed very little variance from each other with a technology leadership preparation level for each. A technology leadership level of 2.8 indicated that the principals perceived themselves as minimally to somewhat prepared to lead their schools in relation to these four ISTE Standards for Administrators. Systematic improvement had the lowest mean at 2.84.

Technology leadership performance indicators are listed for each ISTE Standards for Administrators. These 21 indicators were included in each question of the 2009 PTLA, which helps provide clarity to the standards. For the purposes of this study, the indicators help identify in greater detail how prepared principals are in specific technology leadership areas. The participants' technology leadership preparation levels for these areas are discussed in further detail below in order of the standard with the highest level to the lowest level.

**Digital citizenship.** Principals reported being the most prepared in the ISTE Standard for Administrators of digital citizenship. This standard “refers to the behaviors, knowledge and skills that people should demonstrate when interacting with digital tools” (Crompton, 2015, para. 3). When principals practice leading in this area, they help their students become critical consumers of online content and good citizens of the digital age



(Crompton, 2015). The technology leadership level for digital citizenship was 3.14, which indicated that the participants were somewhat prepared to lead in this standard. Principals reported being the most prepared in the digital citizenship standard indicator of *“Promote, model, and establish policies for safe, legal, and ethical use of digital information and technology,”* with a technology leadership level of 3.46. This indicated the participants believed they were most prepared to be technology leaders in items that related to technology policy and the acceptable use of technology. This was also the largest technology leadership level among all of the 21 indicators. The digital citizenship indicator with the lowest mean was *“Model and facilitate the development of a shared cultural understanding and involvement of global issues through communication and collaboration tools,”* with a level of 2.57. The principals did not feel as prepared to address global issues using technology. Table C6 in Appendix C shows the principals’ responses to each indicator in this standard.

**Digital age learning culture.** This standard address how leaders “create, promote, and sustain a dynamic, digital age learning culture where teachers have access not only to new technologies, but also professional development and support to use them well” (Crompton, 2014, para. 4). The technology leadership level for this standard was 2.87, indicating that the principals felt they were minimally prepared to lead in this standard.

The participants reported that, within this standard, they were most prepared to *“provide learning environments with technology and learning resources to meet the diverse needs of all learners”* (preparation level of 3.17), and least prepared to *“ensure*

*effective practice in the study of technology and its infusion across the curriculum”*

(preparation level of 2.63). This indicated that principals were somewhat prepared to provide training that would meet the diverse needs of their teachers, but were minimally prepared to ensure this training was infused across the curriculum. Table C3 in Appendix C shows the principals’ responses to each indicator in this standard.

**Visionary leadership.** When a leader uses visionary leadership, they create and implement a shared vision that integrates technology into learning and teaching (Larson, Miller, & Ribble, 2009). The technology leadership preparation level for the visionary leadership standard was 2.86, indicating that the participating principals were minimally prepared to lead in this standard.

Within this standard, some principals (those with a technology leadership preparation level of 2.98) reported they were the most prepared to “*promote programs and funding to support implementation of technology-infused plans.*” This suggested that the participating principals are minimally to somewhat prepared to secure technology funding and advocate for technology initiatives beyond the school level. The principals reported that the visionary leadership indicator they were least prepared in was “*engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans,*” with a preparation level of 2.75. This indicated that many principals are not comfortable with creating a technology-infused vision or plan for their school. Table C2 in Appendix C shows the principals’ responses to each indicator in this standard.

**Excellence in professional practice.** Principals who practice excellence in professional practice provide effective training and support, while staying in touch with

research and trends in effective use of technology. The technology leadership level for excellence in professional practice was 2.85, which indicated that principals are minimally prepared to lead in this standard.

The excellence in professional practice indicator with the highest technology leadership preparation level was “*allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration,*” with a level of 2.90. The indicator with the lowest technology leadership level was “*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*” with a level of 2.73. The results from this indicator suggested that principals are not familiar with the latest research and trends related to the effective use of technology. Similarly, a common theme emerged in the open-ended participant comments, where many principals stated that they were eager to learn more about the effective use of technology research and trends. Table C4 in Appendix C lists the principals’ responses to each indicator in this standard.

**Systematic improvement.** Systematic improvement requires principals to use technology leadership to improve their school through the effective use of information and technology resources (ISTE Standards for Administrators, 2009). The technology leadership level for systematic improvement was 2.84.

Principals reported being somewhat prepared for the systematic improvement indicator of “*Collaborate to establish metrics, collect and analyze data, and share findings and results to improve staff performance and student learning*” with a technology leadership preparation level of 3.22. This suggested that principals are

somewhat prepared to initiate strategies to improve technology use as well as to use technology to collect and analyze data with the aim of improving student achievement. “*Establish and leverage strategic partnerships to support systemic improvement*” was the indicator with the lowest technology leadership preparation level (2.40) not only in this standard but also for all five ISTE Standards for Administrators. These results indicated that principals are minimally prepared to establish relationships outside of their school in order to support the effective use of technology. Table C5 in Appendix C lists the principals’ responses to each indicator in this standard.

### **Developing Technology Leadership Skills**

This section describes how the principals in this study have developed technology leadership skills. Principals reported by category the number of hours of technology leadership professional development they had received in the last year. Their responses helped give a clearer picture of how much and what type of technology leadership professional development principals have received. This section discusses the findings from subquestion 1 which is, “*How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?*”

Principals reported the most amount of time in district trainings, which consisted of a total of 559 hours. The next largest category was conferences, with a total of 254 hours. The large gap of hours between the two categories indicated that district training is the primary method of technology leadership training for Utah principals. The cumulative total of professional development hours for each category can be found in Table 4.

The total hours of technology leadership professional development for each

Table 4

*Frequency of Technology Leadership Professional Development*

Category	Total PD hours for all participants
College course	42
Other	85
Literature	133.5
Workshop	168
Conference	254
District training	559
Total	1,241.5

participant within the last year was also computed. 17 principals listed attending zero hours of technology leadership professional development. In addition, all but 26 principals attended less than 16 hours. The median amount of professional development hours was 5. The majority of participants were involved in a minimal amount of technology leadership training (Table 5).

**Technology Leadership Preparation Correlation**

A Pearson correlation analysis was performed to investigate the relationship between each participant's total hours of technology leadership professional development and their technology leadership preparedness level. This analysis answers research subquestion 2, which asked, *"Does the perceived technology leadership preparedness level of Utah principals correlate with the number of hours spent in technology professional development?"*

In order to perform the correlation analysis, the total number of professional development hours for each participant were gathered along with the participant's technology leadership preparedness level, which was obtained from the participants'

Table 5

*Frequency of Technology Leadership Professional Development Hours*

Hours	Frequency	Percent
0-5	69	54.3
6-10	25	19.4
11-15	7	5.4
16 and higher	26	20.2
Total	127	98.4
Missing	2	1.6

composite mean score on section two of the 2009 PTLA. The Pearson  $r$  between each participant's total hours of technology leadership professional development and their technology leadership preparedness level was .38. This indicated that there is a moderate relationship between the amount of time spent in technology leadership training and how prepared each principal is to lead his or her school using technology leadership skills. The correlation was also significant at  $p < .01$ . The significance of this correlation suggested that there is a relationship between the total hours of technology leadership professional development and the technology leadership preparedness level. In addition, it can be assumed that, when a principal receives training in technology leadership, they feel more prepared to be technology leaders.

### **Technology Leadership Preparedness for Participant Characteristics**

This section discusses the differences in the technology leadership preparation level for several different participant characteristics. Characteristics that do not make a significant difference in the principal's technology leadership preparation level are discussed first followed by a discussion of the characteristics that do make a significant

difference. The findings in this section answer subquestion 3, “*What are the differences in technology preparation levels for the following characteristics:*

- a. Gender*
- b. Age*
- c. Number of years as an elementary school principal*
- d. Enrollment*
- e. Highest degree earned*
- f. School type (Urban, Suburban, Rural)*
- g. University where earned administration license*
- h. Priority of technology integration*
- i. Acquisition of Utah Educational Technology Endorsement”*

Inferential statistics, including independent samples *t* test and one-way ANOVA, were used to discover if there were differences in the technology leadership preparation level for the characteristics listed in research subquestion 3. It was found that, in all but two characteristics, there was not a significant difference in the participants’ technology leadership level. Characteristics that did not cause a significant change in the participants’ technology leadership level were gender, age, number of years as an elementary principal, enrollment, highest degree earned, school type (urban, suburban, rural), and university where an administrative license was earned. Figures C7 through C14 in Appendix C gives additional information regarding the technology leadership levels for each category and Table C7 through Table C12 in Appendix C show the ANOVAs for the nonsignificant characteristics.

A *t* test was used to test the differences in the perceived technology leadership preparation level between the principals who have a technology endorsement and those who do not. There was a significant difference between the principals who have a Utah Educational Technology Endorsement ( $M = 3.47$ ,  $SD = .81$ ) and those who do not have

the endorsement ( $M = 2.88$ ,  $SD = .69$ );  $t(127) = 2.33$ ,  $p = .021$ . The Cohen's  $d$  effect size was .41. An effect size of .2 is considered a small effect size while an effect size of .5 is considered a medium effect size. This indicated that the training the principals received while obtaining the endorsement helped them to be better prepared as technology leaders. Figure 5 shows the technology leadership level for the participants with a Utah Educational Technology Endorsement and those without the endorsement.

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the priority level of technology integration. There was a significant difference between the perceived technology leadership preparation level and the priority level of technology integration ( $3, 125$ ) = 8.09,  $p = .000$  (see Table 6). Figure 6 shows how the technology leadership preparation level increases as the level of priority for technology integration increases.

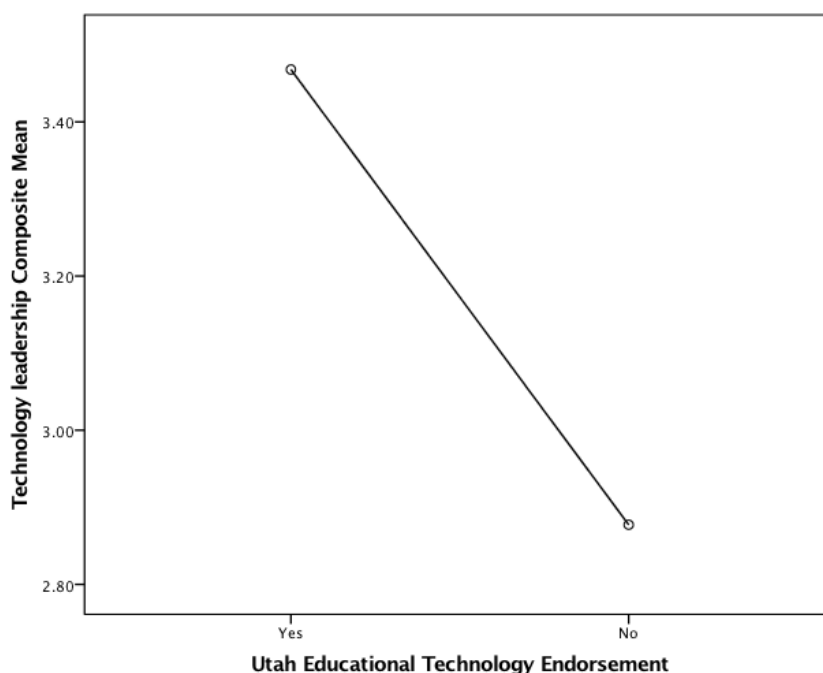


Figure 5. Technology leadership level for Utah Educational Endorsement.



Table 6

*ANOVA for Level of Priority for Technology Integration*

Variance source	Sum of squares	df	Mean square	F	Sig.
Between groups	10.36	3	3.46	8.09	.000**
Within groups	53.37	125	.427		
Total	63.73	128			

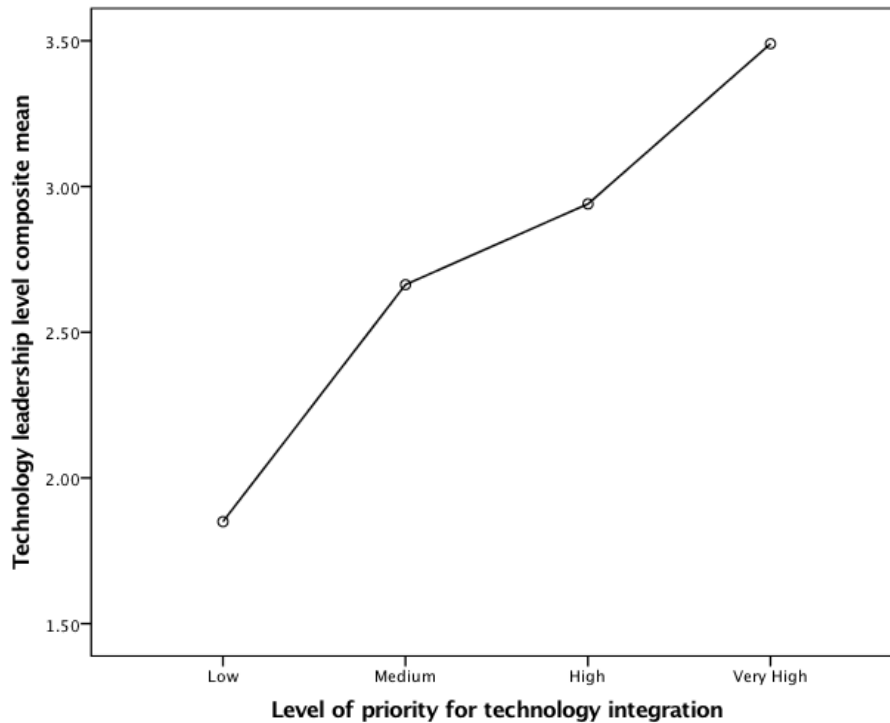
\*  $p < .01$ .

Figure 6. Technology leadership level for level of priority for technology integration.

**Themes from Open-Ended Questions**

Additional insight to the research questions was gathered from three open-ended questions asked in the last section of the survey. The open-ended questions were used to collect more detail regarding each principal's technology leadership preparedness. The

principals' responses helped support and clarify the findings from the 2009 PTLA. These questions gave the participants the power to express themselves in regards to their preparation as technology leaders. The three open-ended questions were as follows.

1. What professional development do you still need in order to effectively lead your school as a technology leader?
2. What are your professional development goals with regards to technology leadership?
3. What barriers do you face in becoming more prepared to be a technology leader?

The results from these questions gave beneficial information regarding the participant's technology leadership preparedness. Several themes emerged that further addressed the studies purpose.

**Effective use of technology.** The most common theme to emerge was an interest in learning more about the effective use of technology. The participants expressed a need to know what is working, why it is working, and how to use technology to improve student achievement. The participants also conveyed a desire to learn about what type of technology is effective and should be used in their schools. A 36-45 years old male principal expressed this by writing, "I want to be better at helping teachers use it effectively. I also want to stay on top of what is available to lead out in sharing it with teachers." Several principals summed up their professional development needs by requesting, "PD on basic technology that should be in every classroom, PD on how technology strengthens the instruction and leads to higher levels of thinking and understanding." Several principals also discussed their desire to learn more about the use of technology to improve literacy instruction.

The survey comments indicated that principals have a need for improved professional development on the effective use of technology. Principals wanted to know what technology is the most effective and how this technology should be used. They also wanted to know how technology can be used effectively in specific content areas, such as literacy.

**Current technology trends.** The participating principals reported a desire and need to have professional development on the current trends of technology. Several principals expressed that they had difficulty keeping up with the rapid changes taking place in technology. This was obvious when a female principal over 56 years old commented;

I'm struggling to keep up with the current trends and technology. We are using it somewhat effectively in our school, but the training I've received has been minimal or somewhat helpful. The principals in our district are basically self-taught or have background and resources independent of the district in the areas of technology, except for the use of data collection and evaluation tools that are required.

Similarly, a first year female principal noted, "Technology is always changing and improving. The challenge to me is to stay current with what resources are out there that are most effective." An additional female principal of 18 years summed up the need for professional development regarding current technology trends by saying, "Technology is always changing. I believe I need constant professional development to effectively lead." The challenge of keeping up with the current trends in technology is both a goal of the principals and also a barrier to their success as a technology leader.

**Software training.** A need for professional development on software was another theme that emerged from the open-ended questions. Many principals commented that

they did not feel prepared to use the software programs their teachers were using. One 35 years or younger female principal mentioned this by writing, “I need more technological training to give me confidence in using programs with ease. There is such a focus on getting hardware in my world, yet there is a serious lack of training on software and how teachers can implement effective practice with their tech.”

The most common software professional development need was for Google programs. A first-year female principal said, “Since our district is going Google, all of the administrators need training to help make sure this happens and can support teachers through this transition.” It was apparent that many schools use the educational resources that are provided by Google such as Google Docs, Google Classroom, Google Sheets, and other Google Apps. Other common software programs that the principals needed training in include Smart technologies, Mastery Connect, PowerSchool, Imagine Learning, Renaissance Learning, and social media tools.

**One to one.** It was evident from the principals’ comments that many of them have strived to provide a device for each student in their school. Several principals indicated that they chose to start acquiring devices for their upper elementary grade students prior to getting devices for the lower grade students. A female veteran principal of 15 years said, “We are currently 1:1 in my third through fifth grades. I would like to see what can be done effectively for the younger students.” In regards to acquiring devices in the upper grades a 36-45 years old male principal said, “My goals are to provide a 1:1 ratio of Chromebooks for my third through fifth grade classes and to provide the training to make this a success.” A different 36-45 years old male principal, commented, “Our goals

include improving student learning by providing 1-to-1 implementation of technology in grades 3-5 to allow them the technology to read, write, and problem solve.” Having a device for each student in the school emerged as a priority for many principals.

**Motivate and train teachers.** Another common theme throughout all three open-ended questions was the desire to learn how to better motivate and train their teachers in the effective use of technology. The principals expressed that this was the next step in their technology leadership progression but was also a barrier to becoming more prepared as a technology leader. One 36-45 years old female principal wrote, “I feel like I need professional development on how to help my more seasoned teachers embrace technology and recognize the need for integration.” Another principal, a female with over 1,000 students, agreed with this sentiment by writing, “I’d like to learn how to better encourage teachers to take the time to learn new tech skills. For many, it is the lowest training priority and I don’t know how to encourage/build more interest.” One principal had the goal to provide enough professional development that teachers would have a desire to replace old practices with technology rich practices. Another female principal remarked, “My goal was to shift our thinking from ‘borrowing’ the devices to actually using them every day as part of routine small group instruction.... I would like professional development to empower teachers on this path.”

It was also expressed by some principals that they did not feel prepared to train their teachers in technology related items. One principal, a 36- to 45-year-old female principal, wrote, “I have a decent personal knowledge of technology and it’s use and value in schools, but don’t feel adequately prepared to be able to share and teach all that

is new and useful to all of my staff.” A female principal, who just completed her first year as a principal, echoed the need to be better trained in technology leadership by stating, “As an instructional leader I need to understand the nuances to be able to get my faculty on board with using technology more often with students.”

**Time and money.** Nearly all principals mentioned that time or money was a barrier to becoming more prepared as a technology leader. Many principals listed both of these items together. Several principals answered the question, “What barriers do you face in becoming more prepared to be a technology leader?” by simply listing, “Time and money.” The participating principals believed that they don’t have enough time to learn how to be a technology leader, train their teachers, and also put a focus on technology leadership. An under 35 years old female principal wrote, “Time is always the biggest factor-time for PD, time to implement and improve.” A separate principal, a female over the age of 56, expressed her frustration by writing, “Time is a big barrier. When do administrators have time to take on one more thing? The evaluations system is huge and very time consuming and leaves very little time for anything else.”

Principals also made comments about how funding was a barrier to becoming more prepared as a technology leader. One principal stated that even if they had the time to train their teachers in technology initiatives, they wouldn’t have the funding to provide the professional development. Another principal wrote, “MONEY! Again – there is a lot of great technology out there but funding is limited. It is also challenging to attend conferences knowing you cannot get those resources. It is also difficult to find funding to take a team of teachers to a technology conference since they are generally out of state.”

A male principal between the ages of 36 and 45 summed up the challenges of having adequate time and money by saying, “Time and money seem to be big stoppers in helping our school learn how to better have/use technology in the school setting.”

**Not a priority.** An additional technology leadership barrier expressed by the participating principals was that other responsibilities were more important than technology leadership. Many principals expressed a desire to lead their schools in technology initiatives, but other demands pushed this aside. There was a sense of frustration in the comments about the amount of demands placed on them and about having to put other items ahead of technology leadership. This was evident in one female principal’s comment when they wrote, “As an elementary principal with 840 students who carries the full weight of administration alone, I find it difficult to have a depth of knowledge about some of my responsibilities. I do support technology advances in my building. Unfortunately, much of our work is grass roots efforts because I don’t have time for classes or additional training.” A 35- to 46-year-old male principal shared this sentiment, “As principals, our plates are full with many tasks. Preparing to be a technology leader is one more thing on our plates.” Another male, who had been a principal for over 6-10 years, commented, “We have so much expected of us as instructional leaders that my primary focus will always be on student learning. Technology leadership is something I support but more likely is not going to be my primary focus in the elementary setting.” Other comments regarding technology leadership not being a priority were, “To be fair, there is just SOOO [*sic*] MUCH we are responsible for that if it isn’t your passion already, it can take a backseat to everything

else.” One rural school principal’s response to the open-ended question seems to summarize the frustration many principals feel about the many demands they face and the priorities that come ahead of technology leadership: “At this point, those goals are put on the back burner due to goals focused on revised teacher evaluation, PLC implementation, and new reading curriculum implementation.”

### **Summary of Findings**

The main purpose of this study was to determine the perceived level of technology leadership preparation among Utah Elementary School principals using the ISTE Standards for Administrators. Several supporting results were also gathered. These results add additional insight to the Utah elementary school principals’ level of technology leadership preparation. This quantitative study used the 2009 PTLA survey to collect data from 129 Utah elementary school principals. This chapter presented an overview of the findings for this study.

Descriptive statistics analyzed the technology leadership preparation level of each principal using the ISTE Standards for Administrators. The technology leadership preparation level for the study sample was 2.92. This indicated that the principals were minimally to somewhat prepared to be technology leaders for their schools. Participating principals reported being most prepared in the digital citizenship standard with a mean of 3.14. The principals reported being minimally prepared as technology leaders for the ISTE Standard for Administrators of visionary leadership, excellence in professional practice, and systematic improvement.



Principals reported that they spent the most amount of their professional development time in district trainings, consisting of a total of 559 hours. The next largest category reported was conferences, with a total of 254 hours.

A correlation between each participant's total amount of technology leadership professional development and their technology leadership preparedness levels was .38. The correlation was also significant at  $p < .01$ . This indicated that when a principal receives training in technology leadership, they are more prepared to be technology leaders.

Using inferential statistics, including independent samples  $t$ -test and one-way ANOVA, there was a significant difference between the perceived technology leadership preparation levels according to the priority given to technology integration. There was also a significant difference between the perceived technology leadership preparation levels when comparing the principals who have a Utah Educational Technology Endorsement and those who do not have a Utah Educational Technology Endorsement.

The open-ended survey questions revealed several themes in regards to technology leadership preparation. Participating principals wanted to receive professional development on the effective use of technology, current technology trends, and how to use the software programs currently in use in their schools. Technology leadership goals for the principals included obtaining more devices for their students and learning how to better motivate and train their teachers. The participants expressed several barriers to becoming more prepared as a technology leader. These included time, money, and other priorities that get in the way of technology leadership.

In conclusion, the principals in this study reported that they were minimally to somewhat prepared to be technology leaders. The principals also reported that the technology leadership training they did receive was minimal. The study also showed that the more training a principal received in technology leadership, the more prepared they were as technology leaders.

## **CHAPTER V**

### **DISCUSSION**

#### **Introduction**

In today's world, technology has become commonplace in both society and education. Therefore, providing strong technology leadership has become an essential part of the principalship. To become competent technology leaders, principals must first be prepared for this important role. Principals who are prepared to be technology leaders are key to successful technology integration into teaching and learning (Brockmeier et al., 2005; Dawson & Rakes, 2003; Flanagan & Jacobsen, 2000). Research has indicated that the degree to which principals are prepared to be technology leaders is not completely clear (Brockmeier et al. 2005). McLeod et al. (2011) have suggested that further research is needed on the preparation of technology leaders. The results of this study will contribute to the larger field of technology leadership preparation research.

The main purpose of this study was to determine the perceived level of technology leadership preparation of Utah elementary school principals when compared to the ISTE Standards for Administrators. Several sub purposes helped support the main purpose. This study identified how Utah principals are developing technology leadership skills. In addition, the study also determined the correlation of the perceived technology leadership preparedness level of Utah principals with the number of hours spent in technology leadership training. Finally, the study compared the differences in technology leadership preparation levels based on characteristics of gender, age, number of years as

an elementary school principal, school enrollment size, highest degree earned, school type (Urban, suburban, Rural), university where administrative license was earned, priority of technology integration, and acquisition of a Utah Educational Technology Endorsement. This chapter presents the conclusions and recommendations based on the findings collected.

The research was guided by the following question, “What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?”

In addition, the following subquestions have brought additional clarification:

1. How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators?
2. Does the perceived technology leadership preparedness level of Utah principals correlate with the number of hours spent in technology leadership training?
3. What are the differences in technology leadership preparation levels for the following characteristics?
  - a. Gender
  - b. Age
  - c. Number of years as an elementary school principal
  - d. Enrollment
  - e. Highest degree earned
  - f. School type (Urban, Suburban, Rural)
  - g. University where earned administration license
  - h. Priority of technology integration
  - i. Acquisition of Utah Educational Technology Endorsement

Using the 2009 PTLA, data for this study was collected from 129 Utah public elementary school principals, which represented a response rate of 58%. Demographic and open-ended questions were added to the survey to help better address the research questions.

### **Technology Leadership Preparation**

As noted throughout this study, technology leadership preparation is central to the effective use of technology in teaching and learning. Dawson and Rakes (2003) have indicated that the more technology training a principal received the more progress the school will make in technology integration. In addition, their study suggested, “as principals become more adept at guiding technology integration, more efficient and effective technology use should become prevalent in schools” (p. 43). This section addresses technology leadership preparation by answering the question, “What is the perceived technology leadership preparedness level of Utah principals as defined by ISTE Standards for Administrators?”

The Utah elementary school principals in this study reported a technology leadership preparation level of 2.92, which can be interpreted that the principals perceived they were minimally to somewhat prepared to act as technology leaders. Although technology leadership preparation research is limited, this finding is consistent with the current research. It can be concluded that Utah elementary school principals are not adequately prepared to act as technology leaders in their schools. This finding also suggested that many Utah principals need more technology leadership professional development in order to be effective technology leaders. To make this happen, educational leaders must prioritize technology leadership training and make it more accessible to principals.

With results similar to the findings of this study, Flanagan and Jacobsen (2003) noted that principals are not prepared for the role of technology leader and have struggled

to develop the skills necessary for successful technology integration. The lack of technology leadership preparation has resulted in many principals failing to integrate technology in ways that positively influence student outcomes. In addition, Flanagan and Jacobsen's research showed that principals lack the knowledge and experience to help their teachers effectively use technology.

Additional research has pointed out that principals are not well informed or involved as technology leaders (Dawson & Rakes, 2003). As a result, principals often find themselves facing the challenge of leading their schools through a change process they are unprepared for. Brockmeier et al. (2005) said, "The challenge facing principals appears to not be a failure to recognize the power and capabilities of technology, but a lack of the acquired expertise necessary to be technology leaders who are able to facilitate technology's integration" (p. 13). Furthermore, results from a study by Brockmeier et al. indicated that almost 50% of principals were unwilling to give technology decision-making authority over to teachers. They also found that only 59% of principals reported that their expertise made them a technology leader. This being the case, it is all the more reason why principals must be prepared to be technology leaders.

Research has also suggested that, in general, universities have not prepared most principals for technology leadership responsibilities. Mehlinger and Powers (2002) said, "Graduate school programs generally are doing a poor job in preparing school principals and superintendents to be technology leaders" (p. 218). This was evident in research conducted by Levine where he found that only 34% of university programs included technology leadership in the coursework (Levine, 2005). McCoy-Thomas (2012)

discovered that most programs address technology through existing courses and not through courses dedicated primarily to technology leadership. This approach did not appear to adequately prepare principals for the responsibility of technology leadership.

According to McLeod and Richardson (2013), “most national and state educational leadership associations, state departments of education, and school districts are not investing heavily in the development of technology-fluent principals” (p. 28). Similar to the findings of prior research, the technology leadership level of 2.92 found in this study suggested that Utah elementary school principals are not adequately prepared as technology leaders.

Using the ISTE Standards for Administrators, the principals reported the following technology leadership preparation levels: digital citizenship (3.14), digital age learning culture (2.87), visionary leadership (2.86), excellence in professional practice (2.85), and systematic improvement (2.84). Principals reported their highest technology leadership preparation level as digital citizenship (3.14). A composite mean of 3.14 indicated that participants perceived that they were somewhat prepared to be technology leaders in the standard of digital citizenship.

The high preparation level in digital citizenship might be attributed to the amount of attention the state of Utah has given to creating policies and resources related to digital citizenship. According to Digital Citizenship Utah (n.d), Utah is currently the only state with laws pertaining to digital citizenship. In 2015, Utah House Bill 213 Safe Technology Utilization and Digital Citizenship in Public Schools was passed. It requires school Community Councils to work with schools to ensure safe technology utilization and

digital citizenship (Rogers-Whitehead, 2015).

The other four ISTE Standards for Administrators were all the same to the tenths place with a mean of 2.8. When analyzing the means to the hundredths place, systematic improvement had the lowest mean at 2.84. The composite means for these four standards indicated that principals perceived that they were minimally to somewhat prepared to be technology leaders in these standards. This supports the findings from several other researchers that have suggested that principals have not been prepared to be technology leaders (Brockmeier et al., 2005; Dawson & Rakes, 2003; Flanagan, 2006). The technology leadership preparation levels found in this study indicated that Utah principals perceived they are not adequately prepared to be technology leaders. It will take additional professional development for principals to feel prepared to lead their schools in the use of technology in teaching and learning. This training will help give principals the added insight to do what is so often requested of them with the integration of technology into schools.

### **Developing Technology Leadership Skills**

Principals need professional development in order to meet the demands placed on them in the twenty-first century (Daresh, 1998). This professional development comes in many different forms. This research study investigated how much professional development the principals are receiving and the ways in which they receive it. This section answers the question, “How are Utah principals developing technology leadership skills as described by the ISTE Standards for Administrators”?



Principals reported by category the number of hours of technology leadership professional development they had received in the last year. They reported that they spent the most amount of time in district trainings, which consisted of a total of 559 hours. The next largest category reported was conferences, with a total of 254 hours. The large gap of hours between the two categories indicated that district training is the primary method of technology leadership training for Utah principals.

The total hours of technology leadership professional development for each participant was also computed. 17 principals reported attending zero hours of technology leadership professional development in the last year. In addition, all but 26 principals attended less than 16 hours of technology leadership professional development. The median amount of professional development hours was five. These results indicated that the amount of technology leadership training was minimal for the majority of the principals. It can also be concluded that principals are not receiving an adequate amount of technology leadership professional development to effectively lead their schools in the use of technology.

Principals can receive professional development through a variety of methods. In the article “*Learning to Lead, Leading to Learn*” (Sparks & Hirsch, 2000), the NSCD discussed the types of professional development activities that will effectively support school leaders. These activities include peer study groups, support networks, administrator portfolios, journal keeping, team training for school improvement, and the development of professional growth plans. NSDC also supports the use of extensive coaching. Many different professional development activities should be considered when

designing professional development for principals (Peterson, 2001).

Regarding technology leadership professional development, Schrum et al. (2011) researched how principals learned about technology leadership. School leaders reported learning about technology on their own and using technology as a teacher. Many noted that reading literature and attending conferences provided insight.

Research has also been done to determine how many hours of technology leadership professional development it takes for principals to effectively lead as technology leaders. Dawson and Rakes (2003) found that principals with more than 51 hours of technology leadership training lead schools that are noticeably different from other schools. This confirmed the belief of many that long-term training is worth the effort and expense. Similarly, they noted that principals who received 13-25 hours of technology leadership professional development were significantly different from principals who received less than 13 hours of such training. In addition to Dawson and Rakes findings, Brooks-Young (2009) recommended 15-60 hours of professional development for effective technology integration.

Principals need technology leadership professional development to effectively lead their schools in the use of technology. This study revealed that the majority of Utah principals are receiving a minimal amount of technology leadership professional development and that the majority of the training they are receiving is from their district leaders. In most cases, the minimal amount of professional development is not adequate for principals to be effective technology leaders. As was mentioned previously, educational leaders should take the preparation of principals seriously when it comes to

technology leadership. Principals are the key to the effective use of technology in teaching and learning. Adequate technology leadership training is needed in order for principals to meet the demands associated with the use of technology in schools.

### **Technology Leadership Preparation Correlation**

Research by Dawson and Rakes (2003) has shown that when principals receive technology leadership professional development they are more likely to effectively integrate technology in their schools. Similarly, this study also sought to discover if there was a correlation between the amount of professional development a principal receives and how prepared they are as technology leaders. This study attempted to answer the question, “Does the perceived technology leadership preparedness level of Utah principals correlate with the number of hours spent in technology training?”

The Pearson correlation for the relationship between each participant’s total hours of technology leadership professional development and the technology leadership preparedness level of each participant was .38. This indicated that there is a moderate relationship between the amount of time spent in technology leadership training and how prepared a principal is to lead their school using technology leadership skills. The Pearson correlation was also significant at  $p < .01$ . The significance of this correlation suggested that there is a relationship between the total hours of technology leadership professional development and the technology leadership preparedness level. In addition, it can be assumed that when a principal receives training in technology leadership, they feel more prepared to be technology leaders and as this training increases so does their

preparedness to lead their schools as a technology leader.

The results from this study support previous technology leadership preparation research. A review of literature conducted by Brockmeier et al. (2005) suggested that principals who are prepared as technology leaders are central to technology integration. In addition, they add that “without a thorough understanding of computer technology’s capabilities, principals will not be ready to provide the leadership in technology necessary to restructure schools” (p. 46). In addition, research by Anderson and Dexter (2005) suggested that effective technology integration efforts are seriously threatened unless administrators lead as technology leaders.

These findings are also supported by Dawson and Rakes (2003), who found that when principals are adequately prepared as technology leaders they are more likely to lead schools in the use of technology. In addition, they also found that “the more sustained the principals’ training and the more those experiences are tied to the curriculum and principal’s needs, the more progress the school is likely to make toward technology integration” (p. 45). Furthermore, Dawson and Rakes have concluded that the more competent principals are as technology leaders, the more efficient and effective the technology use becomes in schools. The research for this sub question can lead to the same conclusion. In addition, the results from this study can lead one to the conclusion that the more technology leadership professional development a principal has received the more prepared they will be to lead in the use of technology in teaching and learning.

### **Technology Leadership Preparedness for Participant Characteristics**

This study sought to discover if there were differences in the principal's technology leadership preparation level and various characteristics of the principal. More specifically, the study researched the question, "What are the differences in technology preparation levels for the following characteristics?"

- a. Gender
- b. Age
- c. Number of years as an elementary school principal
- d. Enrollment
- e. Highest degree earned
- f. School type (Urban, Suburban, Rural)
- g. University where earned administration license
- h. Priority of technology integration
- i. Acquisition of Utah Educational Technology Endorsement

Using inferential statistics, including independent samples *t*-test and one-way ANOVA, few significant differences were found in the participants' technology leadership level and demographics. Demographics that did not show significance in the participants' technology leadership level were gender, age, number of years as an elementary school principal, enrollment, highest degree earned, school type (urban, suburban, rural), and university where an administrative license was earned. There was a significant difference in the participants' technology leadership level of the principals who had a Utah Educational Technology Endorsement. In addition, the technology leadership preparation level for principals who received a Utah Educational Technology Endorsement was 3.47, while those without an endorsement it was 2.88. There was also a significant difference in the participants' technology leadership level and their priority of technology integration.

These results indicated that there is a relationship between the technology leadership preparation level for principals who received their Utah Educational Technology Endorsement and those who did not. The results also indicated that there is a relationship between the degree of emphasis a principal places on technology leadership and their technology leadership preparedness level. Furthermore, these findings indicated that principals who placed a high priority on technology integration were more prepared as technology leaders than those who placed a low priority on technology leadership. As with other results from this study, these findings demonstrated that principals feel more prepared as technology leaders when they receive professional development. As educational leaders implement technology, plans should be in place for principals to receive technology leadership professional development.

### **Discussion of Open-Ended Responses**

Several open-ended questions were asked to bring additional clarity and insight to the research questions. The results from these questions generated information regarding technology leadership preparation that would not have been found without the questions. It was found that many principals have a desire to effectively implement technology in their schools. This desire was often unfulfilled because of the principals' lack of technology leadership professional development. Many principals expressed that their lack of knowledge regarding current technology trends, as well as a lack of funding and time, held them back from being more effective technology leaders. In addition, principals have found it difficult to motivate and inspire some of their teachers to

effectively use technology in their classroom instruction. Several additional findings and conclusions regarding technology leadership preparation were found from the themes that emerged. These are discussed below.

### **Effective use of Technology**

Effective use of technology was the most common theme mentioned by the principals and was mentioned 51 times. These comments were made in regards to a desire to receive training on the effective use of technology to improve student achievement. This included a desire for their staff to understand how to effectively use technology. It can be concluded that, when it comes to principals' goals for technology leadership professional development, principals are most concerned about how themselves and their teachers are receiving training regarding the most effective ways to use technology. These findings are consistent with the technology leadership research by Redish and Chan (2007), who noted that schools with leaders who practice effective technology leadership also, model the use of technology, support best practices in instruction and assessment, and provide professional learning opportunities for their staff.

### **Current Trends**

The principals reported that they were concerned about keeping up with current technology trends. Many principals were not comfortable with the frequent changes being made in technology and wanted further professional development regarding the trends in educational technology. Many principals reported that keeping up with current technology trends was a goal as well as a technology leadership barrier. Richardson,

Flora, and Bathon (2013) have said, “If the school leader does not understand the trends in educational technology then the leader is ill prepared to harness the power of modern digital technologies.” (p. 145). In order to be effective at technology leadership, principals need to keep up on the current technology trends. This topic should be included in the technology leadership training that principals receive.

### **Software Training**

One trend that principals are trying to keep up with is the implementation of new software. The principals expressed a need to receive training in the software programs that their district and school were implementing. There are many programs being implemented throughout Utah. Many principals need additional training in order for these programs to be used more efficiently.

### **One to One**

Another theme that developed was the principals desire to be one-to-one, meaning one device for every student. The findings suggest that principals implement one-to-one programs in the upper elementary grades prior to the lower grades. Some principals have a goal to transition their entire school to a one-to-one format.

### **Motivate and Train Teachers**

Motivating and training teachers was a theme that was very apparent from the principals’ responses. It was also expressed that this both the next step for technology leadership professional development and a barrier to principals becoming more prepared to be a technology leader. The findings suggested that some principals have found that



their teachers are not motivated to use technology with their instruction. Dawson and Rakes (2003) discovered a similar finding. They said that a fundamental reason for the lack of progress with technology integration was the struggle teachers had when transitioning from traditional teaching methods to computer based methods. As a result, these principals would like further training on how to motivate their teachers to have a desire to effectively use technology. The survey results also suggested that some principals feel that they need to have a better knowledge of technology use before they can motivate and train their teachers.

Several researchers have recognized the need for principals to assist their teacher in the use of technology. Afshari et al. (2009) have acknowledged that information technology will only be successfully implemented in schools if the principal actively supports it as well as provides professional development for their staff. Flanagan and Jacobsen (2003) have explained that principals must have professional development in order to effectively inspire and lead teachers in technology integration. In conclusion, principals need additional technology leadership professional development before they can effectively motivate and train their teachers on the use of technology in teaching and learning.

### **Time and Money**

The findings from this study suggested that the greatest barrier principals face in becoming more prepared to be technology leaders is time and money. Nearly all principals who responded to question 3 on the open-ended questions mentioned time and money as a barrier. It is evident from the principals' responses that time and money are

big hurdles for them to overcome as they strive to become technology leaders. Further funding is needed to purchase technology and to provide training for principals and teachers.

### **Not a Priority**

Another barrier reported by the principals was that other responsibilities were more important than becoming more prepared as a technology leader. The principals' responses suggested that many of them felt overwhelmed with the large amount of responsibilities and expectations they faced. These responsibilities were often perceived to be more important than that of technology leadership. Several principals mentioned the changes in the Utah teachers' evaluation requirements as taking priority over technology leadership. This finding has also been repeated outside of Utah. In a research study of Rural Florida principals, Hope et al. (1999) found that principals were simply too busy with the job's demands to spend the necessary time to engage in technology leadership professional development. Some principals in this study do not believe that technology leadership is as important as other responsibilities they face. This may also indicate that they do not believe that technology makes a large enough impact on teaching and learning to spend their time on it.

### **Implications**

The results of this study can be a beneficial guide for those making technology leadership professional development decisions. The results are relevant for a variety of audiences, including state legislatures, policy makers, university principal preparation

programs, state and school district administrators, and elementary school principals. The study supports the argument that, in general, elementary school principals are in need of technology leadership professional development and are currently not prepared to act as technology leaders in their schools.

Implementation of more quality technology leadership professional development for school leaders should be considered as districts and schools strive to better use technology in teaching and learning. This is especially needed as the state of Utah continues to implement technology education initiatives. Recent Utah legislation, H.B. 277 Personalized Learning and Teaching Amendments (2016), has allocated 15 million dollars to digital learning. This legislation is now called the Digital Teaching and Learning Grant Program and is available to all districts and charter schools through a grant application process. The intent of this legislation is to transform the way instruction is delivered and to better prepare students to compete in the global world (Carroll, 2016). In order for this to happen, it will be important that principals are prepared to act as technology leaders.

Research has suggested that most principals have not had technology leadership training in their preparation programs (Redish & Chan, 2007; Riedl et al., 1998; Schrum et al., 2011). There is a need for principal preparation programs to include specific instruction on technology leadership. Universities can use the results of this study in course planning to ensure greater technology leadership preparation for future principals.

This study can also be used to help educational leaders understand the importance of training principals as technology leaders, as well as give needed direction regarding

professional development in specific areas of technology leadership. This training is one of the keys to helping schools improve student achievement with the use of technology.

### **Recommendations for Practical Implications**

The findings from this study suggested that principals are in need of technology leadership training. Several recommendations for practical implications are given. This study found that most principals have received a limited amount of technology leadership professional development. It is recommended that state and district leaders find ways to make technology leadership professional development more accessible to principals. This can be done through programs such as the technology endorsement, or through trainings such as those conducted at a district level. Technology leadership skills do not always need to be taught in isolation. These skills can also be embedded in standard professional development. In addition, it is recommended that principals seek out their own technology leadership professional development. This can come in the form of university courses, online tutorials, conferences, journals, or through a Professional Learning Network (PLN).

A recommendation from this work is that the 2009 ISTE Standards for Administrators be used as a framework as educational leaders plan future technology leadership training. This also applies to university preparation programs. It is further recommended that universities include technology leadership in their principal preparation programs. This can be done as a stand-alone course or imbedded within other courses.

In addition, a technology leadership professional development model has been created that can assist educators as they develop and teach technology leadership. This model is not intended to be exhaustive of technology leadership professional development topics, but is meant to be an assistive guide for those developing and teaching professional development. This model emphasizes five key areas: visionary leadership, instructional practices, schoolwide professional development, resource management, and sustainability. Specific topics are listed within each of the five areas to help give further direction for technology leadership professional development. These topics can be found in Figure 7.



*Figure 7.* Technology leadership professional development model.

To further assist those involved in technology leadership professional development, the following is given as a definition for technology leadership:

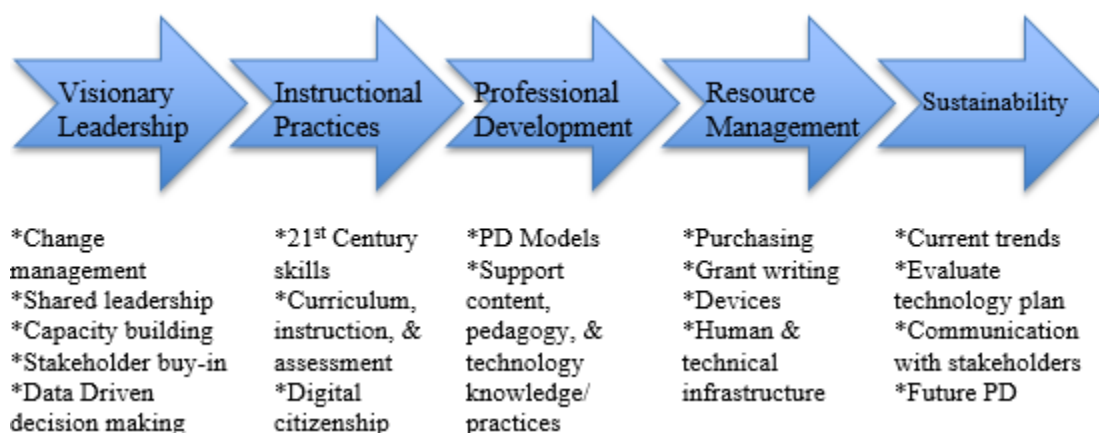
“Technology leadership is the leaders ability to inspire and lead others in the effective use of technology in teaching and learning.” Contributing to this definition is the notion that an essential role of a leader is to inspire those they lead. This definition, along with the technology leadership professional development model, can be used in conjunction with the ISTE Standards for Administrators to train principals and future principals in technology leadership.

Furthermore, it is recognized that it is important that principals are included in conversations related to technology leadership professional development and the use of technology in teaching and learning. Therefore, it is recommended that principals be included in the decision-making regarding technology initiatives.

This study found that principals believed that a barrier to becoming an effective technology leader was the lack of money. It is recommended that, as legislatures and policymakers encourage technology implementation and allocate funding towards hardware and software, funding also be given for principals to receive professional development pertaining to technology leadership.

### **Recommendations for Future Research**

Future research on technology leadership is needed. Several recommendations for further research are given to help advance the literature on technology leadership. This study researched the technology leadership preparation of elementary school principals.



*Figure 8.* Technology leadership professional development detailed model.

A similar study for secondary principals could be beneficial to secondary school administrators. In addition, a study researching technology leadership preparation at all school levels would give greater insight into the similarities and differences of technology leadership for the different school levels.

Utah principals were used as the population for this study. A similar study using additional populations could further describe the status of technology leadership in other states and throughout the United States.

The principals' perceptions of technology leadership preparation were researched in this study. Researching technology leadership from the teachers' perspectives would give additional insight.

Studies using the 2009 ISTE Standards for Administrators are limited. Much of the current research on technology leadership has been done using the 2002 version of the ISTE Standards for Administrators, which are referred to as the NETS-A Standards. Additional studies using the current standards would give up-to-date research.

This study primarily used quantitative research strategies. A qualitative study on

technology leadership preparation would give a different perspective.

### **Limitations**

This study was limited in several ways. The population for this study was limited to Utah public elementary school principals. The results are singular to the perceptions of principals in one state and do not necessarily represent the perceptions of principals outside of Utah. In addition, the research was synonymous with principals in public district schools and did not include principals in private or charter schools.

The 2009 PTLA, which was the survey used in this study, has limited statistical validation. However, the author of the 2009 PTLA survey modeled the survey from the original PTLA survey, which is based on the 2002 ISTE Standards for Administrators. The original PTLA survey went through a rigorous process for statistical validation. The 2009 PTLA has been piloted and used in additional studies. In addition to the limitations, it was assumed that all participants were open and honest in their survey response.

### **Conclusion**

Schools need principals who are prepared for the role of technology leader. Principals who are prepared for this role are key to successful technology integration in teaching and learning (Flanagan & Jacobsen, 2002). Principals need technology leadership professional development in order to successfully act as technology leaders in their schools.

Evidence from this study suggests that most principals are not adequately



prepared to lead their schools as technology leaders. They struggle when it comes to effectively leading their schools in the use of technology in teaching and learning. If principals are going to fulfill their role as technology leaders, they will need to spend more time receiving effective technology professional development.

Placing an emphasis on technology leadership training for principals is a crucial and necessary step to the integration of technology into teaching and learning. For effective technology integration to occur in our schools, educators must recognize that it is the principals and superintendents that control the necessary resources for effective integration including vision, time, money, professional development, and policy (McLeod et al., 2013). Knowing that principals lack technology leadership preparation, educators and policymakers should place a strong emphasis on principal training and should seek out additional time, money, and other resources to make more quality technology leadership professional development a reality.

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## APPENDICES

## Appendix A

2009 ISTE Standards for Administrators

# ISTE STANDARDS FOR ADMINISTRATORS

## 1. Visionary Leadership

Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.

- Inspire and facilitate among all stakeholders a shared vision of purposeful change that maximizes use of digital age resources to meet and exceed learning goals, support effective instructional practice, and maximize performance of district and school leaders.
- Engage in an ongoing process to develop, implement and communicate technology-infused strategic plans aligned with a shared vision.
- Advocate on local, state and national levels for policies, programs and funding to support implementation of a technology-infused vision and strategic plan.

## 2. Digital Age Learning Culture

Administrators create, promote and sustain a dynamic, digital age learning culture that provides a rigorous, relevant and engaging education for all students.

- Ensure instructional innovation focused on continuous improvement of digital age learning.
- Model and promote the 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.
- Ensure effective practice in the study of technology and its infusion across the curriculum.
- Promote and participate in local, national and global learning communities that stimulate innovation, creativity and digital age collaboration.

## 3. Excellence in Professional Practice

Administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.:

- Allocate time, resources and access to ensure ongoing professional growth in technology fluency and integration.
- Facilitate and participate in learning communities that stimulate, nurture and support administrators, faculty and staff in the study and use of technology.
- Promote and model effective communication and collaboration among stakeholders 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.





#### 4. Systemic Improvement

Administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.

- a. Lead purposeful change to maximize the achievement of learning goals through the appropriate use of technology and media-rich resources.
- b. Collaborate to establish metrics, collect and analyze data, interpret results and share findings to improve staff performance and student learning.
- c. Recruit and retain highly competent personnel who use technology creatively and proficiently to advance academic and operational goals.
- d. Establish and leverage strategic partnerships to support systemic improvement.
- e. Establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching and learning.

#### 5. Digital Citizenship

Administrators model and facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture.

- a. Ensure equitable access to appropriate digital tools and resources to meet the needs of all learners.
- b. Promote, model and establish policies for safe, legal and ethical use of digital information and technology.
- c. Promote and model responsible social interactions related to the use of technology and information.
- d. Model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools.

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## Appendix B

### 2009 Principals Technology Leadership (PTLA)

### 2009 Principals Technology Leadership Assessment

You are being given this technology leadership assessment at the request of the researcher in partial fulfillment of the degree of Doctor of Philosophy in Curriculum and Instruction at Utah State University. Assessment items are based on the 2009 International Society for Technology in Education's (ISTE) Standards for Administrators.

The individual items in the assessment ask you about the extent to which you are prepared to engage in certain behaviors that relate to K-6 school technology leadership. Answer as many of the questions as possible.

**Your responses will be kept strictly confidential and you will not be identified.**

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

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

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

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

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

### **Section One: Demographics and Professional Development**

***Instructions:*** Please provide the following demographic information.

1. Gender

- ☐ Male
- ☐ Female

2. What is your age?

(Continuous scale 1-100)

3. How many years have you been in your current position?

(Continuous scale 1-50)

4. How many years have you been an elementary school principal?

(Continuous scale 1-50)

5. What is your schools current student enrollment?

(Continuous scale 1-2,000)

6. How would you classify your school location type?

- ☐ Rural
- ☐ Suburban
- ☐ Urban

7. What is the highest degree you hold?

- ☐ Bachelors
- ☐ Masters
- ☐ Ed Specialist
- ☐ Doctorate

8. Do you have a Utah Educational Technology Endorsement?

- ☐ Yes
- ☐ No

9. In the past year, how many hours did you spend in professional development that was primarily focused on technology leadership (select all that apply)?

- ☐ College course (Drop down menu with number of hours)



- District training (Drop down menu with number of hours)
- Conference (Drop down menu with number of hours)
- Workshop (Drop down menu with number of hours)
- Reading journals and other literature focused on technology leadership (Drop down menu with number of hours)
- Did not participate in technology leadership professional development

10. Where did you complete the majority of your principal preparation coursework?

Brigham Young University  
Southern Utah University  
University of Utah  
Utah State University  
Western Governors University  
Other

11. At what level would you prioritize technology integration in your school?

Very Low  
Low  
Medium  
High  
Very High

## Section Two: ISTE Standards A

### I. Visionary Leadership

**Please note that the accuracy and usefulness of this assessment is largely dependent upon your candor.** Please also consider the errors that could occur with answers that are biased in any way.

“To what extent **have you been prepared** to...”

	Not at all	Minimally	Somewhat	Significantly	Fully
1. Facilitate a change that maximizes learning goals using digital resources.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Promote programs and funding to support implementation of technology-infused plans?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## II. Digital Age Learning Culture

Please remember to use candor in your answer and also consider the errors that could occur with answers that are biased in any way.

“To what extent **have you been prepared** to...”

	Not at all	Minimally	Somewhat	Significantly	Fully
4. Ensure instructional innovation focused on continuous improvement of digital learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Model and promote the frequent and effective use of technology for learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Provide learning environments with technology and learning resources to meet the diverse needs of all learners?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Ensure effective practice in the study of technology and its infusion across the curriculum?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Promote and participate in learning communities that stimulate innovation, creativity, and digital collaboration?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### III. Excellence in Professional Practice

Please remember to use candor in your answer and also consider the errors that could occur with answers that are biased in any way.

“To what extent **have you been prepared** to...”

	Not at all	Minimally	Somewhat	Significantly	Fully
9. Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Facilitate and participate in learning communities that stimulate and support faculty in the study and use of technology?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Promote and model effective communication and collaboration among stakeholders using digital-age tools?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## IV. Systemic Improvement

Please remember to use candor in your answer and also consider the errors that could occur with answers that are biased in any way.

“To what extent **have you been prepared** to...”

	Not at all	Minimally	Somewhat	Significantly	Fully
13. Lead purposeful change to reach learning goals through the use of technology and media-rich resources?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Collaborate to establish metrics, collect and analyze data, and share findings and results to improve staff performance and student learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Recruit highly competent personnel who use technology to advance academic and operation goals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Establish and leverage strategic partnerships to support systemic improvement?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Establish and maintain a robust infrastructure for technology to support management, operations, teaching, and learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## V. Digital Citizenship

Please remember to use candor in your answer and also consider the errors that could occur with answers that are biased in any way.

“To what extent **have you been prepared** to...”

	Not at all	Minimally	Somewhat	Significantly	Fully
18. Ensure access to appropriate digital tools and resources to meet the needs of all learners?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. Promote, model, and establish policies for safe, legal, and ethical use of digital information and technology?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Promote and model responsible social interactions related to the use of technology and information?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. Model and facilitate the development of a shared cultural understanding and involvement of global issues through communication and collaboration tools?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### **Section Three: Open-Ended Questions**

1. What professional development do you still need to learn to effectively lead your school as a technology leader?
2. What are your professional development goals with regards to technology leadership?
3. What barriers do you face in becoming more prepared to be a technology leader?

## Appendix C

### Additional Tables and Figures



Table C1

*Demographics of Participants*

Variable	Number	% of total	Variable	Number	% of total
<b>Gender</b>			<b>Highest Degree Held</b>		
Male	57	44.2	Bachelors	2	1.6
Female	72	55.8	Masters	109	84.5
			Ed Specialist	7	5.4
			Doctorate	11	8.5
<b>Age</b>			<b>University Where Earned Administration License</b>		
35 and Younger	10	7.8	Brigham Young University	27	20.9
36-45	50	38.8	Southern Utah University	24	18.6
46-55	37	28.7	University of Utah	17	13.2
56 and Older	32	24.8	Utah State University	41	31.8
			Western Governors University	3	2.3
			Other	17	13.2
<b>Years as an Elementary School Principal</b>			<b>Priority of Technology Integration</b>		
1-5 Years	50	38.8	Low	1	.8
6-10 Years	26	20.2	Medium	46	35.7
11-15 Years	11	8.5	High	63	48.8
16 Years and Higher	42	32.6	Very High	19	14.7
<b>School Location Type</b>			<b>Acquisition of Utah Educational Technology Endorsement</b>		
Rural	37	28.7	Yes	8	6.2
Suburban	75	58.1	No	121	93.8
Urban	17	13.2			
<b>Student Enrollment</b>					
250 and Under	8	6.2			
251-500	27	20.9			
501-750	61	47.3			
751 and Higher	33	25.6			

Note. Total participants = 129.

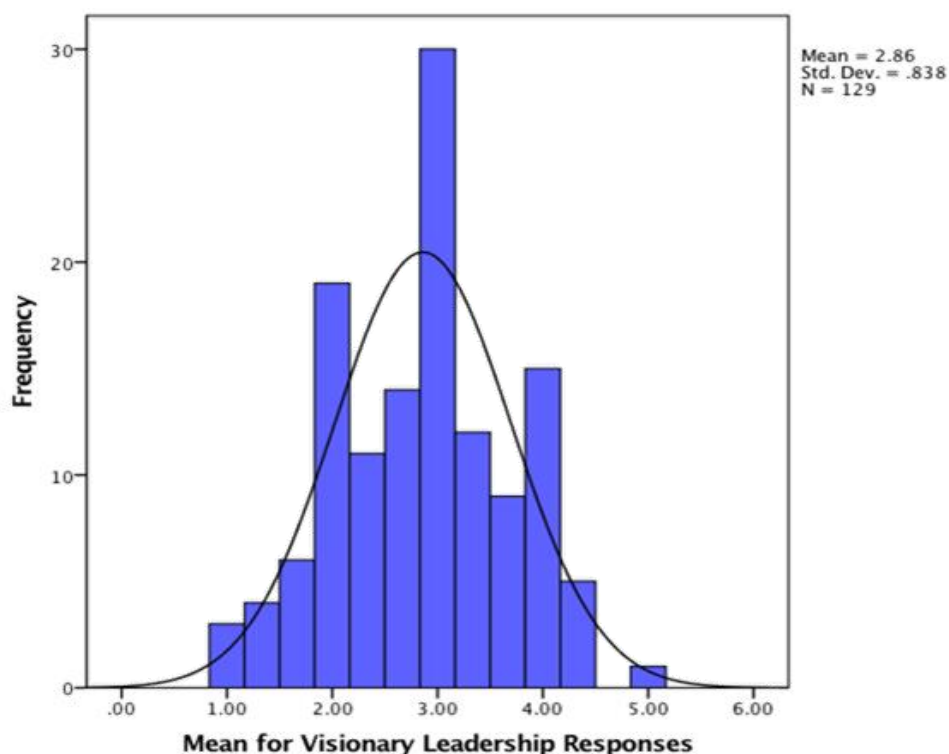


Figure C1. Histogram of principals' visionary leadership responses with normal curve.

Table C2

*Technology Leadership Preparation Level for ISTE Standard A: Visionary Leadership*

ISTE Standards for Administrator	ISTE Standard A Indicator	N	Technology leadership preparation level	SD
Visionary Leadership	Facilitate a change that maximizes learning goals using digital resources.	129	2.85	.83
	Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans?	129	2.75	.94399
	Promote programs and funding to support implementation of technology-infused plans?	129	2.98	.97

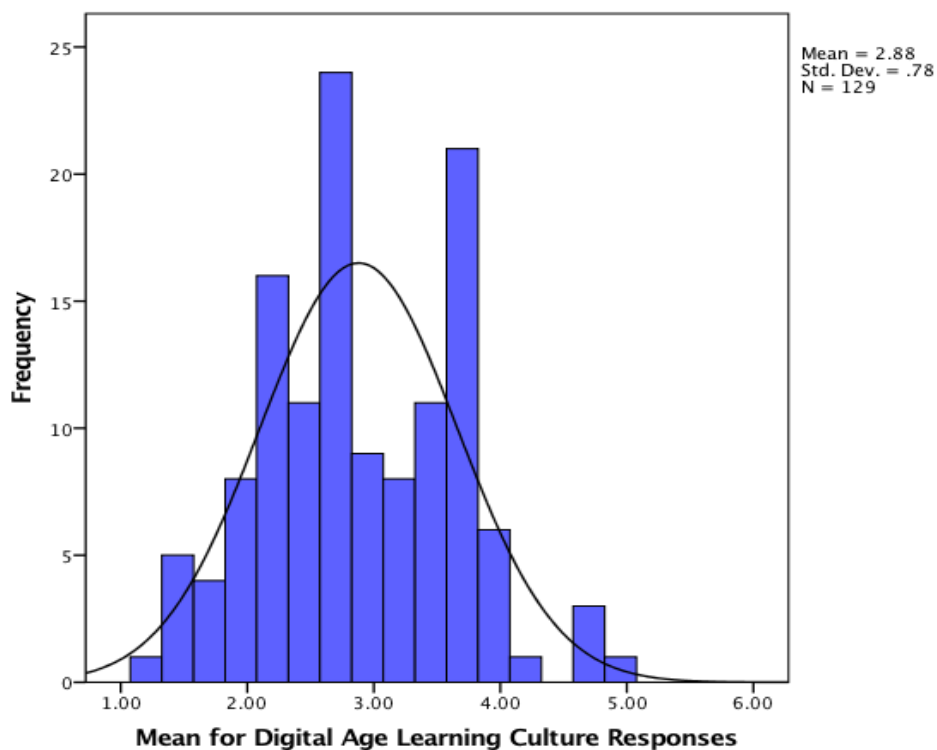


Figure C2. Histogram of principals digital age learning culture responses with normal curve.

Table C3

*Technology Leadership Preparation Level for Digital Age Learning Culture*

ISTE Standard A Indicator	N	Technology leadership preparation level	SD
Ensure instructional innovation on continuous improvement of digital learning?	129	2.	.90
Model and promote the frequent and effective use of technology for learning?	129	2.96	.90
Provide learning environments with technology and learning resources to meet the diverse needs of all learners?	129	3.12	.89
Ensure effective practice in the study of technology and its infusion across the curriculum?	129	2.63	.93
Promote and participate in learning communities that stimulate innovation, creativity, and digital collaboration?	129	2.90	.94

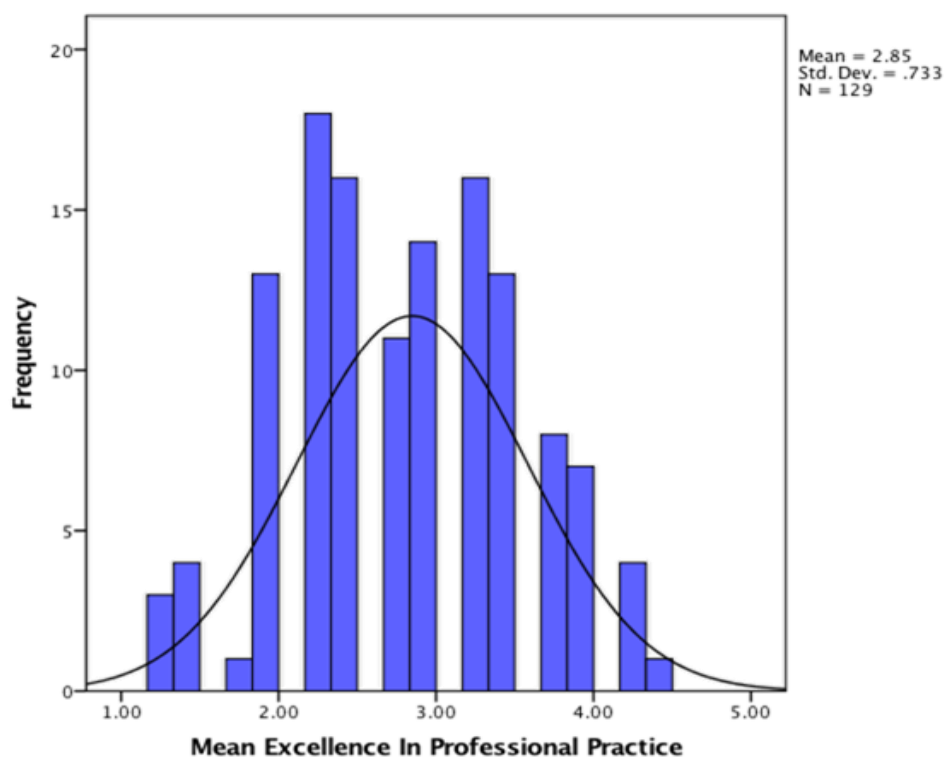


Figure C3. Histogram of principals' excellence in professional practice responses with normal curve.

Table C4

*Technology Leadership Preparation Level for Excellence in Professional Practice*

ISTE Standard A indicator	N	Technology leadership preparation level	SD
Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration?	129	2.90	.86
Facilitate and participate in learning communities that stimulate and support faculty in the study and use of technology?	128	2.87	.89
Promote and model effective communication and collaboration among stakeholders using digital-age tools?	129	2.89	.87
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?	129	2.73	.92

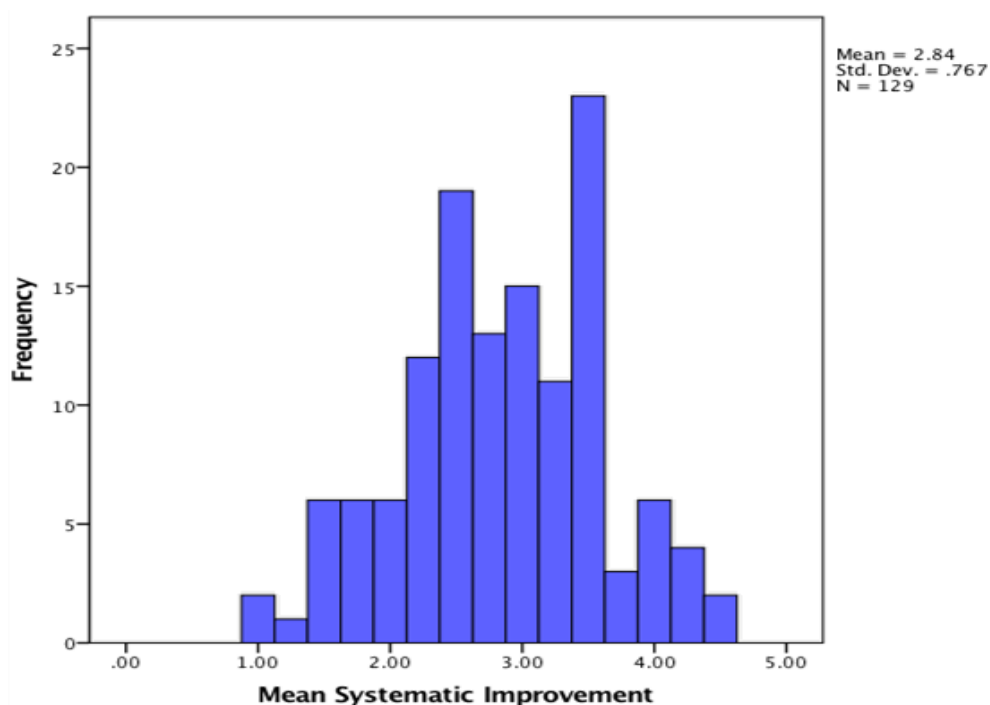


Figure C4. Histogram of principals' systematic improvement responses with normal curve.

Table C5

*Technology Leadership Preparation Level Statistics for Systematic Improvement*

ISTE Standard A indicator	N	Technology leadership preparation level	SD
Lead purposeful change to reach learning goals through the use of technology and media-rich resources?	129	2.75	.93
Collaborate to establish metrics, collect and analyze data, and share findings and results to improve staff performance and student learning?	129	3.22	.95
Recruit highly competent personnel who use technology to advance academic and operation goals?	128	2.98	.98
Establish and leverage strategic partnerships to support systemic improvement?	128	2.40	1.0
Establish and maintain a robust infrastructure for technology to support management, operations, teaching, and learning?	129	2.84	1.01

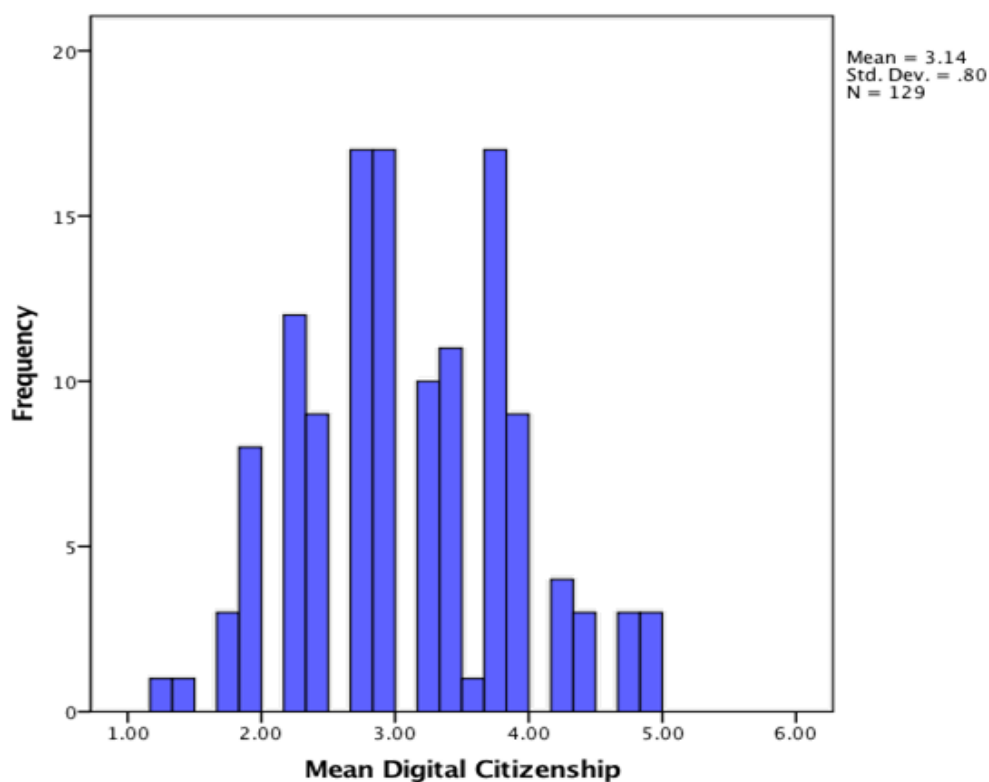


Figure C5. Histogram of principals' digital citizenship responses with normal curve.

Table C6

*Technology Leadership Preparation Level for Digital Citizenship*

ISTE Standard A indicator	N	Technology leadership preparation level	SD
Ensure access to appropriate digital tools and resources to meet the needs of all learners?	129	3.21	.85
Promote, model, and establish policies for safe, legal, and ethical use of digital information and technology?	129	3.46	.93
Promote and model responsible social interactions related to the use of technology and information?	128	3.34	.97
Model and facilitate the development of a shared cultural understanding and involvement of global issues through communication and collaboration tools?	129	2.57	1.05

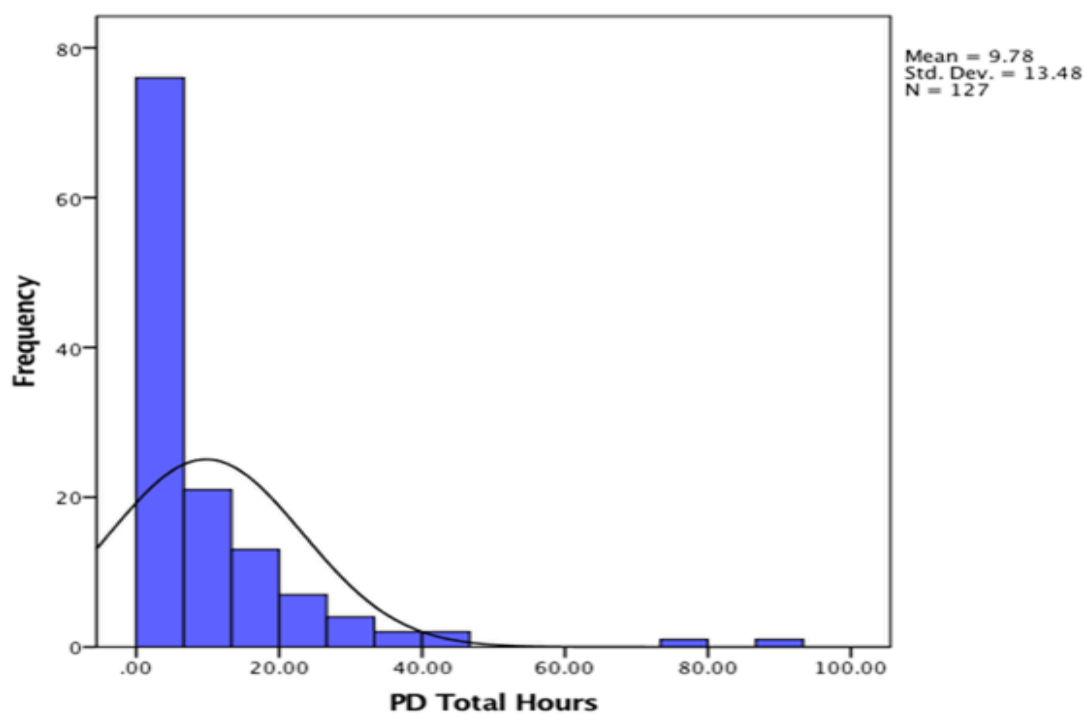


Figure C6. Principals frequency of technology leadership professional development hours.

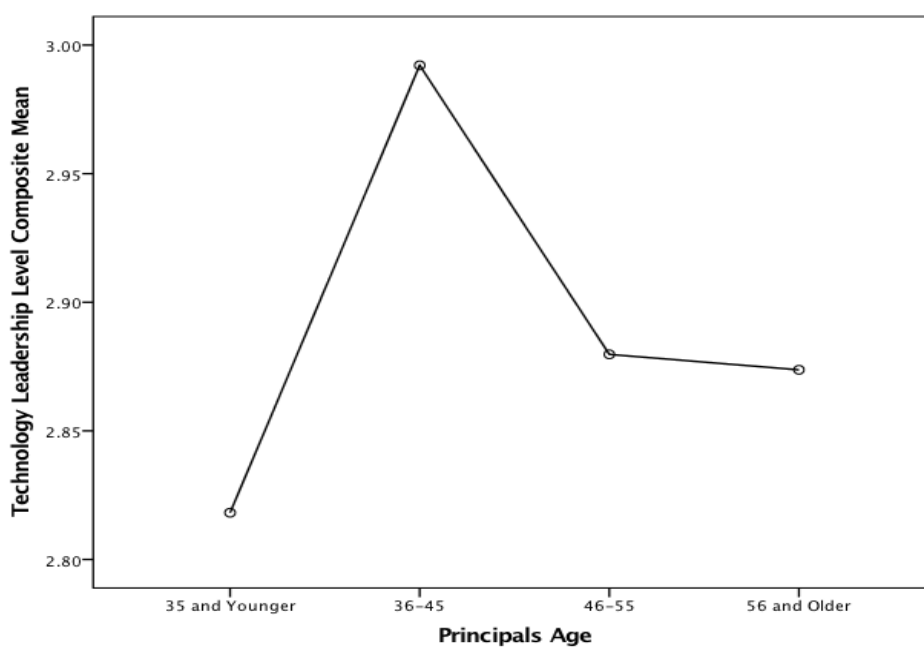


Figure C7. Technology leadership level for principals age categories.

Table C7

*ANOVA for Principals Age*

Variance source	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig.
Between groups	.485	3	.162	.320	.81
Within groups	63.25	125	.51		
Total	63.73	128			

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the number of years as an elementary school principal. Table C8 shows that there was not a significant difference between the perceived technology leadership preparation level and the number of years as an elementary school principal ( $3, 125) = 1.13, p = .340$ . Figure C8 shows the technology leadership level composite mean for number of years as an elementary school principal.

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the school location type. Table C9 shows there was not a significant difference between the perceived technology leadership preparation level and the school location type ( $2, 126) = .065, p = .937$ . Figure C9 shows the shows the technology leadership level composite mean for school location type.

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the student enrollment. Table C10 shows there was not a significant difference between the perceived technology leadership preparation level and the school location type ( $3, 125) = .1.13, p = .340$ . Figure C10 shows the shows the technology leadership level composite mean for school enrollment.



Table C8

*ANOVA for Years as an Elementary School Principal*

Variance source	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig.
Between groups	2.10	3	.70	1.42	.24
Within groups	61.63	125	.5		
Total	63.73	128			

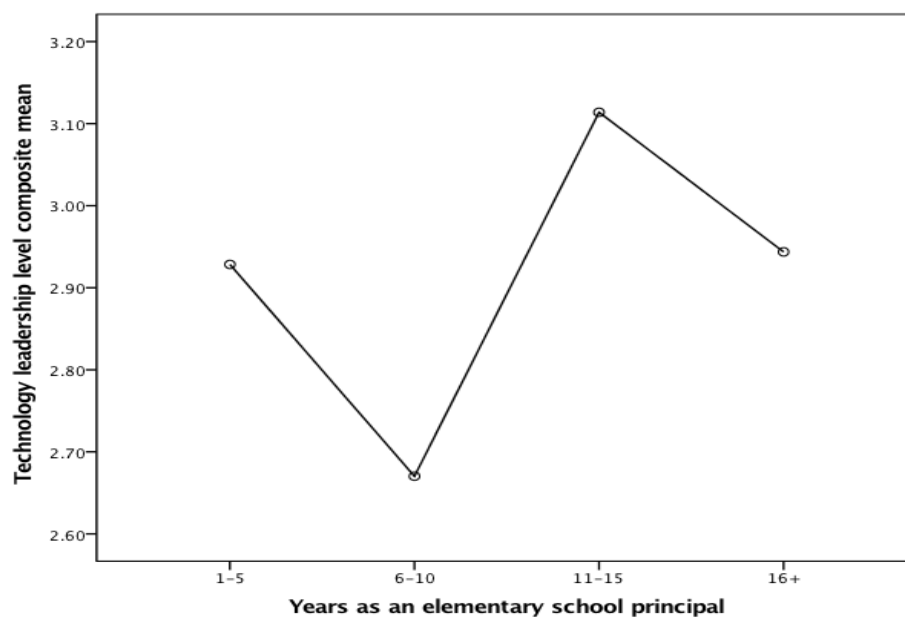


Figure C8. Technology leadership level for years as an elementary school principal.

Table C9

*ANOVA for School Location Type*

Variance source	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig.
Between groups	.07	2	.03	.07	.94
Within groups	63.67	126	.505		
Total	63.73	128			

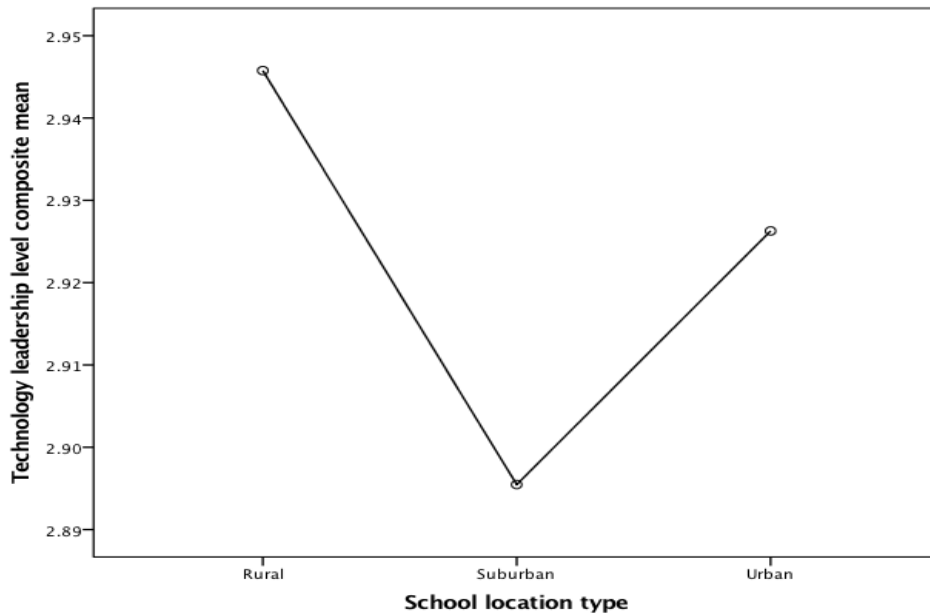


Figure C9. Technology leadership level for school location type.

Table C10

*ANOVA for Student Enrollment*

Variance source	Sum of squares	df	Mean square	F	Sig.
Between groups	1.68	3	.56	1.13	.340
Within groups	62.05	125	.50		
Total	63.73	128			

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the principal's highest degree earned. Table C11 shows there was not a significant difference between the perceived technology leadership preparation level and the highest degree earned ( $3, 125$ ) = .420,  $p = .739$ . Figure C11 shows the technology leadership level composite mean for school enrollment.

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the university where majority of principal preparation

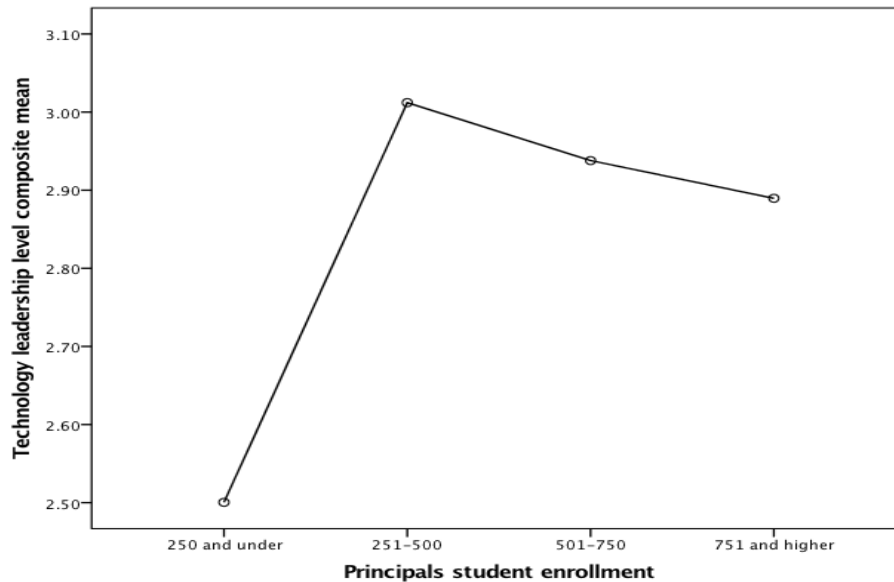


Figure C10. Technology leadership level for student enrollment.

Table C11

*ANOVA for Highest Degree Held*

Variance Source	Sum of squares	df	Mean square	F	Sig.
Between groups	.637	3	.21	.42	.74
Within groups	63.09	125	.505		
Total	63.73	128			

was completed. Table C12 shows there was not a significant difference between the perceived technology leadership preparation level and the university where majority of principal preparation was completed ( $5, 123 = .594, p = .705$ ). Figure C12 shows the technology leadership level composite mean for the university where the majority of the participants' principal preparation was completed.

A one-way ANOVA was used to test differences in the perceived technology leadership preparation level and the priority level of technology integration. There was a

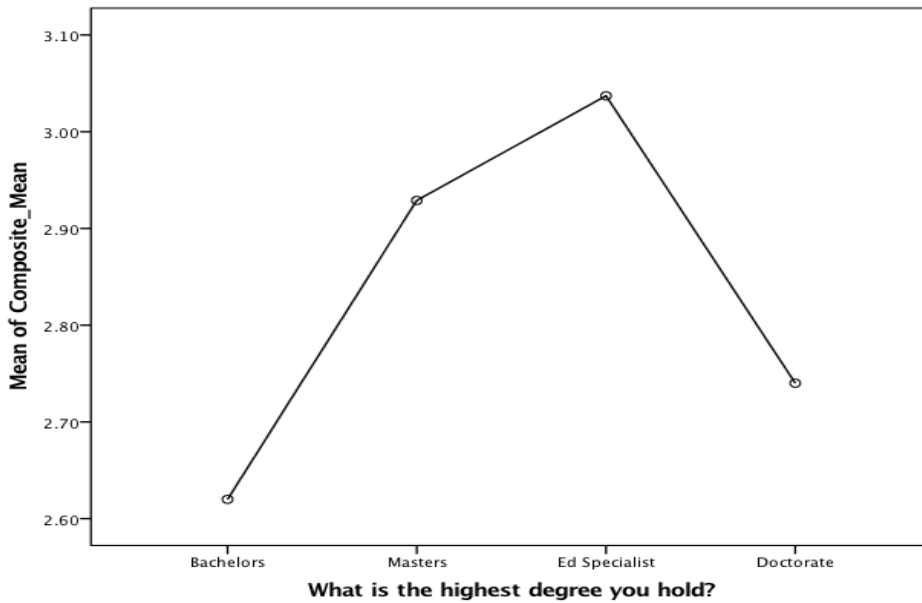


Figure C11. Technology leadership level for highest degree.

Table C12

*ANOVA for Participants University Where Administrative License Was Completed*

Variance source	Sum of squares	df	Mean square	<i>F</i>	Sig.
Between groups	1.50	5	.30	.594	.705
Within groups	62.23	123	.506		
Total	63.73	128			

significant difference between the perceived technology leadership preparation level and the priority level of technology integration (3, 125) = 8.09,  $p = .000$ . The means and standard deviations for the four groups are shown in Table C13. Figure C13 shows the technology leadership level composite mean for the participants' level of priority for technology integration.

A *t* test was used to test the differences in the perceived technology leadership preparation level between the principals who have a technology endorsement and those

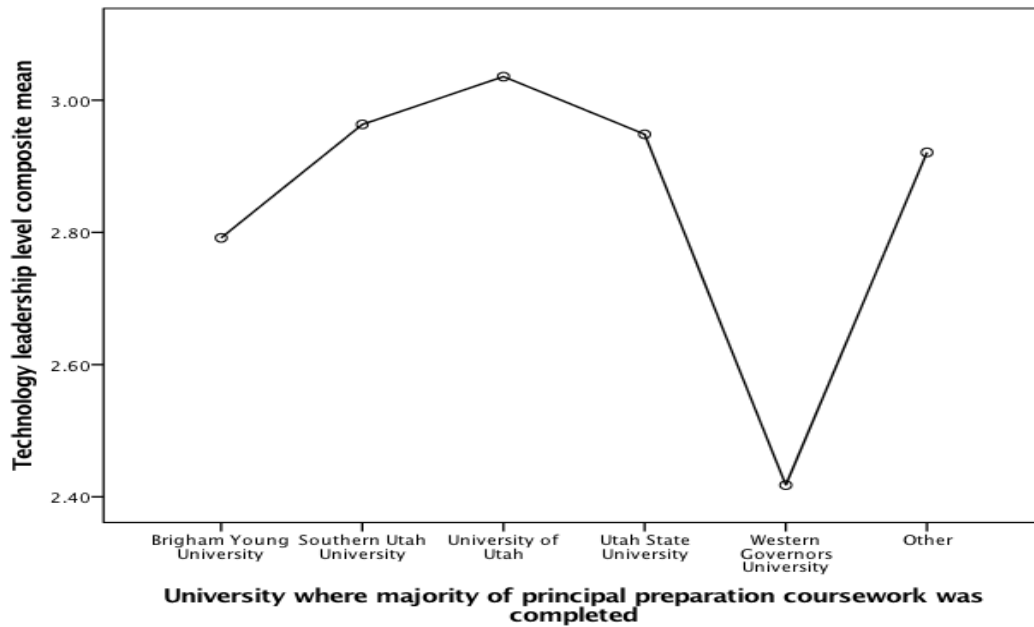


Figure C12. Technology leadership level for university attended.

Table C13

*ANOVA for Level of Priority for Technology Integration*

Variance source	Sum of squares	df	Mean square	F	Sig.
Between groups	10.36	3	3.46	8.09	.000**
Within groups	53.37	125	.427		
Total	63.73	128			

\*\*  $p < .01$ .

who do not have a technology endorsement. There was a significant difference between the principals who have a Utah Educational Technology Endorsement ( $M = 3.47$ ,  $SD = .81$ ) and those who do not have a Utah Educational Technology Endorsement ( $M = 2.88$ ,  $SD = .69$ );  $t(127) = 2.33$ ,  $p = .021$ . Cohen's  $d$  was .41. This is considered a medium effect size. Figure C14 shows the technology leadership level composite mean for the participants who have earned a Utah Educational Technology Endorsement and those who have not earned a Utah Educational Technology Endorsement.

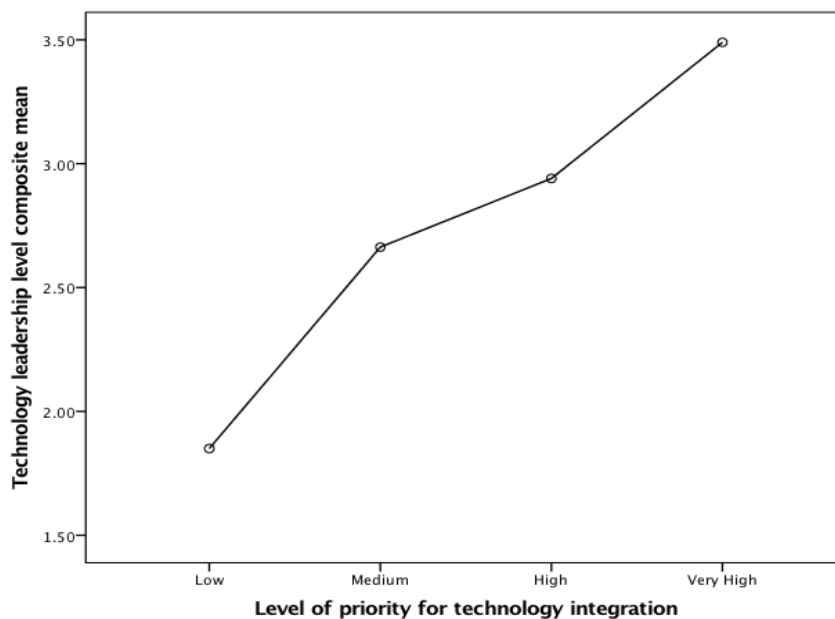


Figure C13. Technology leadership level for level of priority for technology integration.

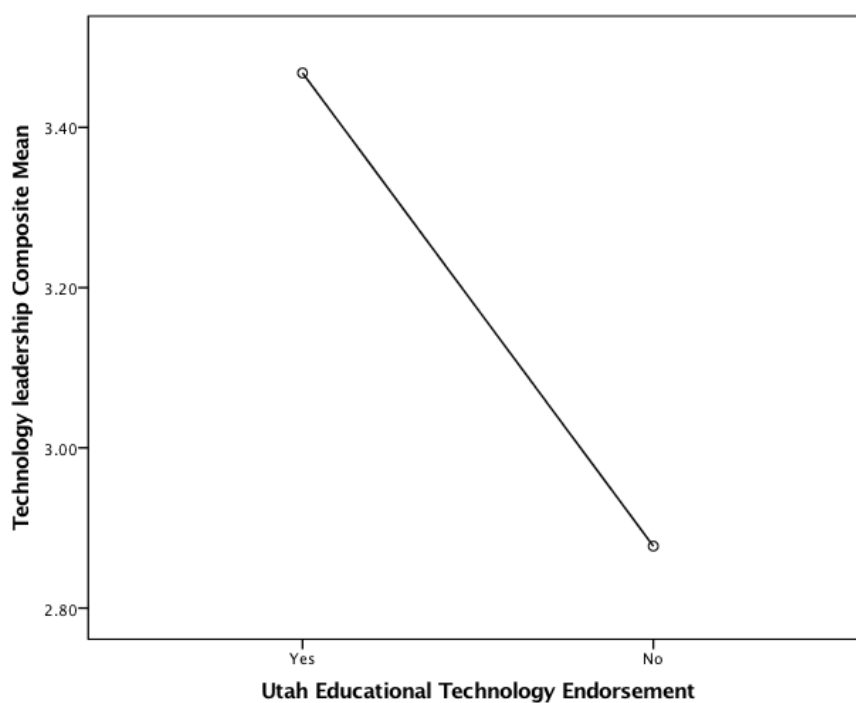


Figure C14. Technology leadership level for Utah Educational Technology Endorsement.

## Appendix D

### Permissions



**Institutional Review Board**  
 USU Assurance: FWA#00003308



**Exemption #2  
 Certificate of Exemption**

FROM: Melanie Domenech Rodriguez, IRB Chair

Nicole Vouvalis, IRB Administrator

To: Courtney Stewart, Nathan Esplin

Date: December 01, 2015

Protocol #: 7019

Title: Utah Elementary School Principals' Preparation As Technology Leaders

The Institutional Review Board has determined that the above-referenced study is exempt from review under federal guidelines 45 CFR Part 46.101(b) category #2:

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through the identifiers linked to the subjects; and (b) any disclosure of human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

This exemption is valid for three years from the date of this correspondence, after which the study will be closed. If the research will extend beyond three years, it is your responsibility as the Principal Investigator to notify the IRB before the study's expiration date and submit a new application to continue the research. Research activities that continue beyond the expiration date without new certification of exempt status will be in violation of those federal guidelines which permit the exempt status.

As part of the IRB's quality assurance procedures, this research may be randomly selected for continuing review during the three-year period of exemption. If so, you will receive a request for completion of a Protocol Status Report during the month of the anniversary date of this certification.

In all cases, it is your responsibility to notify the IRB prior to making any changes to the study by submitting an Amendment/Modification request. This will document whether or not the study still meets the requirements for exempt status under federal regulations.

Upon receipt of this memo, you may begin your research. If you have questions, please call the IRB office at [\(435\) 797-1821](tel:4357971821) or email to [irb@usu.edu](mailto:irb@usu.edu).

The IRB wishes you success with your research.



**Nathan Esplin** <nesplin77@gmail.com>

10/29/15 ☆



to wendy\_metcalf ▾

Dear Dr. Metcalf,

My name is Nate Esplin. I am a graduate student at Utah State University. I am researching principal technology leadership preparedness. I would like to use the PTLA version 2009 for my research. May I have your permission to use the PTLA version 2009 survey with some minor changes?

Sincerely,

Nate Esplin

---

**Wendy\_Metcalf@gwinnett.k12.ga.us**

10/29/15 ☆



to me ▾

Yes, you have my permission to use the instrument with slight modifications. I'd love to see your research when completed.

Kind regards,  
Dr. Wendy Metcalf  
Director, School Technology  
Gwinnett County Public Schools

**Nathan Esplin** <nesplin77@gmail.com>

Nov 7 (5 days ago) ☆



to emerald ▾

To Whom It May Concern,

My name is Nate Esplin. I am a Doctoral student at Utah State University and am writing a dissertation on technology leadership preparation.

I am requesting your permission to include a diagram of the "Role and Responsibilities and Goals of Technology Integration." I have obtained permission from Michele Jacobsen to use the diagram, but she recommended that I also get approval from the Journal of Educational Administration. I have attached a document depicting the page in my dissertation with the model. I will include acknowledgments and/or appropriate citations to your work and copyright and reprint rights information in a special appendix. The reference citation will appear at the end of the manuscript. Please advise me of any changes you require. The reference citation will appear as:

Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, 41(2), 124-142.

Please indicate your approval of this request by emailing back your permission, attaching any other form or instruction necessary to confirm permission. If you have any questions, please call me at the number below.

I hope you will be able to reply immediately. If you are not the copyright holder, please forward my request to the appropriate person or institution.

Thank you for your cooperation.

Sincerely,

Nate Esplin

**Liam Devaney** <L.Devaney@emeraldinsight.com>

Nov 8 (4 days ago) ☆



to me ▾

Dear Nate,

Thank you for your email.

Please allow me to introduce myself, my name is Liam and I am the Rights Executive here at Emerald.

In regards to your request Emerald is happy for you to use this content within your thesis subject to full referencing. Please note however that in the future if you wish to publish your thesis commercially you will need to clear permission again.

I hope the above has answered your query but should you require any further assistance, please do not hesitate to contact me.

Regards

Liam Devaney  
Rights Executive | Emerald Group Publishing Limited  
[L.Devaney@emeraldinsight.com](mailto:L.Devaney@emeraldinsight.com) | [www.emeraldinsight.com](http://www.emeraldinsight.com)

**Nathan Esplin** <nesplin77@gmail.com>

Nov 7 (5 days ago) ☆



to dmjacobs ▾

Dr. Jacobsen,

My name is Nate Esplin. I am a Doctoral student at Utah State University and am writing a dissertation on technology leadership preparation.

I am requesting your permission to include a diagram of the "Role and Responsibilities and Goals of Technology Integration." I have attached a document depicting the page in my dissertation with the model. I will include acknowledgments and/or appropriate citations to your work and copyright and reprint rights information in a special appendix. The reference citation will appear at the end of the manuscript. Please advise me of any changes you require. The reference citation will appear as:

Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, 41(2), 124-142.

Please indicate your approval of this request by emailing back your permission, attaching any other form or instruction necessary to confirm permission. If you have any questions, please call me at the number below.

I hope you will be able to reply immediately. If you are not the copyright holder, please forward my request to the appropriate person or institution.

Thank you for your cooperation.

Sincerely,

Nate Esplin

**Michele Jacobsen**

Nov 7 (5 days ago) ☆



to me ▾

Hello Nathan,

I am happy to give you my permission to use the diagram in your doctoral work.

I expect that you will also need to seek permission from the Journal of Educational Administration.

Michele

~~~~~

Michele Jacobsen, PhD  
Associate Dean, Graduate Programs in Education  
Werklund School of Education | University of Calgary  
T [403.220.4123](tel:403.220.4123)  
[dmjacobs@ucalgary.ca](mailto:dmjacobs@ucalgary.ca)  
<http://werklund.ucalgary.ca/gpe/>

Loftus, J., Jacobsen, M. & Wilson, T. (2016). Learning and assessment with images: A view of cognitive load through the lens of cerebral blood flow. British Journal of Educational Technology. URL: <http://onlinelibrary.wiley.com/doi/10.1111/bjjet.12474/abstract>

Mazur, A., Brown, B., & Jacobsen, M. (2015). Learning Designs using Flipped Classroom Instruction. Canadian Journal of Learning and Technology, 41(2), 1-26. URL: <http://www.cjlt.ca/index.php/cjlt/article/view/909> \*CJLT Editor's Award for Best Article

Brown, B., Dressler, R., Eaton, S., & Jacobsen, M. (2015). Practicing what we teach: Using action research to learn about teaching action research. Canadian Journal of Action Research, 16(3), 60-77. URL: <http://journals.nipissingu.ca/index.php/cjar/article/view/228>

Jacobsen, M. (2014). Design based research: Sponsoring innovation in Education. Education Canada, 54(5), 22-24. URL: <http://www.cca-ace.ca/education-canada/article/design-based-research>

**From:** Nathan Esplin [mailto:[nesplin77@gmail.com](mailto:nesplin77@gmail.com)]  
**Sent:** 07 November 2016 14:42  
**To:** [Patricia.Davies@postgrad.manchester.ac.uk](mailto:Patricia.Davies@postgrad.manchester.ac.uk); Davies, Patricia (Dr)  
**Subject:**

Dear Dr. Davies,

My name is Nate Esplin. I am a Doctoral student at Utah State University and am writing a dissertation on technology leadership preparation.

I am requesting your permission to include a diagram of the "Extended Model of Educational Technology Leadership." I have attached a document depicting the page in my dissertation with the model. I will include acknowledgments and/or appropriate citations to your work and copyright and reprint rights information in a special appendix. The reference citation will appear at the end of the manuscript. Please advise me of any changes you require. The reference citation will appear as:

Davies, P. M. (2010). On school educational technology leadership. *Management in education*, 24(2), 55-61.

Please indicate your approval of this request by emailing back your permission, attaching any other form or instruction necessary to confirm permission. If you charge a reprint fee for use of your material, please indicate that as well. If you have any questions, please call me at the number below.

I hope you will be able to reply immediately. If you are not the copyright holder, please forward my request to the appropriate person or institution.

Thank you for your cooperation.

Nate Esplin  
-----

Davies, Patricia (Dr)

Nov 7 (5 days ago)



to me ▾

Dear Nathan,

Thanks for getting in touch.

You have my permission to include the diagram in your dissertation with an appropriate acknowledgement. What you have shown in the screenshot provided is fine and the reference included in your email below is accurate.

Best regards,  
Dr Davies

Dr. Patricia M. Davies | Senior Lecturer | Department of Mathematics and Computer Science | Faculty of Science and Engineering | Ext. 18584 | [Patricia.Davies@wlv.ac.uk](mailto:Patricia.Davies@wlv.ac.uk)

Recipient of the 2016 [Google CS4HS Award](#)

Davies, P.M. (2014). "Student Action Research: fluidity and researcher identities", in H. Gunter, D. Hall and C. Mills (eds.). [Education Policy Research: design and practice at a time of rapid reform](#), London: Bloomsbury.

Nathan Esplin <nesplin77@gmail.com>  
To: pzline@rowman.com

Mon, Dec 26, 2016 at 8:45 AM

Dear Ms. Zline,

My name is Nate Esplin. I am a Doctoral student at Utah State University and am writing a dissertation on technology leadership preparation.

I am requesting your permission to include a diagram of the technology leadership model designed by Sousan Arafeh — the bullseye figure and the table that further explains it. I have attached a document depicting the model I would like to use. I will include acknowledgments and/or appropriate citations to your work and copyright and reprint rights information in a special appendix. The reference citation will appear at the end of the manuscript. Please advise me of any changes you require. The reference citation will appear as:

Arafeh, S. (2015). Educational Technology Leadership for Education Leaders: An Integrated

Technology Leadership Model. In Haynes, N. M., Arafeh, S., McDaniels, C.

*Educational Leadership: Perspectives on Preparation and Practice.* (pp. 253-269.)

Lanham, MD: University Press of America.

Please indicate your approval of this request by emailing back your permission and by attaching any other form or instruction necessary to confirm permission. If you charge a reprint fee for use of your material, please indicate that as well. If you have any questions, please call me at the number below.

In addition, I have not been able to locate a digital version of the technology leadership model bullseye graphic. Is it possible to get the digital version of this graphic from you?

I hope you will be able to reply immediately. If you are not the copyright holder, please forward my request to the appropriate person or institution.

Thank you for your cooperation.




12/29/2016

Gmail - Copyright Permission

Nate Esplin

435-313-0020

 **Arafeh's Technology Leadership Model.docx**  
85K

Patricia Zline <pzline@rowman.com>  
To: Nathan Esplin <nesplin77@gmail.com>

Tue, Dec 27, 2016 at 10:01 AM

Good Morning Nathan,

Thank you for your email.

This permission grants, no fee, the non-exclusive license to use the material cited below, originally published by University Press of America:

**Permission is granted for your dissertation and coursework and Utah State University only.** It is understood that your dissertation may be included in an academic publishing archive. If you decide to publish it independently at a later date, permission must be re-cleared.

Your citation is fine.

Best

Patricia

Patricia Zline

Rights and Permissions Assistant



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pzline@rowman.com

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## CURRICULUM VITAE

NATHAN ESPLIN

**EDUCATION**

|                                                                                           |          |
|-------------------------------------------------------------------------------------------|----------|
| Utah State University                                                                     |          |
| Ph.D. in Education                                                                        | 2017     |
| Dissertation: <i>Utah Elementary School Principals' Preparation as Technology Leaders</i> |          |
| <br>Southern Utah University                                                              | <br>2005 |
| Master's in Education                                                                     |          |
| <br>Southern Utah University                                                              | <br>2002 |
| Bachelor of Science Degree in Elementary Education                                        |          |
| Minor: Reading                                                                            |          |
| Magna Cum Laude                                                                           |          |
| Dean's List                                                                               |          |
| <br>Dixie College                                                                         | <br>2000 |
| Associates of Arts                                                                        |          |
| Cum Laude                                                                                 |          |
| Dean's List                                                                               |          |

**ENDORSEMENTS**

|                        |      |
|------------------------|------|
| Reading                | 2002 |
| Administration         | 2006 |
| ESL                    | 2007 |
| Educational Technology | 2015 |

**AWARDS**

|                                                                        |      |
|------------------------------------------------------------------------|------|
| Utah Association of Elementary School Principals Innovator of the Year | 2012 |
| Utah STEM Principal of the Year Nominee                                | 2016 |

**TEACHING EXPERIENCE**

|                                                            |           |
|------------------------------------------------------------|-----------|
| Coral Cliffs Elementary, Washington County School District | 2002-2007 |
| Fourth Grade                                               |           |

## ADMINISTRATIVE EXPERIENCE

|                                                            |              |
|------------------------------------------------------------|--------------|
| Sunset Elementary, Washington County School District       | 2007-2013    |
| Crimson View Elementary, Washington County School District | 2013-Current |

## PUBLICATIONS

Esplin, N. (Winter, 2017). *STEM Journey*. *Leader Magazine* MMXIV. Published by Utah Association of Elementary School Principals.

## PRESENTATIONS

Esplin, N. (2016, June). *STEM Elementary Schools*. Presentation at STEM Best Practices Conference, Salt Lake City, Utah.

Esplin, N. (2015, April). *Use Technology to Share What is Right*. Presentation at Utah Coalition for Educational Technology Conference, Herriman, Utah.

Baker, A. & Esplin, N. (2015, November). *Tech Tips for Establishing a Positive School Climate*. Presentation at Southern Utah Education Conference, St. George, Utah.

## MEMBERSHIPS

|                                                                |              |
|----------------------------------------------------------------|--------------|
| Association for Positive Behavior Support                      | 2017-Current |
| Association for Supervision and Curriculum                     | 2007-Current |
| International Society for Technology In Education              | 2013-Current |
| International Technology and Engineering Educators Association | 2016-Current |
| National Association of Elementary School Principals           | 2007-Current |
| Utah Association of Elementary School Principals               | 2007-Current |
| Washington County School District Principals Association       | 2007-Current |

## PAST MEMBERSHIPS

American Educational Research Association  
 International Reading Association  
 National Council of Teachers of Mathematics  
 National Science Teachers Association