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Technology Underutilized: Principal's Role in Creating a Culture of High-Level Uses

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Technology Underutilized:

Principal's Role in Creating a Culture of High-Level Uses

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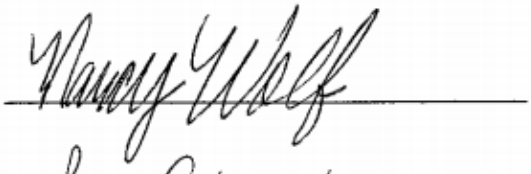
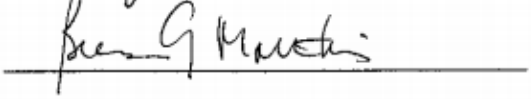
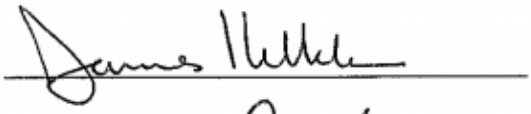
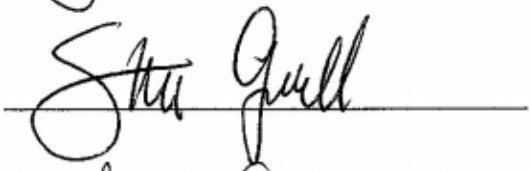
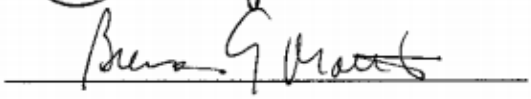
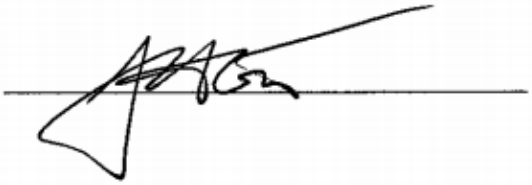
Approvals

In the judgment of the following signatories, this Dissertation meets the academic standards that have been established for the Doctor of Philosophy degree.

Dr. Nancy Wolf Doctoral Committee Chair		12-16-16 Date
Dr. Brenda Matthis Doctoral Committee Member		12/13/16 Date
Dr. James Kelleher Doctoral Committee Member		12/13/16 Date
Dr. Stephen Gould Director, Educational Leadership Specialization		1/11/17 Date
Dr. Brenda Matthis Director, Ph.D. Educational Studies		1/11/17 Date
Dr. Jonathon H. Gillette Dean, Graduate School of Education		1/12/17 Date

Dedication

This dissertation is dedicated to my husband and children, John, Matt, and Maddy, for giving me love and support throughout this journey. We all sacrificed in various ways because of my commitment to public education and my commitment to finish this program in a reasonable amount of time. It was not easy, but it was possible with the three of them.

Abstract

Teachers need to maximize technology to support student learning by drawing upon varying pedagogical orientations; however, teacher-centered, highly structured approaches that foster low-level thinking is more prevalent. Although highly structured approaches help develop students' foundational skills and content knowledge, student-centered, open-ended approaches foster high-level thinking aimed by the Common Core State Standards (CCSS). Literature suggests principals have an important role in the implementation of the CCSS and technology integration, but it does not capture the ways principals help teachers adopt high-level uses of technology. This research asks the overarching question, "What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" A qualitative research design with a phenomenological approach was utilized to discover the knowledge, dispositions, and actions of principals who were successful in creating a culture of high-levels of technology integration. Interviews with 12 public middle school principals in Massachusetts and Rhode Island with ample technology resources reaffirm literature and add new understandings. Findings show that these technology-oriented principals: (a) were knowledgeable about ways real-time collaborative tools supported student learning; (b) applied their knowledge about high-levels of technology integration in organizational decisions and actions; (c) encouraged experimentation with technology; (d) supported flexible uses of technology and teacher autonomy but continuity with some resources was needed; (e) provided teachers sustained technology-related professional development but comprehensive planning was not common; (f) recognized that first-order barriers continued to persist in their school; and (g) believed that slow implementation and colleagues helped slow adopters overcome second-order barriers but peer coaching was needed.

The findings suggest that these principals provided most Essential Conditions of Transformational Learning and applied Professional Standards for Educational Leaders to create a culture of high-level technology use. The outcomes of this study call attention to the complexity of achieving high-levels of technology integration in schools with or without sufficient resources and technology-oriented leadership.

Keywords: Common Core State Standards; essential conditions of transformational learning; middle school; principal; Professional Standards for Educational Leaders; sustained professional development; technology

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Acknowledgements

When I received my acceptance letter into the Ph.D. program at Lesley University, my husband's first response was, "We can talk about it," as if we had a choice to make. After a short discussion about the importance of this opportunity, we held on tight and never looked back. My husband and children, John, Matt, and Maddy provided unconditional love and support that I needed to complete this journey. My mother, father, sister, grandmother, in-laws, and close friends showed never-ending love and understanding. Visits and phone calls were not as frequent, but we all did our best to make it work.

Cohort 2013 is a group of dedicated individuals with diverse experiences, talents, and interests. I learned so much about the field of education and cultural diversity through their stories and our work together. Their humor, dedication, and candor helped see me through this challenging process. They have become life-long friends. #phdproblems

The professors in the Educational Studies Program at Lesley University provided me with the resources to build my knowledge and skills so that I could become confident in my educational leadership capabilities. Each of them, especially Dr. Ciesluk, Dr. Gould, and Dr. Naso, had an influence on my professional growth. At the start, I could not articulate what I meant by the phrase 'curriculum delivery' the summer of 2013 when asked to state my potential dissertation topic in the amphitheater. At the conclusion of this journey, I fully understand the meaning and I look forward to the next chapter in my professional career when I help teachers develop a deeper understanding of pedagogy.

My dissertation committee included Dr. Nancy Wolf, Dr. Brenda Matthis, and Dr. James Kelleher. Each of them brought something different to my dissertation journey and I appreciated all their gifts. Nancy, my senior advisor, gave me a perfect balance of autonomy and guidance that allowed me to build a study that was truly meaningful to my professional practice. Brenda

brought her wealth of technology integration knowledge and positive attitude to push my thinking. She introduced new ideas and questioned my assumptions so that no stone was left unturned. Jim's years of experience as a leader in public education brought new thoughts and clarity in my writing. These committee members embraced this topic from the beginning and helped me develop a complex understanding of the issue.

A special thank you goes to Jim Parsons who helped me clean up those annoying typos and unnecessary words. I needed a fresh set of eyes on this paper at a time when my own eyes were as weary as could be. I learned so much from his edits and I now have a short list of words that will never appear in another academic paper.

Lastly, I am incredibly grateful for the participants in this study. I learned so much from their experiences, examples, and strategies. They taught me to lead by trusting teachers and providing them with autonomy, while, at the same time, promoting new classroom approaches and providing the organizational resources to support their growth and development throughout the school year. Each principal had an immediate impact on my thinking and professional growth.

CHAPTER ONE: INTRODUCTION

This chapter includes a personal statement that motivated me to pursue the topic of high-levels of technology integration, a statement of the problem, the purpose of the study, definition of terms, significance of the study, review of the literature, and design of the study overview. The delimitations of the study and my assumptions follow to acknowledge the constraints and personal influences on this study. The dissertation chapter outline concludes the chapter.

Personal Statement

Teaching with technology has always been important to me because of my belief that technology can engage students in the learning process. I believe that technology can be a powerful resource for students when they are trying to contextualize abstract concepts and developing authentic, technology-related assessment products; however, in my roles as classroom teacher and technology integration specialist, I have seen technology used inconsistently across classrooms. This dissertation evolved from my curiosity to understand differences between teachers that influenced how technology was used and how principals helped teachers advance their use of technology to meet the expectations of the CCSS.

Statement of the Problem

Teachers are not maximizing technology to support deeper learning and primarily integrate technology in ways that foster low-level thinking among students (An & Reigeluth, 2012; Boser, 2013). Students use classroom technology for listening, watching, and "skill and drill" activities that limit the ways they can develop deeper understandings of topics (McLeod & Richardson, 2013). These teacher-centered approaches to technology integration are often a one-size-fits-all model that target students' development of concepts, content, and skills. For technology to be most advantageous, students also need to use technology at high-levels that

foster deeper learning, investigation, analysis and collaboration (Ertmer & Newby, 2013; Ertmer & Ottenbreit-Leftwich, 2010). Because both approaches benefit student learning, teachers need the knowledge and skills to align the most suitable approach with learning objectives (Ertmer & Newby, 2013; Groff, 2013). They need to expand their repertoire of technology integration approaches to include both teacher-centered and student-centered approaches.

Studies have been conducted to understand the barriers to technology integration when technology resources have been provided (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Kim, Kim, Lee, Spector, & DeMeester, 2013; Windschitl & Sahl, 2002). These studies found that teachers' pedagogical beliefs were underpinned by teacher-centered or student-centered beliefs that influenced how technology was utilized. Teacher-centered approaches to technology integration are highly structured activities such as guided practice applications and viewing websites (An & Reigeluth, 2012; Enonbun, 2010). Student-centered approaches are designed to be open-ended and require students to apply creative, analytic, and investigative skills utilizing technology applications (Ertmer & Ottenbreit-Leftwich, 2010; Kim et al., 2013; Koehler, Mishra, & Cain, 2013). Table 1 shows examples of student-centered and teacher-centered approaches to technology integration.

Table 1: Example Approaches to Technology Integration

Student-Centered/High-Level Approaches	**Teacher-Centered/Low-Level Approaches**
Blogs	Assignment information applications
Digital storytelling	Direct-instruction or guided practice applications
Discovery learning	Exploring websites for reading
Discussion boards/social networks	Watching video demonstration
Graphic organizers	Word Processing
Problem-based learning and inquiry learning	
Role-play or virtual learning	
Simulations	
Real-time collaborative learning	
Wikis	
(An & Reigeluth, 2012; Enonbun, 2010; Ertmer & Ottenbreit-Leftwich, 2010; Kim et al., 2013; Moeller, Reitzes, & Education Development Center, 2011; O'Bannon, 2012)	

The Common Core State Standards (CCSS) include student-centered, high-level approaches to technology integration. The CCSS outlines college and career readiness goals that specify the use of technology by students for reading, writing, speaking, listening, and language development. It states that students will leverage technology to research, create presentations, communicate, and collaborate with peers, teachers, and experts online (Common Core State Standard Initiative, 2015). These technology standards are aimed to increase student engagement, active participation, and promote deeper inquiry-based learning (Levin, Datnow, & Carrier, 2012).

Principals have an important role in the implementation of the CCSS and the success of technology integration (Achieve, College Summit, National Association of Secondary School Principals, & National Association of Elementary School Principals, 2013; O'Dwyer, Russell, & Bebell, 2005; Stegman, 2014; Superville, 2014; Wisniewski, 2010). They have the ability to provide the necessary organizational structures to help teachers align the standards with assessments and resources. Principals can provide teachers with professional development, necessary time to learn and master new skills, and collaboration time with peers. Because the

CCSS aims to shift classroom practices from a "sit and get" (Achieve et al., 2013, p. 20) culture of knowledge acquisition for students to a "create and learn" (p. 20) culture, principals must provide teachers with the resources that help transform classroom practices using technology (Achieve et al., 2013; Fullan, 2014).

This section outlines factors that contribute to the problem of teachers' low-level, teacher-centered approaches to technology integration, and the current responsibilities of the principal that aim to improve teaching and learning. The current context, historical factors, theoretical orientations held by teachers, and other contributing factors are explained to help understand why technology is not utilized at high-levels.

Current Context

Wagner et al. (2006) describe context as "the larger organizational systems, within which we work, and their demands and expectations, formal and informal" (p. 104). Consideration of the context helps explain why certain decisions, actions, and conversations occur. The interaction between people, community, policies and practices, and organizational structures shape the environment of a school.

The current global context is heavily dependent on technology for commerce and communication that has made it necessary to include technology into educational reform policies to prepare students for their future (Jerald, National Governors' Association, Council of Chief State School Officers, & Achieve, 2008). On a national level, the No Child Left Behind (NCLB) Act of 2001 states that all students should be "technologically literate" (U.S. Department of Education, 2001, p. 1672) upon completion of the eighth grade. At the state level, the CCSS include technology throughout the literacy standards for reading, writing, speaking, listening, and language development (Common Core State Standard Initiative, 2015). These standards

describe how students can leverage technology to research topics in depth to solve problems, communicate, create multi-media presentations, and collaborate with peers, teachers, and experts online. The standards outline the ways to which students should learn how to use technology for college and careers. The CCSS illustrate students' need to experience high-level uses of technology in schools and establishes the expectation that teachers provide those learning opportunities (Draper, 2013; Foiles Kiel, 2014; Levin et al., 2012).

Technology is considered an important part of transforming American education because it can provide flexible learning experiences to meet individual learning needs (Office of Educational Technology, 2010, 2016). Students can leverage technology to learn in ways that help them understand concepts more deeply. Technology also provides students with access to resources and information outside of the physical school and beyond the school day. According to the Office of Educational Technology (2016), technology "can help affirm and advance relationships between educators and students, reinvent our approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners" (2016, p. 1).

Increasing access to technology resources in schools has been a focus for stakeholders since late 1970's (Molnar, 1997), and providing equitable access continues to be an important part of political agendas. Technology spending for educational purposes increased 150% between 2010 and 2012 (Boser, 2013). In 2015, the federal government increased its STEM (Science, Technology, Engineering, and Mathematics) funding by 3.7% from the previous year and allocated $2.9 billion to continue improving education (White House Office of Science and Technology Policy, 2014). Studies show that this influx of technology has enabled more teachers to use technology (Versal, 2015); however, the technology is not utilized at high-levels

that instill active participation, deeper inquiry-based learning, collaboration, and communication (An & Reigeluth, 2012; Boser, 2013; Levin et al., 2012).

Mobile innovations in recent years have increased technology integration expectations for teachers. Schools are increasingly using mobile carts, one-to-one programs, and Bring Your Own Device (BYOD) policies to create flexible learning environments in all subject areas. The 2013 Speak Up (Project Tomorrow, 2013) nationwide survey shows a 10% increase of BYOD policies from 2010 to 2013. The same survey shows that approximately one third of students in sixth through twelfth grades are provided a mobile device for learning by their district (2013). The increase of mobile devices is also visible in households. According to the 2013 United States Census Bureau survey that included 60,000 households, 78.5% of all households have a "desktop or laptop computer, and 63.6% have a handheld computer" (File & Ryan, 2014, p. 2). The increased availability of technology in schools and in homes has led to the expectation that teachers will use technology in their practice (Office of Educational Technology, 2016).

Educational reform policies and the increased access to mobile technologies have changed the technological expectation for school leaders and teachers. All teachers must have the capacity to integrate technology effectively since these expectations cut across every content area (Office of Educational Technology, 2010, 2016). The current context creates an immediate need for educational leaders to help teachers align standards with digital resources.

Historical Factors

The history of a society also contributes to the current culture in schools. The traditions, celebrations, and symbols experienced today have roots that began long ago. Those experiences naturally become part of a person's identity and belief system (Mezirow, 1991). People draw from that belief system usually without awareness to guide their thoughts, decisions, and actions

(1991). The classroom teacher's history and the whole-group approach to technology integration contribute to the difficulty schools face when attempting to change teaching practices.

Standardized curriculum and whole class instruction have strong historical roots (Cuban, 2009). The archived photographs of Boston Latin School in 1841 – the first public school in America – show a lecture approach to teaching with the students sitting in rows (Boston Latin School & Jenks, 1886). Grade levels, isolated subject areas, standardized curriculum, and whole group instruction evolved in the United States from society's need to educate the influx of immigrants of that era. The factory model of education helped schools streamline resources to prepare students for the workforce (Serafini, 2002). This model began in the early 1900's and still dominates today (Duncan, 2010). Most educators experienced this type of schooling themselves, and educators who wish to create learning environments that differ from this model must move past their own personal and school traditions.

Teachers tend to approach technology integration with that same standardized curriculum lens and create highly structured activities. Today's classrooms are equipped with mobile technologies that that offer flexibility to meet individual needs and interests. This more complex approach requires teachers to have comprehensive pedagogy, content, and technology knowledge to structure effective learning opportunities (TPACK, Koehler & Mishra, 2009). Teachers today must understand which technology tools and resources can support the standards, know how to use the tools, and have the technical knowledge and skills to train students. The evolution of technology requires teachers to use devices and resources in ways that differ from their own educational experiences as students.

The history and past experiences of teachers contribute to their pedagogical beliefs. As Lortie (2009) stated, "When a structure has persisted without major changes over several

decades, and is largely similar in most communities, common traditions are likely to emerge and effect the beliefs and values of participants" (pp. 4-5). These structures "shape individuals and the occupational subcultures to which they subscribe" (p. 5).

Theoretical Orientations Held by Teachers

Approaches to technology integration are underpinned by the pedagogical theory of behavorism or constructivism (Ertmer & Newby, 2013). Literature exists that introduces other categorical names for pedagogical theories but I chose to present the information with the traditional orientations (Becker, 2000; Ertmer & Newby, 2013). Focusing on behaviorism and constructivism provides simplicity to readers who might have limited knowledge about technology applications but who are familiar with the tenets of those orientations.

Teachers need to integrate technology from both behaviorism and constructivism orientations to meet the needs of students and achieve learning objectives (Ertmer & Newby, 2013; Groff, 2013); however, many teachers rely on behaviorist methods (Aguirre, 2014; Ertmer et al., 2012; Johnson, Adams, Cummins, New Media, & Educause, 2012; McDowell, 2013). Student-centered pedagogical methods have gained attention in recent years because of the increased interest in project-based learning and inquiry learning experiences, but behaviorist methods are still predominant (Ertmer & Newby, 2013).

Behaviorist methods require teachers to predetermine the content, skills, and the assessments. The method of Direct Instruction is a popular behavioral approach to teaching and is often used to support basic academic skills (Snowman & Biehler, 2006). Direct Instruction lessons break complex lessons into small learning tasks by utilizing explicit instructions and corrective feedback to support learning. The quantitative outcomes from these responses allow educators to measure student growth and provide specific support if concepts are not attained.

Moreover, empirical evidence suggests that behaviorism is effective in increasing the skill level of students, especially in children who enter school with skill deficits (Kirschner, Sweller, & Clark, 2006; Matthews, 2003). Many technology applications used by schools that help to develop math and reading skills utilize behavioral methods (Ertmer & Newby, 2013; Snowman & Biehler, 2006).

Constructivism presumes knowledge is developed through a person's interactions with the world (Jonassen, 1999). Knowledge begins with the learner's preconceived notion or mental models that are altered by new information through the "powers of observation" (Piaget, 1973, p. 23). In the context of a school, teachers act as guides or mentors in students' investigation utilizing interdisciplinary resources (1973). The content and skills vary depending on student needs and interests. Many technology applications are now available that offer the active, collaborative, and investigative experiences foundational to constructivism. Constructivist-based "Web 2.0 technologies such as blogs, wikis, podcasts, social networks, and virtual worlds have become popular and are gradually making their way into the classroom" (Enonbun, 2010, p. 18). The collaborative nature of many Web 2.0 tools support the speaking, listening, and critical thinking standards outlined in the CCSS. The CCSS "create a major impetus for implementing Web 2.0 technologies" (Luther, 2015, p. 47) in classrooms.

Educators need to understand the fundementals of behaviorism and constructivism, as well as the benefits and drawbacks to each if they are to create the most suitable learning environment when using technology (Ertmer & Newby, 2013; Groff, 2013). Behaviorist approaches to technology integration should be utilized when students need to master skills and knowledge essential to future learning activities (Kirschner et al., 2006). Students can experience a sense of confusion and a level frustration if they lack sufficient knowledge to

engage in learning. Student-centered approaches to technology integration develop problem solving, critical thinking, creativity, collaboration, and the communication skills needed for college and career (An & Reigeluth, 2012; Ertmer & Newby, 2013; Moeller et al., 2011). Obviously, students benefit from both approaches.

The practice of teachers not aligning pedagogy to technology integration rests partly on their experiences, as described previously, and a lack of sufficient training. Teacher preparation programs contribute to the problem because less than 2% of technology integration courses include pedagogical theory (Ertmer & Newby, 2013). (Teacher preparation programs are further discussed in Chapter Two). Technology-related professional development also contributes to the problem because if often focuses on how to use the technology and does not include sufficient pedagogical applications that meet teachers' needs (Fullan, 2014; Guskey, 2002; Koehler et al., 2013). The lack of training that helps teachers align technology resources to theoretically based pedagogical approaches is a persistent problem.

Other Contributing Factors

Two areas have an indirect influence on effective technology integration–federal educational reform policy and the capacity of principals. Federal reform programs create a sense of performativity that negatively affects classroom practices. The capacity of the school principal has to include the skills and knowledge to contend with current expectations and accountabilities.

Federal reform programs. The reauthorization of the Elementary and Secondary Education Act of 1965 (ESEA) known as No Child Left Behind Act (NCLB) of 2001 and the Race to the Top (RTTT) grant program raise school accountability for teachers and school leaders (Onosko, 2011). Although these programs provide states with much needed funds to

support change, the programs have increased, intensified, and expanded the teacher's role that has had a negative impact on teaching practices (Valli & Buese, 2007).

The NCLB is specifically designed to "ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State achievement standards and state academic assessments" (U.S. Department of Education, 2001, p. 1439). The last reauthorization of NCLB mandated that every state develop and implement educational standards and administer annual testing in mathematics and reading (2001). Many teachers perceive that the annual high-stakes testing promotes a sense of pressure and an atmosphere of performativity, which in turn influences instructional decisions (Jones et al., 1999; Walker, 2014). The high-stakes testing environment drives teachers to focus student learning on predetermined content and assessments they anticipate will appear on the test (Au, 2007).

In a further step to reform education, the federal government developed the Race to the Top (RTTT) grant program that began in 2009 to help states implement the CCSS, create innovative methods to increase student achievement, improve teacher effectiveness, and improve school leadership (Office of the Press Secretary, 2009). The parameters of the RTTT grant required states to develop and implement statewide principal and educator evaluation programs that included student achievement outcomes as a component in the evaluation process (U.S. Department of Education, 2009). Critics argue that linking student achievement outcomes in the educator evaluation process fosters comparisons, judgments, and rewards among colleagues that influence teachers' instructional decisions and promote inauthentic teaching practices (Ball, 2003). Similar to NCLB, this measure fosters the predetermined content and assessments to ensure students are successful on measures that affect their evaluation. The RTTT grant expired

in 2015 but the evaluation programs developed in accordance with the grant are still in place (U.S. Department of Education, 2015).

Federal reform programs create new challenges for school leaders. NCLB and RTTT aim to improve achievement outcomes for all students, but the accountability placed on teachers influence instructional decisions that support teacher-directed approaches (Au, 2007; Jones et al., 1999; Walker, 2014). NCLB and RTTT are explained further in Chapter Two.

Skills and Knowledge of the Principal. Another contributing factor is the skills and knowledge of principals. The National Policy Board for Educational Administration (2015) recently released the Professional Standards for Educational Leaders. The research-based framework includes 10 standards that require principals to manage school operations and resources; support the care, well-being, and developmental growth for all students; and facilitate school improvement to improve teaching and learning for all students. These new standards require principals to have a sophisticated repertoire of skills and knowledge with a "future-oriented perspective" (National Policy Board for Educational Administration, 2015, p. 3) to guide the school community towards a collective vision of improved educational outcomes.

The skills and knowledge of a school principal must include technology integration to prepare students for their futures (Bobbera, 2013; Fullan, 2014). Principals can provide resources such as professional development, planning time, accessibility to hardware and software to influence technology integration (O'Dwyer et al., 2005; Stegman, 2014; Wisniewski, 2010). Professional development should aim to change classroom practices, change the beliefs and attitudes of educators, and improve learning outcomes for students (Guskey, 2002); however, professional development alone is not enough. Studies also show that principals' technological knowledge, their ability to develop a shared vision, and their ability to foster

supportive relationships lead to successful technology integration (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014). These studies add understandings, but questions about specific practices of principals that help move teachers from traditional to student-centered, high-level uses of technology remain.

Today's principals have to contend these factors with attention towards the teachers' professional growth and development to improve teaching and learning for all students. How well principals create those learning opportunities is critical to the improvement of technology integration. Without the support of a principal who can provide organizational structures aimed to increase teachers' knowledge and skills, systemic change that improves learning for all students, will not occur (Fullan, 2014). More information about how principals might help teachers build the knowledge and skills to reach high-levels of technology integration as described in the CCSS is needed. As Ertmer and Ottenbreit-Leftwich (2010) assert, "It is no longer appropriate to suggest that teachers' low-level uses of technology are adequate to meet the needs of the 21st-century learner" (p. 257).

Purpose of Study

The purpose of this study was to discover the experiences of principals who have been successful in creating a culture of high-levels of technology integration to have a better understanding of how they influenced the pedagogical practices in classrooms. The following research question aimed to understand how principals created a culture of high-levels of technology integration to meet the expectations of the CCSS, "What actions, decisions, and relationships do principals perceive contribute to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" The three guiding questions that focused my research were:

1. Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?
2. How do you help teachers integrate real-time collaborative tools to meet the CCSS?
3. How do you help teachers overcome barriers to technology integration?

Numerous online tools can support learning. For the purpose of this study, it was important to differentiate between low-level technology tools and high-level technology tools to understand how principals create a culture of high-levels of technology integration that can support the CCSS. High-level technology tools are "associated with learner-centered or constructivist practices" (An & Reigeluth, 2012, p. 56) and allow students opportunities to learn more deeply through investigative, analytic and collaborative approaches. Because the CCSS also describe a student-centered approach to increase student engagement, instill active participation, and promote deeper inquiry-based learning, collaboration, and communication (Levin et al., 2012), I am assuming high-level technology tools can support these standards.

Web 2.0 tools are web-based resources that are generally easy to use and allow users to create a product and share their creations (O'Reilly, 2005). This category of online resources includes more than 1,400 websites and can support a variety of uses for educators and students (Ferlazzo, 2016). Experts in the field of education have categorized Web 2.0 tools using Bloom's Taxonomy Pyramid (Literacy Teaching and Teacher Education, 2015; Puentedura, 2014b; Schrock, 2015). Tools that fall into the top two tiers that demand higher levels of thinking–evaluation and creation–help identify tools that could support high-levels of technology integration; however further discretion is applied. All Web 2.0 tools allow users to share their work but some also offer real-time collaboration that promotes collaborative learning. Collaborative learning is a "*situation* in which *two or more* people *learn* or attempt to learn

something *together*" (Dillenbourg, 1999, p. 1). Although sharing of information or ideas is necessary for a collaboration to exist, the act of sharing does not always result in a reciprocal exchange of ideas to solve problems (Thomson & Perry, 2006). Sharing information or ideas can be unidirectional for entertainment, evaluation, and task completion purposes; but it does not necessarily lead to co-constructed, meaning-making interactions in the same way collaborative learning does. See Table 2 for a list of representative examples.

Table 2: Web 2.0 Examples that Promote Sharing and Real-Time Collaboration

Application Title	**Purpose**	**Sharing**	**Real-time Collaboration**
Animoto (2016)	video creation	•	
FaceTime (Apple, 2016)	video conferencing	•	•
Google Apps for Education (Google, 2016)	suite of tools that include Docs, Slides, Sheets, and Drawing	•	•
Padlet (Wallwisher, 2016)	interactive whiteboard	•	•
Storyjumper (2016)	storytelling	•	
Wordle (Feinberg, 2014)	word cloud design	•	

Tools that allow multiple users to talk, video chat, type, and/or create together from different locations or devices are *real-time collaborative tools*. Tools within this category include four critical elements: they (1) allow students to have control over the content to promote higher level thinking, (2) require the use of communication skills, (3) allow for collaboration, and (4) have a web-based platform for ubiquitous access and flexible use. Because real-time collaborative tools' are applicable to the CCSS and high-level technology integration, that category of tools serves as the technology focus for this study.

Definition of Terms

- *Bring Your Own Device:* acronym BYOD, students use personally owned technology in the classroom.

- *First-order barriers:* external barriers that lie outside of teachers' control that impede technology integration such as access to training, support, hardware, software applications, and time to learn or practice (Ertmer, 1999).
- *Google Apps for Education:* A suite of cloud-based applications that include Google Drive, Docs, Sheets, Drawing, and Classroom designed for schools, collaboration, and 24/7 access.
- *High-levels of technology Integration*: A student-centered approach to technology integration that utilizes high-level digital tools.
- *High-level digital tools*: Tools that are "associated with learner-centered or constructivist practices" (An & Reigeluth, 2012, p. 56) and allow students the opportunity to learn more deeply through investigative, analytic and collaborative approaches.
- *Instructional Technology Coach*: A person in a non-administrative role that supports technology integration and curriculum alignment.
- *Low-level digital tools*: Tools that require lower levels of thinking (McLeod & Richardson, 2013) and often foster opportunities for listening, or watching, and "skill and drill" practice.
- *One-to-One Technology Programs:* All students in a school or classroom are issued a school-owned device to use throughout the day.
- *Professional Standards for Educational Leaders (PSEL)*: Ten standards that define the nature and quality of work by educational leaders to influence student achievement (National Policy Board for Educational Administration, 2015).

- *Real-time collaborative tools*: Internet resources that allow at least two users to collaborate simultaneously from different locations to support learning objectives and the development of communication skills.
- *Second-order barriers:* Internal barriers are the beliefs or feelings held by the teacher such as how students learn, their confidence and skills to use new technology, or the role of technology in the classroom that impede technology integration (Ertmer, 1999) .
- *Slow-adopters*: Teachers who have been hesitant to use technology in classrooms and encompass laggards as defined by Rogers' Innovation Theory Model (Rogers & Scott, 1997).
- *Transformational Learning*: Occurs when people are autonomous thinkers and have "the understanding, skills, and disposition necessary to become critically reflective of one's own assumptions and to engage effectively in discourse to validate one's beliefs through the experiences of others who share universal values" (Mezirow, 1997, p. 9).

Significance of Study

The experiences of principals who support high-levels of technology integration need additional research. Principals can provide resources such as professional development, planning time, and accessibility to hardware and software to influence technology integration (O'Dwyer et al., 2005; Stegman, 2014; Wisniewski, 2010). Studies show that principals' technological knowledge, their ability to develop a shared vision, and their ability to foster supportive relationships helps successful integration (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014). To expand the literature, this study aimed to capture the ways principals created a culture of high-levels of technology integration. The outcomes of the study helps to both understand the

skills and knowledge of principals that lead to high-levels of technology integration and the various ways principals help teachers develop student-centered classroom practices with technology. This study also aimed to understand the persistent barriers in an environment with ample technology resources and ways principals help teachers overcome those barriers.

This study contributes to the field of educational leadership by providing additional information about the principal's role in supporting teachers to improve teaching and learning with technology. School district leadership teams can use this study to reflect on district practices to identify strengths in weaknesses to improve technology integration within their own district. Principals who strive to improve technology integration can use this dissertation as a resource. Additionally, this dissertation can help teachers understand the technology knowledge new administrators need to help teachers contend with changing expectations. Families and community members can use this dissertation to understand the challenges principals have when implementing technology. Educational policy makers can use the research findings to understand the challenges schools face when attempting to change teaching practices with technology. Federal and state educational reform policies influence teaching practices that hinder the advancement of technology integration. Higher education institutions can use this study to help prepare teachers and school administrators. Last, this study is a resource for future research that aims to improve technology integration in classrooms.

Review of the Literature

This dissertation leans heavily on three topic areas. Explanations of state and federal policies, expectations placed on principals, and essential conditions that foster transformational learning provide context to the challenge of changing teacher practices. Below is a summary of Chapter Two: Literature Review that provides that rational for this dissertation.

One topic area includes information regarding technology and education reform. This section explains NCLB, the CCSS, and Race to the Top (RTTT) that influence teaching and learning with technology (Common Core State Standard Initiative, 2015; Jerald et al., 2008; U.S. Department of Education, 2001). Research that investigated how NCLB positively and negatively influenced teaching practices is explained (Byrd-Blake et al., 2010; Valli & Buese, 2007). The anchor standards that are integrated throughout the CCSS are explained to understand the student-centered, technological, and pedagogical expectations for all teachers. RTTT grant program is included to understand its influence on the educator evaluation process. These state and federal policies are important to understand given their impact on teachers and principals.

The second area explores literature regarding principals' role in schools. Professional Standards for Educational Leaders and International Society for Technology in Education for Administrators are two frameworks used by educational leaders that specify job responsibilities of today (International Society for Technology in Education, 2009; National Policy Board for Educational Administration, 2015). These frameworks illustrate the complexity of the principalship and the level of leadership knowledge and skills needed to transform schools. This second area examines barriers to technology integration and the influence of principals' knowledge and skills on those barriers (Bobbera, 2013; Draper, 2013; Fisher, 2013; Foiles Kiel, 2014; O'Dwyer, 2005; Stegman, 2014; Wisniewski, 2010).

The final topic area examines the literature to understand transformational learning and the essential conditions that foster transformational learning. Teachers need to experience transformational learning to change their beliefs from teacher-centered to student-centered instruction. The tenets of transformational learning are explained in this section (Illeris, 2002,

2013; Kegan, 1994; Merriam & Caffarella, 2007; Mezirow, 1991; 1997). The essential conditions that foster transformational learning for adults asserted by Lamm (2003) and Mezirow (1991) are outlined.

A review of the literature shows gaps in qualitative research that provides specific ways principals helped teachers move from teacher-centered technology integration to high-level, student-centered as outlined by the CCSS. Studies that aimed to understand a principal's role to improve technology integration did not include high-level technology integration with defined technological resources. Studies that investigated principals' roles in improving technology integration in schools did not include the Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991). Few research studies explored systematic approaches used by principals to improve technology integration. The goal of this dissertation is to make contributions that address those gaps.

Design of the Study Overview

Phenomenological qualitative research was employed in this study to give principals the opportunity to explain their role and the cultural conditions that improved teaching and learning with technology. A plethora of research exists to support the assertion that school culture influenced learning among teachers (Ertmer et al., 2002; Fullan, 2014; Mezirow, 1991; Somekh, 2008). This study aimed to learn about the cultural "norms, rules, institutions, values, and interpretations" (Mezirow, 1991, p. 57) embedded into how people work and interact (Kotter, 2012). Analyzing the similarities across contexts helped define the phenomenon of high-level technology integration that occurred in some schools.

Thirteen principals from Massachusetts and Rhode Island public middle schools participated. The middle school level was chosen because of the NCLB mandate that all students

should be technologically literate by the end of eighth grade (U.S. Department of Education, 2001). Principals were invited to participate through snowball sampling (Polkinghorne, 2005). Principals self-reported that they met three criteria: high-levels of technology integration existed in their school, the principal had been successful in implementing high levels of technology integration and influenced pedagogical practices to meet the CCSS; and at least one real-time collaborative tool was available and utilized. One principal was considered as an outlier because the criteria were not met. Interviews were conducted using a semi-structured interview protocol. All interviews were conducted face-to-face, audio recorded and transcribed verbatim.

The analysis and synthesis of the data is not a linear process in qualitative research and included repeated readings and analysis of documents (Creswell, 2012). Qualitative research software was utilized to code transcriptions. Field notes and memos stored my questions, salient points, or ideas. Matrices were utilized to bind the data and cross-reference participant responses relative to codes. As a result, the data on the matrices led to the findings reported in Chapter Four. The design of the study is explained with complete details in Chapter Three: Methods and Procedures.

Delimitations of Study

This study has the following delimitations:

- only principals from public middle schools were invited to participate given the NCLB mandate that all students should be technologically literate by the end of eighth grade (U.S. Department of Education, 2001);
- given the geographic location to the researcher, only principals in Massachusetts and Rhode Island participated;

- only principals who perceived that high-levels of technology integration were occurring in their schools were selected to participate;
- only data from principals with ample technological resources are reported in the findings to focus the study on barriers beyond the attainment of technology;
- findings are based on principal perceptions and observations with the understanding that teachers are integrating technology because of the CCSS technology-related standards; and
- real-time collaborative tools served as the focus of the study to help differentiate the various types of technological resources available to teachers within a school; these tools support student-centered learning and the CCSS because they foster online collaboration and provide a flexible platform for the expression knowledge and meaning.

Assumptions

In pursuing this dissertation, I made the following assumptions:

1. High-levels of technology integration is achievable with the support of principals. Previous studies show that principals' knowledge and skills improve technology integration in schools (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014).
2. In the context of a classroom, technology can help close the achievement gap when implemented correctly (Darling-Hammond, Zielezinski, Goldman, Alliance for Excellent Education, & Stanford Center for Opportunity Policy in Education (SCOPE), 2014).
3. High-level technology integration is not common (Ertmer et al., 2012).

4. I assumed that computer-based technologies could be categorized into the two traditional pedagogical categories – behaviorism and constructivism (Becker, 2000; Ertmer & Newby, 2013).

5. I have assumed that principals' actions and decisions help to build school culture (Bryk & Schneider, 2003; Marzano, Waters, & McNulty, 2005).

6. Because the CCSS describe a student-centered approach to increase student engagement, instill active participation, and promote deeper inquiry-based learning, collaboration, and communication (Levin et al., 2012), I assume that high-level technology tools can support the standards.

Dissertation Chapter Outline

The dissertation includes five chapters. Chapter One contains the introduction, a description of the proposal, the statement of the problem, the purpose of the study, definitions of terms used in the study, significance of the study and the delimitations. Chapter Two presents the literature review relating to the study topic. Chapter Three describes the methods and procedures used for collecting, analyzing, and protecting data used to complete the study. Chapter Four contains the findings in relationship to the three guiding questions. Chapter Five includes a study summary, a discussion of the findings and implications, outlines future research possibilities, and includes a final reflection.

CHAPTER TWO: LITERATURE REVIEW

This chapter is organized into three topic areas. The first topic area is educational reform and technology integration. Specific sections of the No Child Left Behind Act of 2001 (NCLB), the Common Core State Standards (CCSS), and the Race to the Top grant program (RTTT) are explained to describe the current expectations and impact on teachers and principals. The second topic area explores the role of principals in schools. The Professional Standards for Educational Leaders and the International Society for Technology in Education Standards for Administrators frameworks are explained and aligned to show their relationship and the complexity of the position (International Society for Technology in Education, 2009; National Policy Board for Educational Administration, 2015). This topic area also explains principals' roles in contending with barriers of technology integration. The final area examines the literature to understand transformational learning and the essential conditions that foster transformational learning. The chapter closes with an explanation of the gaps in the literature.

A review of the literature helps to understand the context of the problem and the rationale behind why more research is needed to understand the ways principals create a culture of high-levels uses of technology in classrooms. In this chapter, I work from the assumption that schools are systems and every part of the system influences the other parts of the system (Lunenburg, 2011; Senge, 2015). Using this lens assumes that the three topic areas explored in this chapter influence technology integration.

Educational Reform and Technology Integration

Technology is an important part of educational reform for two fundamental reasons. First, technology helps students reach their full potential with customizable content. Current technology applications can engage students in their understanding and mastery of concepts,

content, and skills (Groff, 2013; Office of Educational Technology, 2016; U.S. Department of Education, 2010). Second, technology is an important part of educational reform because of society's dependence on technology (Groff, 2013; Jerald et al., 2008; Office of Educational Technology, 2016). Teachers need to prepare students for college and careers that rely on technology for learning, communication, innovation, and administrative processes. This section includes an explanation of No Child Left Behind Act of 2001 (NCLB), the Common Core State Standards (CCSS), and the Race to the Top (RTTT) grant program to understand their impact on technology integration in schools.

No Child Left Behind

The reauthorization of the Elementary and Secondary Education Act (ESEA) of 1965 is also known as No Child Left Behind Act (NCLB) of 2001. NCLB was specifically created to "ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging state academic achievement standards and state academic assessments" (U.S. Department of Education, 2001, p. 1439). Every Student Succeeds Act (ESSA) was signed into law in December 2015 (National Conference of State Legislatures, 2015), which will essentially replace NCLB. Full implementation of Every Student Succeeds Act (ESSA) is not scheduled until the 2017-2018 academic year (2015) and NCLB was in effect during the data gathering and analysis of this dissertation.

NCLB contains specific language regarding technology integration and that can be found in *Title II: Preparing, Training, and Recruiting Highly Qualified Teachers and Principals* (U.S. Department of Education, 2001) under *Part D: Enhancing Education through Technology Act 2001* (2001). The primary goal of this legislation is to "improve student academic achievement

through the use of technology in elementary schools and secondary schools" (U.S. Department of Education, 2001, p. 1671). Additional goals outlined in Part D aim to improve the digital divide by establishing the expectation that all students will become technologically literate by the end of eighth grade. The NCLB outlines the responsibilities of the federal, state governments, and local agencies and it outlines how agencies can obtain financial support, initiatives, and assistance to increase the capacity of teachers, principals, and administrators.

NCLB funding has improved the technological infrastructure of schools and professional development for teachers, principals, and administrators. Under the Education Technology Grant Program Act, various states received over $900 million between the years 2007 and 2010 to increase access and technology-related professional development (Atlas, 2015). A case study that followed a district that used NCLB grant money to purchase laptops and provide technology professional development found that the influx of hardware and training was attributed to changing teacher attitudes towards technology and technology integration increased (Cullen, Brush, Frey, Hinshaw, & Warren, 2006). Findings from that study also showed that teachers did not have the knowledge and skills to measure student growth from technology-based curriculum sources. NCLB funds have also allowed students who attend schools with limited course offerings to take advantage of virtual courses (Office of Educational Technology, 2007). These examples shed light on the positive effects NCLB has had on the technological infrastructure in schools.

Critics argue that NCLB hinders educational reform due to the strict annual student achievement levels schools must meet. The Adequate Yearly Progress (AYP) achievement structure has created a data driven environment that influences teachers' classroom practices and the learning experiences of students (Ravitch, 2011). Rather than fostering an environment

where students are leveraging technology to research, explore topics, and solve problems, students are using the technology primarily for assessments or low level thinking tasks (An & Reigeluth, 2012; Ertmer & Ottenbreit-Leftwich, 2010). The criticism suggests that NCLB legislation contributes to the problem of the "skill and drill" pedagogical approach currently seen in schools (Ravitch, 2011).

Studies show that NCLB adversely effects teaching practices due to student achievement accountability. These studies do not include the use of technology, but they help reveal the pedagogical implications of NCLB. Valli and Buese (2007) conducted a qualitative study involving 150 teachers across different schools in one school district over a four-year period. The purpose of the study was to track the change in the teacher role from inception of NCLB though full implementation. Findings showed that data analysis, grouping, and assessment were more critical to the role of teaching by the third year of implementing NCLB than during prior years. Teachers reported that pacing of curriculum drove instructional decisions that inhibited their autonomy with instructional decisions. The findings also showed that NCLB has improved colleague collaboration but the new responsibilities of NCLB weakened teacher-student relationships. It is important to note that district leadership involved in this study did not support the pedagogical changes that occurred in light of implementation of NCLB.

Byrd-Blake et al. (2010) used a mixed-method approach to determine morale effects of NCLB and the pressure of achieving Adequate Yearly Progress (AYP). The study included administrators and 96 teachers from four different schools representing all grade levels and a variety of content areas. The findings of this study showed that NCLB adversely affected the morale of teachers at all grade levels. The disaggregated results showed that elementary teachers demonstrated a greater student academic achievement pressure than secondary teachers.

Teachers in this study placed more emphasis on state-tested content areas and chose to limit non-tested topics. This study highlights the pressure teachers feel and the need to cover explicit content because of NCLB's accountabilities

According to this literature, NCLB has had both a positive and negative impact on teachers. On one hand, NCLB has influenced greater teacher collaboration and provided financial resources to provide technology (Cullen et al., 2006; Valli & Buese, 2007). Today's teachers are also analyzing student data to target instruction (Valli & Buese, 2007). On the other hand, NCLB influences instructional decisions that foster narrowed curriculum topics and quick pacing (Byrd-Blake et al., 2010; Cullen et al., 2006; Ravitch, 2011). The Common Core State Standards (CCSS) juxtaposes the rigidness of NCLB with a deeper investigation of topics as explained next.

Common Core State Standards (CCSS)

The CCSS was developed based on the international benchmarking data that compared the academic performance of students in the United States to other students across the globe (Jerald et al., 2008). A partnership between the National Governors Association, Council of Chief State School Officers, and Achieve (Jerald et al., 2008) reviewed historical data from the Program for International Student Assessment, Trends in International Mathematics and Science Study, and the Progress in International Reading Literacy Study to define the strengths and weaknesses of the United States educational system. The outcomes of the data ultimately led to the development of the "common core of international benchmarked standards in math and language for grades K-12 to ensure that all students are equippend the necessary knowledge and skills to be globally competitive" (Jerald et al., 2008, p. 6).

The CCSS is currently adopted by 42 states – including Massachusetts and Rhode Island – and considers technology integral to the teaching and learning of reading, writing, speaking, listening, and language development at all levels (Common Core State Standard Initiative, 2015). Specifically, the Common Core College and Career Readiness Anchor Standards (2015) describe how students can leverage technology to research topics in depth, create multi-media presentations, and collaborate with peers, teachers, and experts online. The standards describe a student-centered approach to technology integration to increase student engagement, instill active participation, and promote deeper inquiry-based learning, collaboration, and communication (Levin et al., 2012).

A student-centered pedagogical approach dates back to the early 1900's, with Dewey (1938) challenging the traditional teaching model. According to Dewey (1938), students grow through experiences initiated by their own interests, motivations, observations, and questions about the world around them. Piaget (1973) asserts that children develop knowledge from social interactions and a deep understanding about a topic. Social interactions promote learning conditions that allow students to compare preconceived notions or mental models with new observations. Accepted new information changes students' mental models. Vygotsky, Hanfmann, and Vakar (1962) add that social learning environments contribute to learning through construction of word meanings, where differences in participant perspectives inform and expand understanding of word meanings. In a student-centered classroom, teachers structure learning opportunities to support individual growth motivated by student interests and social collaborations (Dewey, 1938; Piaget, 1973). In a student-centered classroom, the teacher's role changes from lecturer and knowledge provider to facilitator of constructing knowledge.

The CCSS include a series of College and Career Readiness Anchor Standards that specify the technology-related skills that students should have attained by graduation to be prepared for college or the workforce (Common Core State Standard Initiative, 2015). The anchor standards include the exploration of topics, student collaboration, and the utilization of diverse resources that align with student-centered pedagogical practices. These anchor standards, listed below, are to be integrated with content standards across all grade levels (2015):

- Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words ("College and Career Readiness Anchor Standards for Reading," para. 8).
- Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, and orally ("College and Career Readiness Anchor Standards for Speaking and Listening," para. 3).
- Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations ("College and Career Readiness Anchor Standards for Speaking and Listening," para. 6).
- Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others ("College and Career Readiness Anchor Standards for Writing," para. 7).
- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism ("College and Career Readiness Anchor Standards for Writing," para. 9).

Additional anchor standards outline the social expectations applied to face-to-face or online learning interactions:

- Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively ("College and Career Readiness Anchor Standards for Speaking and Listening," para. 2).
- Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric ("College and Career Readiness Anchor Standards for Speaking and Listening," para. 4).

The anchor standards explicitly state that students can leverage technology to research topics, collaborate with other students, teachers and experts, and to gather information digitally as a means to construct knowledge and share newly developed understandings. These standards explain the role of technology and the new technological expectations for teachers. The CCSS states, "new technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened their link to other forms of communication" (CCR Anchor Standards: Speaking and Listening, Common Core State Standard Initiative, 2015).

The technology component of the CCSS creates new challenges for schools. Technology spending for 2015 in the United States for K-12 was projected at $6.6 billion to purchase laptops, tablets, and applications (McCandless, 2015). Critics argue that schools are redirecting critical financial resources from other important programs to make these technology purchases (Majumdar, 2014). Critics also argue that districts without financial resources, the CCSS create a greater academic divide between students rather than reducing the divide. According to a recent report, "23% of school districts are still not meeting the minimum FCC Internet access goal, leaving 21.3 million students without the connectivity they need for digital learning" (EducationSuperHighway, 2015, p. 6). Students in these ill-equipped schools are at a

disadvantage because they lack access to information and resources as their peers with adequate access. Lastly, the CCSS require teachers to adapt their pedagogy to foster deeper learning and critical thinking with the use of appropriate technologies (Fullan, 2014). To achieve this goal, school leaders also need to provide teachers with quality professional development that helps teachers align practices, technology, and content (Achieve et al., 2013). Reliable technological resources are necessary and teachers need the knowledge and skills to use the technology.

The CCSS influences the decisions and actions of state, local, and school leaders and teachers. Different from NCLB, the CCSS serves as an instructional road map that helps teachers make curriculum decisions on a daily basis. Implementing these standards requires districts to build the capacity of its teachers and this responsibility "falls squarely on the shoulders of school leaders" (Achieve et al., 2013, p. 6). School leaders need to provide teachers ample time and training to understand the standards, sufficient opportunities to collaborate with peers to develop new lessons and assessments, and opportunities to evaluate and reflect on the outcomes.

Race to the Top (RTTT)

In a further step to reform education, the federal government developed the RTTT grant program to increase student achievement, and improve teacher effectiveness and school leadership (Office of the Press Secretary, 2009). The program awarded funds to 19 states that submitted a reform plan that addressed four areas: (1) adopting the CCSS, (2) creating data systems to measure student academic growth and success, (3) developing and retaining teachers and principals who could support goals, and (4) turnaround lowest achieving schools (U.S. Department of Education, 2013). To be eligible, states needed to include a Science, Technology, Engineering, and Mathematics (STEM) plan that developed the skills of teachers to prepare

students for college and career. Another eligibility requirement included the use technology where appropriate that allows students to demonstrate understanding of critical concepts through open-ended questions and performance tasks. The RTTT grant expired in 2015, but the evaluation programs that are aimed to improve pedagogy and developed in accordance with the grant are still in place (U.S. Department of Education, 2015); therefore, principals and teachers will continue to experience the influence of RTTT.

Massachusetts and Rhode Island were among the states awarded with RTTT grant funds. To comply with the grant requirements, they implemented new educator evaluation systems in 2011-2012 academic year that linked achievement data (Boser, 2012; U.S. Department of Education, 2013). Critics argue that this approach to evaluating teachers fosters comparisons, judgments, and rewards among colleagues that influence teachers' instructional decisions and promote inauthentic teaching practices (Ball, 2003).

Each reform program influences technology integration in classrooms. The NCLB provided districts with technology-funding opportunities that increased teachers' access to technology resources; however, NCLB also fostered teacher-centered approaches to technology integration to cover explicit concepts and skills to meet achievement levels. The CCSS established new pedagogical expectations for teachers with standards that integrate high-level, student-centered technology integration to support learning. Some states were awarded RTTT grant funding partially because of their ability to implement a new educator evaluation system that includes student achievement outcomes. Including the achievement data on evaluations, promotes predetermined curriculum and assessments to ensure that explicit skills and content are covered. Principals have to contend with the benefits and drawbacks of these policies to improve technology integration.

The Role of Principal

To meet the demands of technology integration as outlined in the CCSS, principals need to change the school culture from a "sit and get" (Achieve et al., 2013, p. 20) culture of knowledge acquisition for students to a "create and learn" (p. 20) culture. The "norms, rules, institutions, values, and interpretations" (Mezirow, 1991, p. 57) that lay in the messaging and actions of the principals create the context to support new pedagogical practices with technology (Venezky, 2004). The decisions and actions of the principal can positively influence teacher practices, which–in turn–influence student outcomes (Hallinger, 2011).

The principalship requires systems thinking that considers all the parts of the school and the people who influence student learning and outcomes (Kotter, 1996; Lunenburg, 2010; Senge, 2015). Such thinking includes various departments and subject matter, teachers, students, administrators, parents, and the community. The complex task of creating a culture that integrates high-levels of technology needs principals who communicate the value of technology among the school community and the people who are inspired to influence "the acts and commitments" (Senge, 2015, p. 6) of others. Principals cannot achieve change alone.

Technology integration is complex and requires systems thinking (Earle, 2002). The introduction of new technological expectations exposes new problems that require access to appropriate technology resources and an increase in the teachers' knowledge and skills. With these points in mind, this study aimed to discover the range of actions, decisions, and relationships that create a culture of high-level use of technology among middle school principals. This section explores two frameworks that illuminate the complexity of school principalship today and literature that addresses the principal's role in effective technology integration.

School Leadership Frameworks

This section includes two frameworks for a dual purpose. First, the frameworks illustrate the complex role of today's principal. The role of the principal is not as it once was due to the increase of school accountabilities (Fullan, 2014; Kafka, 2009; Rousmaniere, 2007). Principals are accountable for both student achievement outcomes, as outlined in the No Child Left Behind Act, and the implementation of the CCSS (Superville, 2014).

National Policy Board for Educational Administration recently revised the 2008 Council of Chief State School Officer standards for educational leaders. The new Professional Standards for Educational Leaders (PSEL) describe a position that far exceeds the former manager role that principals once held (National Policy Board for Educational Administration, 2015). It includes leadership skills that create and cultivate a school vision and the establishment of a positive school culture. Educational leaders must set high expectations for both students and teachers, and foster collaboration and partnerships among the entire school community. A subsection within Standard 10 highlights the need for principals to lead with a systems thinking approach and states that effective leaders "Adopt a systems perspective and promote coherence among improvement efforts and all aspects of school organization, programs, and services" (National Policy Board for Educational Administration, 2015, p. 18). An outline of the PSEL is in Table 3 and a full description of the standards is in the appendices (See Appendix A).

Table 3: PSEL and ISTE for Administrators Alignment

Professional Standards for Educational Leaders (PSEL)	The International Society for Technology in Education (ISTE) Standards for Administrators
Standard 1: Mission, Vision, and Core Values	Standard 1: Visionary Leadership
Standard 2: Ethics and Professional Norms	Standard 5: Digital Citizenship
Standard 3: Equity and Cultural Responsiveness	
Standard 4: Curriculum, Instruction, and Assessment	Standard 2: Digital Age Learning Culture
Standard 5: Community of Care and Support for Students	
Standard 6: Professional Capacity of School Personnel	Standard 3: Excellence in Professional Practice
Standard 7: Professional Community for Teachers and Staff	
Standard 8: Meaningful Engagement of Families and Community	
Standard 9: Operations and Management	
Standard 10: School Improvement (National Policy Board for Educational Administration, 2015)	Standard 4: Systemic Improvement (International Society for Technology in Education, 2009)

The second framework considers the skills and knowledge principals need to improve technology integration. Studies show that the principal's involvement and technological knowledge is necessary for successful implementation of technology (Bobbera, 2013; Draper, 2013; Fisher, 2013). A principal's attention to technology-related professional development, equitable access to digital resources, and pedagogical approaches can help reduce the barriers to successful integration (Flanagan & Jacobsen, 2003). The International Society for Technology in Education (ISTE) has developed a set of standards for Educational Administrators to define the skills needed to lead change and integrate technology effectively in schools (International Society for Technology in Education, 2009). The International Society for Technology in

Education (ISTE) Standards for Administrators does not specifically include systems thinking but all five standards have commonality with the Professional Standards for Educational Leaders above. The International Society for Technology in Education (ISTE) Standards for Administrators is in Table 3 and a full description of the standards is in the appendices (see Appendix B).

The PSEL and the ISTE for Administrators have many similarities. Table 3 shows the two frameworks aligned to understand the correlation between technology-related leadership standards and the overall responsibilities of educational leaders. The table shows that the technology-related standards are not additional standards for principals to contend with and are relative to existing responsibilities.

Both frameworks illustrate the high degree of involvement required by a principal to lead change. The CCSS and the continuous evolvement of technology create an unchartered set of circumstances for educational leaders. Principals need to have a vast repertoire of leadership skills if they are to build the capacity of the staff to meet these new challenges.

Principal's Role in Effective Technology Integration

Recent research has shown that the decisions and actions of principals can help address barriers to the technology integration practices of teachers (Bobbera, 2013; Draper, 2013; Fisher, 2013). Between the two different types of barriers, first-order barriers are external to teachers and include required training, support, and materials and foundational resources such as hardware and software to implement technology (Ertmer, 1999). Second-order barriers are internal to teachers and are difficult to change. These barriers include challenging personal beliefs about the cognitive development of children, increasing confidence to use technology in the classroom, and changing the perceived value technology has in the classroom (Ertmer, 1999;

Kim et al., 2013). Principals can positively influence technology integration by addressing both types of barriers (Flanagan & Jacobsen, 2003). Most studies included in this section do not specify how students used the technology or specific resources to understand the principals' role. These studies aimed to understand the principals' role in effective technology integration, not necessarily achieving high-level uses of technology.

First-order barriers. First-order barriers are tangible resources provided to teachers that support technology integration. Principals can provide resources such as professional development, planning time, and accessibility to hardware and software to influence technology integration (O'Dwyer et al., 2005; Stegman, 2014; Wisniewski, 2010). These resources are considered fundamental to technology integration because the absence of any of them affects the teachers' ability to utilize technology with students (Hew & Brush, 2007; Norris, Sullivan, Poirot, & Soloway, 2003; Wisniewski, 2010).

O'Dwyer et al. (2005) conducted a quantitative study utilizing Use, Support, and Effect of Instructional Technology survey with a hierarchal lens. Participants included administrators, middle school and high school principals, and teachers from 22 Massachusetts districts. The purpose of this study was to understand organizational characteristics associated with an increased use of technology for teaching and learning. When the researchers compared teachers in a single building, teachers had similar survey responses and little variability. Conversely, when researchers compared schools in a single district, they found greater variability among teachers. The researchers posited that, although all principals have access to the same district resources, principals provide varying technology-related resources, expectations, planning time, and professional development to their teachers.

Wisniewski (2010) modified the Use, Support, and Effect of Instructional Technology survey in a quantitative study with 228 elementary principals. The purpose of the study was to identify strategies principals used to improve technology integration. The findings showed that principals' leadership capacity that included knowledge, attitudes, and organizational capacity influenced first-order barriers of technology integration. The participants believed that the success of technology integration was attributed to their ability to provide professional development, contractual time for master, and technology resources.

Stegman (2014) conducted a qualitative case study involving four principal participants from high poverty schools. The purpose of the study was to investigate how principals who faced contextual challenges addressed the technological expectations of the Common Core State Standards. Principals in this study considered technology integration necessary to prepare students for college and career, and they were active in the implementation. The researcher found that the principals were instrumental in providing essential support such as accessibility to resources, coordinating staff support, planning time, and administrative support that fostered risk-taking. Principals in this study were able to address first-order barriers in high poverty schools by providing equity of opportunity and experience for teachers and students.

These three major studies found that principals who attend to these barriers experience positive outcomes. The organizational structures they create and support to provide greater access to technology can increase the use of technology. The principal's attention to scheduling, hardware purchases, targeted professional development and the expectation that technology should be integrated provide the essential supports teachers need. These qualitative and quantitative studies add to the body of literature regarding the principal's role in addressing first-

order barriers to technology integration; however, questions about the ways principals advance student-centered technology integration remain.

Second-order barriers. As with first-order barriers, principals can influence technology integration by supporting teachers with challenging barriers such as their knowledge and beliefs about the cognitive development of children, their confidence and skills to use new technology, and the perceived value of technology in the classroom (Ertmer, 1999). These barriers guide instructional decisions and decisions about how technology is used (Duffy & Jonassen, 1992). The lack of pedagogical knowledge and teacher confidence and proficiency contribute to the problem. Principals need to help teachers contend with these barriers to increase student-centered learning opportunities with technology.

Two studies show that pedagogical beliefs do not change by providing technology related resources. Kim et al. (2013), who followed 22 teachers over a four-year period, found that teacher beliefs about how students learn did not change when provided professional development that focused on increasing the technological capacity. Windschitl and Sahl (2002) conducted a two-year multi-case study utilizing an ethnographic perspective and found that teachers integrate technology according to the beliefs they held about how children learn. These studies show that access to hardware did not change pedagogical approaches and teachers continued to employ teacher-centered or student-centered practices.

Literature also shows that teachers who regularly use technology tend to hold constructivist beliefs. Becker (2000) reviewed data from a national survey of more than 4,000 teachers and found that teachers who utilized technology regularly understood the learning objectives they sought to achieve and ranked collaborative learning as an important objective. Ertmer et al. (2012) conducted a qualitative study using a case study approach with 12

kindergarten through twelfth grade teachers who were publicly recognized for their high quality technology integration practices. Ertmer found a close connection between their beliefs about how children learn and their student-centered pedagogical practices. These studies illustrate the influence of pedagogical beliefs on technology integration. Regardless of professional development offerings or lack of resources, the pedagogical beliefs of teachers guide instructional decisions. Principals need to contend with pedagogical barriers to achieve high-levels of technology integration.

A few studies explore the principal's role in addressing second-order barriers (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014). Bobbera (2013) found that principals who had technology leadership skills were able to provide teachers with essential support aimed to change pedagogical beliefs in relation to technology integration. Bobbera used an experimental, quantitative design to document leadership changes among 12 principal participants. Half the principals participated in an experimental group that completed a series of technology-related professional development. The other half in the control group did not participate in the professional development opportunities during the duration of the study. The researcher found that, as the capacity of principals in the experimental group increased, classroom technology integration and student engagement also increased. Conversely, the control group showed a decrease in both technology integration and student engagement. Bobbera's study revealed that principal leadership skills were influential in changing pedagogical practices but the specific principal actions and decisions that led to change were not included in the outcomes of the study.

Other studies found (Fisher, 2013; Foiles Kiel, 2014) that the technological capacity of principals influenced the creation of a shared student-centered vision and access to technology-related professional development that led to successful technology integration. Fisher (2013)

conducted a quantitative study that examined data involving 328 principals and 303,750 teachers. Fisher found positive correlations between the leadership proficiencies identified from the Principal's Technology Self-Assessment and the teachers' ability to integrate technology into the curriculum and teachers having to access technology-related professional development. The highest correlation existed between the principal's shared vision of "student-centered real-world learning experiences…that promote collaboration and higher-order thinking" (Fisher, 2013, p. 84) and the teachers' ability to integrate technology.

Foiles Kiel (2014) used an autoethnographic approach to document changes with technology integration while implementing a one-to-one laptop program over an eight-year period. The researcher used the Interstate School Leaders Licensure Consortium (Council of Chief State School Officers, 2008) as a framework and found that technology-related leadership skills aligned with the professional standards. This set of standards is the earlier version of PSEL used in this study. The researcher found that applying servant and transformational leadership skills and having a student-centered pedagogical vision contributed to the positive outcomes among teachers. The establishment of an inspiring school culture, supportive relationships, and meaningful professional development improved technology integration in classrooms.

These three studies support the assertion that principals can help address second-order barriers. The principals' technological knowledge, their ability to develop a shared vision, and their ability to foster supportive relationships lead to successful integration. These studies add understandings; but questions about specific practices of principals that help teachers move from traditional uses of technology to student-centered remain. The quantitative studies of Bobbera (2013) and Fisher (2013) lack specific principal practices that promote high-level uses of

technology. The qualitative study by Foiles Kiel (2014) focused on the implementation of a one-to-one laptop program but did not reveal how teachers used the devices to foster student-centered learning. This study also involved a single participant that makes it difficult to transfer to other contexts.

Transformational Learning and Essential Conditions

With the CCSS, teachers need to create classroom experiences that conflict with educational practices that have been steadfast for over one hundred years. The images and symbols of the classroom teacher as lecturer represent the experiences of most current educators. "When a structure has persisted without major changes over several decades, and is largely similar in most communities, common traditions are likely to emerge and effect the beliefs and values of participants" (Lortie, 2009, pp. 4-5). Changing those traditional beliefs is not easy but is necessary to meet the expectations of the CCSS.

For teachers to integrate technology to meet the CCSS teacher practices must be aligned with their pedagogical beliefs (Ertmer & Ottenbreit-Leftwich, 2010) and changing those beliefs is a difficult process (Ertmer, 1999; McDowell, 2013; Wisniewski, 2010). Beliefs guide decision-making (Kegan & Laskow Lahey, 2009; Wagner et al., 2006), which in turn influences how teachers choose to integrate technology into the curriculum (Duffy & Jonassen, 1992). Studies show that teachers who believe students learn by constructing knowledge socially with authentic tasks integrate technology in a manner consistent with those beliefs (Becker, 2000; Ertmer et al., 2012; Kim et al., 2013; Windschitl & Sahl, 2002).

Transforming classroom practices is applicable to both veteran teachers and teachers new to the profession (Office of Educational Technology, 2016). The fast pace of change with available technology resources, require all teachers to learn about new technology, and new

approaches (Gronseth et al., 2010). Today's teacher preparation programs include technology integration and student-centered coursework but the skills do not always transfer to classroom practices (Roessingh & Chambers, 2011). Some research shows that technology integration in college courses is basic compared to the level of technology integration needed on the job (Cavenall, 2008). Other research shows that the technology skills of professors and practicum teachers influence the preparedness of preservice teachers (Gronseth et al., 2010; Keane, 2015). Other research shows that only 2% of teacher preparation programs offer theory-based technology integration courses (Ertmer & Newby, 2013). Principals cannot assume that recent college graduates have the ability to integrate technology at high-levels.

Teachers who are proficient users of technology outside of school also need attention. Jones (2014) conducted a case study in a school that was implementing a Bring Your Own Device (BYOD) program. Nine of twelve teachers interviewed reported that they were technologically strong. More than half those teachers did not include BYOD technology into lesson plans regardless of their perceived comfort with technology. Woolard's (2012) case study of 10 teachers also found that teachers' use of technology outside of school had no effect on the use of technology in the classroom. These studies highlight the need for principals to consider the pedagogical practices among all teachers – new and veteran.

Changing beliefs to alter teaching practices require varying organizational structures that foster critical reflection that leads to a transformation (Drago-Severson, 2009). This section explores transformational learning in adults and the conditions that need to exist to support transformational learning.

Transformational Learning

Transformational learning is the act of redefining prior personal experiences that influence held beliefs, judgments, assumptions, attitudes, and feelings (Mezirow, 1991). Transformational learning is a theory of adult learning that explains the process of changing one's existing definition of "their life world" (Mezirow, 1997, p. 5) to one that holds new meanings and perspectives. It explores learning beyond the attainment of explicit information to a mindset that can contend with the abstract problems or complex problems prevalent in today's working environment (Drago-Severson, 2009; Mezirow, 1997). Transformational learning draws upon social constructivism where learning is an active process that requires dialogue, critical reflection, and a situation or problem (Merriam & Caffarella, 2007). This section explores three transformational learning of adult learner models to explain the overarching tenets (Illeris, 2002; Kegan, 1994; Mezirow, 1991).

Mezirow (1997) defines a person's frame of reference as life experiences that contribute to held values and feelings. Those *frames of reference* serve as the structure and set of assumptions people use when trying to understand new experiences. Both habits of mind and point of view are foundational and influential to *frames of reference*. Habits of mind are deep-rooted cultural ways of knowing that serve frames of reference indiscriminately. They are the beliefs people hold without awareness. Points of views are expressive products of habits of mind that communicate beliefs, judgments, attitudes, and feelings. For Mezirow (1997), transformational learning occurs when people are autonomous thinkers and have "the understanding, skills, and disposition necessary to become critically reflective of one's own assumptions and to engage effectively in discourse to validate one's beliefs through the experiences of others who share universal values" (p. 9). The transformation of beliefs occurs

when frames of reference are changed; where and when transformation occurs differs between people.

Kegan's (1994) constructive-developmental theory to transformational learning puts individual growth on a continuum. Influenced by Piaget's model of psychological development in children and extending Mezirow's transformational theory, Kegan's theory includes five levels of consciousness that begins with learners only capable of considering their own point of view and perspective to more complex ways of knowing that integrate personal perspectives with opposing perspectives. Dialectical thinking is fundamental in reaching the fifth level where learners reflect on the judgments, opinions, or beliefs of others and critically examine these contradictions. Learners in the highest level value the contradictions and allow them to exist.

Illeris' (2013) Three Dimensions of Learning Model suggests that individuals experience transformational learning at the point where a balance between new information or content and emotion intersects with the individual and society. Learners experience a change in attitudes, judgments, or beliefs when an appropriate level of personal motivation or openness combines with new information relative to needs of the surrounding environment. Illeris' model illustrates the interrelationship among three dimensions and highlights the critical role of emotion in the learning process. Too much stress or too little motivation can create barriers to learning and can impede transformational growth.

School districts are constantly facing new demands because of federal and state policy changes, new educational expectations, and technological changes. Understanding transformational learning theory is important because it highlights the cognitive, emotional, and contextual requirements that support adult learners. Educators do not simply adopt new pedagogical practices because a state adopted new standards. Principals need to provide teachers

opportunities to construct new understandings, socially interact, and critically reflect to help them contend with new demands that conflict with held beliefs.

Essential Conditions for Transformational Learning

Literature strongly supports the assertion that people need the skills and knowledge to adapt to complex organizational problems (Elmore, 2004; Heifetz, 1994; Senge et al., 2000). In educational settings, school leaders are responsible for providing teachers with resources to increase pedagogical, content, and technological knowledge and helping all students succeed (National Policy Board for Educational Administration, 2015). Research shows Professional Learning Communities help to achieve shared goals, relational trust, and collaboration (Bryk, Sebring, Allensworth, Luppescu, & Easton, 1992; Lencioni, 2002; Wagner et al., 2006). Educational leaders can enhance outcomes of Professional Learning Communities or other collaborative groups by understanding the Essential Conditions for Transformational Learning (Lamm, 2003; Mezirow, 1991).

Mezirow (1994) posits that transformational learning has occurred when a learner can "include context awareness, reflectivity, and more effective participation in discourse and interpretations which are more inclusive, differentiating, permeable, and integrative of experience" (p. 59). Lamm (2003) adapted Mezirow's criteria to include more human qualities and asserted that transformative learning occurs when "a distorted, inauthentic, or otherwise unjustified assumption is replaced with a new belief or paradigm resulting in thinking and actions that are more differentiated, inclusive, reflective, complex and empathic, patient, humble and tolerant" (p. 274). Lamm (2000, 2003) studied three large organizations that successfully produced transformational learning opportunities to contend with contemporary problems. The similarities that emerged across the diverse contexts help to understand the conditions that

support transformational learning. The essential conditions to foster transformational learners outlined by Mezirow (1991) and Lamm (2003) are summarized here in nine Essential Conditions for Transformational Learning:

1. Condition of Trust (Lamm, 2003): Relational trust gives people the necessary security to share ideas, feelings, and opposing viewpoints (Bryk et al., 1992). Trust enables individuals to open themselves to vulnerability (Lencioni, 2002). Trust fosters autonomy and minimizes self-doubt (Mezirow, 1991). Participants are free to ask questions to clarify meaning or gain more information (Mezirow, 1991) without fear of conflict (Lencioni, 2002).
2. Condition of Exploration: Learners must be encouraged to explore and evaluate varying arguments (Mezirow, 1991). Participants are placed in unfamiliar and new situations that help increase awareness and minimize reliance on previous knowledge (Lamm, 2000, 2003).
3. Condition of Critical Reflection: The learning opportunity is relevant and meaningful to participants (Bill and Melinda Gates Foundation, 2015; Polly & Hannafin, 2010). Learners should have opportunities to reflect on their own experiences, attitudes, opinions, and beliefs (Mezirow, 1991). The environment challenges underlying assumptions with the support of a coach or facilitator (Lamm, 2003).
4. Condition of Feedback: Individuals are open to opposing opinions, judgments, and beliefs (Mezirow, 1991). A norm of giving and receiving honest feedback (Lamm, 2003) holds people accountable to standards. In highly collaborative groups, a sense of "peer pressure" (Lencioni, 2002, p. 213) motivates team members to reach expectations.

5. Condition of Diversity: Participants with varying experiences improve learning (Lamm, 2003) and equal contributions are valued (Mezirow, 1991). Participants are considered peers and social powers are minimized (Mezirow, 1991).
6. Condition of Acceptance of Collective Consensus: Individuals are accepting of "informed, objective, and rational consensus as a legitimate test of validity" (Mezirow, 1991, p. 198).
7. Condition of Comprehensive Programming: Extensive and sustained training programs support opportunities for action and reflection (Lamm, 2003). Sustained professional development provides opportunities for repeated exposure to concepts and skills (Bill and Melinda Gates Foundation, 2015; Harwell, 2003; Moeller et al., 2011). Research shows a distinct correlation between the depth and length of experience and proficiency levels (Ericsson & Charness, 1994). Sustained professional development should include 49 hours over the course of the year and 20 separate instances of practice (Darling-Hammond et al., 2009; Moeller et al., 2011).
8. Condition of Personal Goals. There is a focus on personal development with individualized learning goals (An & Reigeluth, 2012; Lamm, 2003).
9. Condition of Repeated Team Collaboration. Team opportunities support action, reflection, and dialogue among all participants (An & Reigeluth, 2012; Lamm, 2000, 2003).

Some literature exists that helps clarify correlations between transformational leadership and technology integration leadership (Brunson, 2015; Foiles Kiel, 2014). Foiles Kiel (2014) used an autoethnographic approach to document changes with technology integration while implementing a one-to-one laptop program over an eight-year period. Foiles Kiel (2014) found

that having a transformational leadership style with a student-centered pedagogical vision contributed to successful technology implementation. The establishment of supportive relationships, a non-threatening atmosphere, and meaningful professional development improved technology integration in the researcher's school.

Brunson (2015) surveyed 132 elementary principals in one large school district as part of a quantitative study utilizing an assessment tool intended to measure the International Society for Technology in Education Standards for Administrators (2009). Most items on the survey aligned to either shared leadership or transformational leadership. Brunson found that the existence of transformational leadership competencies that foster professional development, risk-taking, and reflective feedback are strong predictors of technology leadership competencies.

Supporting transformational learning within an organization requires leadership that understands adult learners and deliberate action and support. Hence, principals need to create an active community of learners that encourages members to share perspectives and understandings to construct meaning together (Marshak & Grant, 2008). This discourse must include broader perspectives that consider the behaviors and processes necessary to "close the gap between what is and what ought to be" (Cuban, 2001, p. 6). Members need to understand that empowering learning is supported by open and honest discourse and that the lack of honesty creates barriers and hinders progress. Creating an environment that fosters transformational learning requires a principal to manage the resource of time, how time is utilized, and to consider the individual needs of all teachers.

Gaps in the Literature

A gap in the literature exists regarding the ways principals support high-levels of technology integration to improve student learning. Studies show that principals are considered

critical to both the implementation of the CCSS (Achieve et al., 2013; Fullan, 2014) and to technology integration (Bobbera, 2013; Draper, 2013; Fisher, 2013; Foiles Kiel, 2014); however, the literature does not yet explain how principals create a culture of high-levels of technology integration to meet the expectations of the CCSS.

Bobbera (2013), Draper (2013), and Fisher (2013) used quantitative surveys to find that a principals' knowledge and skills influence pedagogical practices. Although these studies shed light on a principal's dispositions that lead to improved technology integration, the broad categorization of behaviors and decisions typical of quantitative research leave questions about the relationships and interconnections between events, situations, processes, and people unanswered (Maxwell, 2013).

Educational technology tools are designed to promote teacher-centered instruction or student-centered learning (Duffy & Jonassen, 1992). Current studies that aim to understand a principal's role to improve technology integration do not differentiate between teacher-centered and student-centered online resources nor how principals promote student-centered technology applications.

Among the literature that investigated second-order barriers, only Bobbera (2013) and Foiles Kiel (2014) aligned principal practices to technology integration that include creativity, collaboration, communication, critical thinking, and problem solving. Bobbera (2013) used the International Society for Technology in Education Standards to observe changes in classroom practices, but the research outcomes only provide broad explanations of principal support for technology integration. Foiles Kiel (2014) referred to 21st century skills needed to meet the expectations of the CCSS in an autoethnographic study. The focus of this study was on the implementation of a one-to-one laptop program and not the use of student-centered applications.

Studies that investigate principals' roles in improving technology integration in schools do not yet include the Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991). Brunson (2015) and Foils Kiel (2014) assert that transformational leadership competencies that include the establishment of organizational goals, high expectations, and trust positively influence technology leadership. Additional research would help to understand the principals' role in creating the Essential Conditions of Transformational Learning among teachers.

Few research studies explore systematic approaches used by principals to improve technology integration. Foiles Kiel (2014) is the only study identified that used the tenets of transformational leadership and professional standards to improve the use technology in classrooms. Foiles Kiel used the Interstate School Leaders Licensure Consortium (Council of Chief State School Officers, 2008) as a framework, an earlier version of the PSEL used in this study, to provide a systematic approach to the implementation of a one-to-one laptop program. Foiles Kiel found that applying servant and transformational leadership skills and having a student-centered pedagogical vision contributed to the culture and positive technology integration outcomes among many teachers. The findings of this this qualitative autoethnographic study adds to the body of literature but the transferability to other contexts is limited.

Based on this gap in the literature, additional research would help understand how principals create a culture of high-levels of technology integration to meet the expectations of the CCSS across multiple contexts. Qualitative research would help to understand the specific practices among principals that promote the use of student-centered technology resources found in previous quantitative studies.

Chapter Summary

The literature relating to the technology integration in schools includes educational reform policies, the role of principals in addressing the barriers to technology integration, and an explanation of transformational learning and the essential conditions that support transformational learning among teachers. The literature represents various parts of a system – federal and state, school, and teacher – and – it explains the contextual and cultural information to understand the premise of the problem (Senge, 2006).

Educational reform policies have positive and negative impacts on classroom practices. No Child Left Behind has improved teacher collaboration, improved data analysis, and provided financial resources to provide technology but fosters narrowed curriculum topics and quick pacing (Byrd-Blake et al., 2010; Cullen et al., 2006; Ravitch, 2011; Valli & Buese, 2007). The Common Core College and Career Anchor Standards explicitly state that students can leverage technology to research topics, collaborate with other students, teachers and experts, and gather information digitally as a means to construct knowledge and share newly developed understandings. Districts and teachers in RTTT states are contending with new state-mandated educator evaluation systems and classroom expectations. These programs guide the decisions of superintendents and principals that ultimately influence classroom practices.

According to the literature, principals need a vast repertoire of leadership skills if they are to build the capacity of staff and to meet these new challenges. The 10 Professional Standards for Educational Leaders (PSEL) illustrate the various aspects of a school to transform teaching and learning. Previous studies describe the positive impact of principals' actions on technology integration. Their knowledge and management of school resources help address both first and second-order barriers to technology integration.

Last, transformational learning and the essential conditions to foster transformational learning were explained. Because the CCSS aims to shift classroom practices from teacher-centered learning tasks to student-centered, principals must provide learning opportunities for teachers that support this transformation of classroom practices (Achieve et al., 2013; Boatright, 2015; Fullan, 2014)

A gap in the literature exists regarding the ways principals support high-levels of technology integration to improve student learning. Studies show that principals are considered critical to both the implementation of the CCSS (Achieve et al., 2013; Fullan, 2014) and to technology integration (Bobbera, 2013; Draper, 2013; Fisher, 2013; Foiles Kiel, 2014); however, the literature does not yet explain how principals create a culture of high-levels of technology integration to meet the expectations of the CCSS.

CHAPTER THREE: METHODS AND PROCEDURES

The chapter includes the design of the study, ethical considerations, and issues of trustworthiness. The design of the study includes the research approach, and an explanation of the setting rationale, pilot study, obtaining participants, data collection methods, data analysis procedures, and the data synthesis procedures.

The chapter describes the methodology used to research question, "What actions, decisions, and relationships do principals perceive contribute to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" The three guiding questions that focused my research are:

1. Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?
2. How do you see yourself helping teachers integrate real-time collaborative tools to meet the CCSS?
3. Can you tell me about helping teachers overcome barriers to technology integration?

Design of the Study

This study used a qualitative research design employing a phenomenological approach to discover the knowledge, dispositions, and actions of principals who were successful in creating a culture of high-levels of technology integration to learn from their "lived experiences" (Creswell, 2013, p. 76). Qualitative research enables the relationships and interconnections between events, situations, processes, and people to be exposed (Maxwell, 2013). Although previous studies assert that the principal's knowledge about technology integration improved the use of technology in classrooms (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014), a qualitative approach across multiple contexts that explains how principals create a culture of high-levels of

technology integration does not exist. As a researcher and an educator in public schools, I wanted to develop a deeper understanding about the ways principals support high-level technology integration with replicable strategies. I felt that such information would be useful to others seeking to improve teaching and learning using technology.

Phenomenological research investigates shared human experiences and aims to describe the essence of the experiences (Bloomberg & Volpe, 2012; Creswell, 2013). The researcher aims to capture what participants experienced and how it was experienced (Creswell, 2013). Phenomenological research is rooted in Husserl's transcendental phenomenology (Creswell, 2013) that relies upon the reflection process to develop meaning of the objective reality (Moustakas, 1994). Researchers construct "a textural description and includes thoughts, feelings, examples, ideas, situations" (Moustakas, 1994, p. 47) to make meaning of the phenomenon. This reflective process requires repeated exposure to the evidence to see what was always there.

Phenomenological research is conducted under the constructivism inquiry paradigm that drives the approaches used throughout the data gathering, analysis, and synthesis processes (Bloomberg & Volpe, 2012; Mertens, 2015). According to Guba and Lincoln (1998), under any paradigm – including constructivism – three interrelated belief systems create an inquiry framework for the researcher: ontology, epistemology, and methodology. For the constructivist-oriented researcher:

- the ontological tenet is that reality is context-specific and, therefore, many realities exists;
- the epistemological tenet assumes findings evolve through an interaction between researcher and the object of inquiry; and

- the methodological tenet values the interpretative processes or hermeneutics of inquiry that are revealed through dialectical encounters.

Principals will share their experiences that are unique to the school community and to the principal. I assume that no two schools or principals are the same. Findings will emerge through an analysis and interpretation of the interviews, and I assume at the start of the dissertation that the answer to my research question is unknown. As a researcher, I wanted to recognize and be transparent about these assumptions because they consciously or unconsciously underpin my research decisions (Mertens, 2015).

Middle school principals who have experienced success in creating a culture of high-levels of technology integration are the focus of this study to understand how the success occurred. The design of the study explains the setting rationale, interview protocol, the pilot study, and process for obtaining participants. An explanation of the methods used for data collection, data analysis, and data synthesis helps to understand the management of participant confidentiality and to ensure accuracy of data.

Setting Rationale

Studying a common setting increases the transferability of findings into similar settings (Jensen, 2008). The middle school level was chosen because the No Child Left Behind (NCLB) Act of 2001 states that all students should be "technologically literate" (U.S. Department of Education, 2001, p. 1672) upon completion of the eighth grade. Given the technological NCLB mandate along with the adoption of the Common Core State Standards (CCSS) that include technology standards, middle school students should be exposed to a variety of digital resources and attaining technology-related skills.

To find principals with the experiences that would help answer my research question, purposeful selection (Maxwell, 2013) was used as the participant selection strategy. "In this strategy, settings, persons, or activities are selected deliberately to provide information that is particularly relevant to your questions and goals, and that can't be gotten as well from other choices" (Maxwell, 2013, p. 97). Participants in this study were from Massachusetts and Rhode Island for two reasons: (1) these states were included in the research because the researcher resides in Massachusetts and all points in Rhode Island are within a two-hour travel time; and (2) Massachusetts and Rhode Island have officially adopted the Common Core State Standards (CCSS, Common Core State Standard Initiative, 2015) and were awarded Race to the Top grant funds (U.S. Department of Education, 2013). Principals and teachers are accountable to the mandates relative to each initiative. As explained in Chapter Two, these programs, as well as NCLB, influence classroom practices.

Interview Protocol

Phenomenological research relies mostly on data from in-depth interviews from participants who have experienced the phenomenon firsthand (Creswell, 2013). Interviews provide an opportunity to gain a deeper understanding of the principals' perspectives, actions, and experiences that influence high-levels of technology integration.

An interview protocol was developed to provide consistency to the data gathering process (see Appendix C). The first section of the protocol served as a materials checklist. The second section included two open-ended questions that solicited background information on the principal and the structure of the school and schedule. The third section included the three guiding questions and a fourth question that solicited suggestions to help other principals seeking to improve technology integration. The last section served as an interviewer checklist with

reminders about closing remarks. The Data Collection Methods section provides a detailed explanation of the interview process.

Pilot Study

A pilot study was conducted to have an opportunity to test and improve my questions and interview skills (Maxwell, 2013). All research tools were trialed to understand specific benefits and drawbacks to each one to improve the quality of the data collection process. Tools utilized in the pilot study included the interview protocol, the audio recording device, and Atlas.ti qualitative analysis software (Version 7.5.10; Atlas.ti Scientific Software Development GmbH, 2016).

Purposeful selection guided the sampling process for the pilot study. Two middle school principals known to me participated in the pilot study. I believed these participants would provide open and honest feedback on the questions and interview techniques because of our professional relationship. My relationship with these individuals developed over a three-year period through our work in one district. I believed these individuals were my colleagues on a lateral level and hierarchical professional relationship did not exist that would have inhibited honest feedback.

The pilot interviews occurred in early November 2015 using the interview protocol and the recording device. The interviews were transcribed verbatim into Atlas.ti (Version 7.5.10; Atlas.ti Scientific Software Development GmbH, 2016). The interview protocol needed adjustment to clarify the meaning of the questions. The interviewee feedback and transcription process highlighted the need to add a question to gain information about the demographics and structure of the school. The information gleaned from the additional demographic and structural question provided the necessary context information to understand other responses. For instance,

when I asked the question about helping teachers, principals referred to varying teacher collaboration time. Adding the demographic and structural question provided understanding to those references. The following questions were added to the protocol, "Tell be about this school in terms of demographics and structure." The pilot study also showed that I needed to increase my wait time before asking additional questions to allow the interviewee additional response time.

Participants

Phenomenological approach to qualitative research only needs a small number of participants (Englander, 2012; Polkinghorne, 2005). It was my goal to include 12 participants in this study to increase my exposure to the complexity of the phenomenon. At the completion of the data collection phase, 13 middle school principals who reported leading in schools with high-levels of technology integration had participated.

Snowball sampling (Polkinghorne, 2005) was used to select principals who had experiences that would help answer my research question. I relied largely on the referrals of superintendents, middle school principals, and technology leaders within Massachusetts and Rhode Island. Beginning in October 2015, I sent email or Facebook messages to superintendents, technology leaders, middle school principals, and curriculum leaders that I knew professionally. The message requested their assistance to identify middle school principals who have been successful in integrating technology. Most of my contacts were able to produce at least one referral.

Twenty-two referrals resulted from the process as described above between the months of October and December 2015. A Microsoft Excel spreadsheet stored all the names of initial contact names and names of referrals, correspondence dates, email addresses, and school

locations. Referred names included initial contact name, correspondence dates, email addresses, and school locations.

When a contact made a referral, I sent an email to the referred middle school principal. My email message recognized the source of the referral, described the purpose of my study, and the description of principal experience aimed in the study. The criteria outlined in the letter included:

- high-levels of technology integration exists;
- the principal has been successful in implementing high levels of technology integration and influenced pedagogical practices to meet the CCSS; and
- at least one real-time collaborative tool is available and is utilized.

The email then asked if he/she met the criteria of the study and if he/she would be interested in participating in a study that would require a face-to-face interview. A sample letter is in the appendices of the dissertation (see Appendix D). Two referred middle school principals felt they did not meet the criteria as described in my email and declined to participate. Nine middle school principals did not respond to my email or follow-up emails. I was pleased that 13 principals believed they met the criteria and agreed to participate in my study. Two principals were in Rhode Island public schools and the remaining eleven were in Massachusetts public schools.

All thirteen principals were from traditional, non-charter public schools. All schools involved in this study follow a traditional middle school model that places students on teams. Teachers have regular collaboration time built into a rotating schedule to meet with colleagues on their team and within their discipline. Table 4 summarizes the participant demographics. School characteristic data was obtained from each state's department of education website

(Massachusetts Department of Elementary and Secondary Education, 2015-2016; Rhode Island Department of Elementary and Secondary Education, 2016) and the remaining information was gleaned through the interview process. School size, number of years with an adopted program, and school characteristics are reported in approximation on

Table 4 to maintain participant confidentiality.

Table 4: Participant Demographics

Participant	Gender	Principal Experience	State	Middle School Model	School Size	Adopted Program	School Characteristics	Economically Disadvantage	Title I Participant
1	Male	5 years	MA	6-8	640	BYOD > 3 years	90% white student population	5%	no
2	Male	4 months	RI	6-8	830	BYOD < 1 year	90% white student population	37%	no
3	Male	7 years	MA	6-8	1300	BYOD < 1 year	80% white student population, > 13% hispanic	25%	no
4	Female	5 years	MA	5-8	760	1:1 > 5 years ago; BYOD > 3 years	90% white student population	20%	yes
5	Male	18 years	MA	5-8	700	1:1 > 5 years	85% white student population, 7% asian	8%	no
6	Male	7 years	MA	6-8	540	1:1 > 3 years	93% white student population	3%	yes
7	Female	7 years	MA	5-8	950	1:1 > 5 years	77% white student population, 7% hispanic	9%	no
8	Male	6 years	MA	6-8	850	1:1 < 1 year	88% white student population, 9% asian	4%	no
9	Female	2 years	MA	7-8	860	1:1 > 5 years	81% white student population, 8% asian	4%	no
10	Male	8 years	MA	6-8	780	1:1 > 5 years	94% white student population	5%	no
11	Male	13 years	RI	5-9	960	1:1 < 3 years	94% white student population	20%	yes
12	Male	10 years	MA	6-8	800	BYOD < 3 years	91% white student population	23%	no
13	Male	3 years	MA	6-8	380	none	96% white student population	7%	yes

Participant two was treated as an outlier. This study aimed to learn from principals who were successful in creating a culture of high-levels of technology integration to understand how they influenced the pedagogical practices in classrooms. The outlier was very knowledgeable about technology but was new to the principal position and new to the school. The school did not yet have stable Wi-Fi, access to technology, and a schedule that supported teacher

collaboration. High-levels of technology integration may have occurred in isolated incidences but the lack of resources presented consistent barriers for teachers as explained in Chapter Two. For these reasons, I categorized this principal as an outlier.

I scheduled face-to-face interview appointments with all 13 principals through email communication. After a middle school principal agreed to participate, I sent two follow-up emails. The first follow-up email requested an appointment date and time. I also asked for the contact information if I needed district permission to conduct the interview. Upon receiving a confirmed date, a second follow-up email was sent that included a message of my gratitude and the interview questions so that the principal could reflect on the questions prior to the interview. A sample of the follow-up emails is in the appendices of this dissertation (see Appendix E).

Data Collection Methods

Data was obtained through interviews and accessing public websites. I completed in-depth interviews with 13 middle school principals who reported high-levels of technology integration building-wide. All interviews occurred face-to-face during a mutually agreed upon time at the principal's school. Face-to-face interviews were selected over written responses and video conferencing to foster deep discussions and capture nuances (Englander, 2012). Interviews occurred during the months of November 2015, December 2015, and January 2016. Interviews were in the principals' office. One interview was in a conference room. All interviews were on days when the school was open at a time between 8:00 a.m. and 4:00 p.m.

At the start of each interview, I spent a few minutes getting to know the principal and allowing the principal to get comfortable with me. A few principals inquired about the Ph.D. program at Lesley University and my professional experience. I made comments or inquiries about the school surroundings. One principal warned me about a field mouse that was living in

the office. The warning was too late since I had already witnessed the critter scurrying across the floor as I waited outside the principal's office. While these friendly conversations were underway, I organized my materials that included the recording device, interview protocol, two copies of the Consent to Participation, gift card, and a pen for notetaking. I asked permission to record the interview when my materials were organized. The audio recording began immediately upon the principals' permission. All participants agreed to have the interview audio recorded.

I reviewed the Consent to Participation with the participant. I explained my responsibilities to maintain confidentiality, my procedures to maintain confidentiality, the purpose of the audio recording, and contact information. The Consent to Participation required a signature from the participant and a copy was given to the participant (see Appendix F). To show my gratitude for participation, each participant received a $25 gift card at the time of the interview. See the appendices for state ethics law information (see Appendix G). I expressed my appreciation for the time the principal took to meet with me given his/her busy schedule. Participants stated that they appreciated the opportunity to contribute to educational research.

This study used a semi-structured interview approach. A semi-structure approach includes the use of an interview protocol with an established set of questions but permits the interviewee or the participant to introduce other topics or probe deeper into a topic (Bernard, 2006). The interview began by first explaining the premise of my research to participants with a brief explanation of the literature. I then asked two questions that solicited background information on the principal and the structure of the school and the daily schedule. I asked participants the three guiding questions and an additional question that asked for recommendations for principals who are aiming to improve technology integration.

The interview questions remained the same for all interviews but a couple of follow up questions changed over the data collection process. The first participant disclosed that the instructional technology coach attended weekly team meetings. After that interview, I ensured that I understood how instructional technology coaches provided support across all schools to compare the established norms. I also learned early on that course offerings changed to include relevant technology skills so I included a follow up question to capture organizational changes.

The interviews ranged in duration from approximately 60 to 130 minutes. The average interview was 1 hour 29 minutes. At the end of the interview, I thanked the participant for his or her time. I explained to the principals the study timeline and the estimated date when a copy of the dissertation would be sent to them. All interactions with the principals were professional and pleasant and I enjoyed my time with each of them. Although the topic of the interview was the same, each principal shared his or her unique story that contributed to my learning and this dissertation.

I wrote field notes directly on the interview protocol during the interview and following the interview. The field notes included observations about the environment and the interview relationship. I wrote short descriptive field notes during the interview that helped to capture the event and jot down salient points made by the principal (Creswell, 2012). After the interview, the descriptive notes helped to remind me of discussion points that jarred my thinking and I then added reflective field notes. Reflective field notes are the "personal thoughts that researchers have that relate to their insights, hunches, or broad ideas or themes that emerge during the observation" (Creswell, 2012, p. 207). Reflective thinking continued beyond the field notes were documented as memos in Microsoft Word. Memos included questions and potential themes used throughout the data analysis phase of this dissertation.

Post-interview procedures helped maintain consistency and confidentiality. A confidential binder stored the Consent to Participation, field notes, and any documents provided to me by the participant. I transferred the audio recordings from the audio recording device onto my desktop computer on the same day of the interview. I deleted the original recordings from the audio recording device after completing the transcription to maintain participant confidentiality. All the interview audio files on my desktop were renamed using a code opposed to using participant names. Names of individuals mentioned during the interview were replaced with a pseudonym during the transcription process to protect identities. To ensure accuracy of the transcriptions, participants received a copy for review via email. Participants were given approximately a week to review the transcript and provide feedback. Five participants responded to acknowledge receipt and no changes were submitted.

I obtained additional data from public websites. School demographic data was obtained from the Massachusetts Department of Education and Rhode Island Department of Education websites (Massachusetts Department of Elementary and Secondary Education, 2015-2016; Rhode Island Department of Elementary and Secondary Education, 2016). Individual school improvement plans were obtained from school websites.

Data Analysis

The data analysis began with a simple framework that evolved into a complex illustration of the data. The data analysis process included the transcription of the audio recordings, memoing, analysis notes, creating a participant profile matrix, deciding on a framework for coding, the process of coding the transcripts, and creating code family matrices that bounded the data.

Audio recordings were transcribed verbatim in the Atlas.ti qualitative analysis software (Version 7.5.10; Atlas.ti Scientific Software Development GmbH, 2016). All participant names, school names, towns, and any colleague or staff member mentioned by the participant in the interview were changed to pseudonyms to maintain confidentiality. Atlas.ti has the capability to match specific points in the audio recordings to lines in the transcription, and I leveraged this feature. By pairing the audio and the text, I was able to quickly retrieve the original audio of a particular quote to clarify meaning, word usage, or tone of the statement during the coding, or later when developing interpretations.

I transcribed all audio recordings verbatim. Transcribing the interviews myself gave me the opportunity to listen to the participant stories again and become more familiar with data (Bloomberg & Volpe, 2012; Creswell, 2012). I transcribed the interviews in the same order as the appointment. Typically, I transcribed interviews within a week of recording it. I conducted the first interview on November 11, 1015 and the transcription process began four days later. I conducted the last interview on January 20, 2016 and the transcription process began the following day. Transcribing the interviews myself and soon after the interview occurred, helped me to *know* the data (Bloomberg & Volpe, 2012). Each interview was transcribed from beginning to end to create an accurate depiction of the participant stories (Bloomberg & Volpe, 2012; Creswell, 2012).

As Creswell (2012) suggests, I did not code the interview during transcription so that I could focus on the conversations and develop a "general sense of the data" (p. 243). A Microsoft Word document stored memos of arising questions, ideas, and emerging themes throughout the transcription process. Memos included the current date and initials of participants if the memo was specific to quotations. Memoing is considered an important part of the analysis process and

serves as a bulletin board for random streams of thought and new ideas (Maxwell, 2013). After transcribing all the interviews, I used the memos to make decisions about coding themes. The themes revealed a complex set of characteristics involving relationships, management of resources, organizational improvement, and adult learning.

I decided to use the Professional Standards for Educational Leaders (PSEL, National Policy Board for Educational Administration, 2015) as a framework for coding. The memos represented aspects of varying professional standards. I developed a list of 14 primary codes based on the PSEL descriptions. The primary codes created boundaries to the analysis process and were used to isolate participant specific data points in the transcriptions (Creswell, 2013). A fellow researcher read two transcriptions, read the PSEL descriptions, and provided feedback on the primary codes. The fellow researcher agreed with the proposed framework and thought that many codes related to more than one professional standard. I created a matrix to document the relationship between the PSEL standards and initial codes (see Appendix H).

Table 5 lists the primary codes.

Table 5: Primary Code List and Definition

Primary Code Name	**Definition**
Alignment	evidence of curriculum alignment and technology
Barriers	evidence of tech integration barriers in classrooms
Equity	evidence of addressing equity of technological resources
Expectations	evidence of tech integration expectations in classrooms
Family/Community	evidence of tech support for families or support for tech from families and community
Learning Communities	evidence of tech integration in learning communities
Norms	evidence of cultural norms including relationships that support tech integration in classrooms
Own Learning	evidence of principal's tech-related learning
Professional Learning Frequency	evidence of the frequency of tech-related learning
Professional Learning	evidence of informal and formal tech-related learning
Vision/Mission/Core Values	evidence of school vision/mission, core values, and principal beliefs
Technology Continuum	evidence of tech-related implementation past, present, future
Technology Resources	evidence of tech resources other than PD
Who supports technology?	evidence of who encourages teachers to use tech in the classroom

Each transcription was read two times from beginning to end to expose the "rich data" (Maxwell, 2013, p. 126) that existed. The first reading guided the assignment of the primary codes to quotations. I reread the PSEL (2015) to ensure my definitions and use of codes aligned with standards. During the second reading, I either identified additional quotations that needed coding, deleted quotations from codes, or reassigned quotations from one code to another. After the two readings, 10 primary codes had a large number of quotations linked to them and I used sub-codes to extrapolate meaning. For instance, barriers had 146 quotations linked to it so I developed five sub-codes that represented the data: fear/control, risk-taking, structural, technological ease, and TPC knowledge (technological, pedagogical, and content).

I handled each primary code with the large number of quotations linked to it in isolation. After selecting a primary code to work with, I read the linked quotations to identify new sub-codes. The primary code and the relative sub-codes are referred to as code families from this point forward. The new sub-codes were entered into Atlas.ti (Version 7.5.10; Atlas.ti Scientific

Software Development GmbH, 2016); then I proceeded to reassign quotations from primary code to a sub-code in the software. I repeated the same process for every primary code that had more than 80 quotations assigned to it. As a result, I created 50 new sub-codes that refined the data. A complete listing of code families is the appendices of this dissertation (see Appendix I). The multiple readings of the transcripts provided a deep understanding of data that led to a refined coding system (Creswell, 2012)

Analysis of the individual school improvement plans needed to be completed. I obtained the improvement plans from official school websites. These plans were printed and reviewed to identify technology-related goals for the current school year. Technology-related goals were coded as vision/mission/core values.

I created a participant profile matrix to hold specific information about each participant. This matrix was a live document, and I added information to it throughout the data collection process and the data analysis process. The participant profile matrix contains the participant pseudonym, years of experience as a principal and assistant principal, and length of interview. It also contains demographic information such as socio-economics, size of the school, and sub-group statistics. This document also tracked technology-related details. This technology-related information included whether or not the school had an instructional technology coach on staff and if the school district adopted Google Apps for Education, one-to-one device program, and/or Bring Your Own Device program. For the purpose of clarity, a person in a non-administrative role who supports technology integration and curriculum alignment is referred to in this dissertation as an instructional technology coach. Principals often referred to individuals who held similar positions but with varying job titles such as learning coach, digital literacy specialist, and technology integration specialist.

The analysis process included transcribing the audio recordings verbatim, writing memos, and developing codes and sets of sub-codes. The various steps required several readings of the transcripts to ensure coding was accurate and to develop a deep understanding of the data. As explained next, analysis reoccurred throughout the synthesis process.

Data Synthesis

Qualitative research requires a summarization of the data and an illustration of the data (Bloomberg & Volpe, 2012). I reviewed the code families and assigned each family to one of the three guiding questions. Question one included code families that related to the principals' understanding of real-time collaborative tools and uses to meet the CCSS theme included data that pertained the principals' knowledge principals' or attainment of understanding. Question two included code families that related to how principals help teachers integrate real-time collaborative tools to meet the CCSS included data that explained the various ways the principals helped teachers. Lastly, question three included code families that revealed barriers to technology integration and how principals help teachers overcome those barriers.

Three themes emerged from sorting the code families by criterion. These technology-oriented principals:

- were knowledgeable about real-time collaborative tools and uses that influenced actions and decisions;
- provided teachers a supportive environment to achieve high-levels of technology integration; and
- contended with barriers that interfere with the improvement of technology integration.

I used Microsoft Excel to develop matrices that cross-referenced participant responses relative to codes. According to Creswell (2003), matrices help isolate and constrain the information of each context. I created three Microsoft Excel workbooks to represent each theme. Each workbook contained separate sheets – or matrices – containing assigned code-families and a summarized participant responses. I collapsed some sub-codes with a small number of responses into other sub-codes that shared similarities in outcomes. I did not analyze a few sub-codes because they seemed insignificant. For example, the presentation sub-code had a low response rate and the topic was evident in the sub-code problem solving and projects. Analysis of the presentation sub-code was not needed. The matrices helped me sort the responses and identify consistencies and inconsistencies within sub-codes and code families across all contexts.

After creating the matrices, it became evident that one participant was considered an outlier. This study aimed to learn from principals who were successful in creating a culture of high-levels of technology integration to understand how they influenced the pedagogical practices in classrooms. The outlier did not meet this criterion. As mentioned previously, the principal was quite knowledgeable about technology integration but had only a few months experience as principal and had limited technology resources. According the principal's responses, this school will be experiencing significant change over the next couple of years. A new vision, a new schedule that would include additional time for teacher collaboration, and new technology resources such as stable Wi-Fi and computers were in the preplanning stage. As a result, the presentation of the data and implications do not include responses from this participant. My recommendation is to repeat the study with this principal in two years to analyze changes in technology-related pedagogical practices among teachers.

The matrices were printed and were fundamental in the synthesis process that included repeated data analysis. As Creswell (2012) posits, qualitative research is not a linear process and the interpretive process requires a "back and forth between data collection and analysis" (p. 238). In some instances, I had new questions and the data was not on the matrices. In those cases, I referred to the original transcripts and made handwritten notes on the matrices. I used the data from the matrices to illustrate findings found in Chapter Four.

I used a memo document throughout the process to hold ideas or questions. The memos most often served as reminders for a later time. For example, on May 15, 2016 I wrote, "Continuum is critical! It demonstrates a shift in thinking by the principal." I documented that thought while working on the presentation of the data and I wanted to remember it when considering the implications of the data. I also used this document to place participant quotations that seemed to capture the essence of a finding. I might not have used the quotation in this dissertation but the presence of the quotation served as a reminder to revisit that thought or idea.

The design of the study describes qualitative research utilizing a phenomenological approach to discover the knowledge, dispositions, and actions of principals who are successful in creating a culture of high-levels of technology integration. The face-to face interviews, the repeated analysis, and synthesis provided the structure to learn from their "lived experiences" (Creswell, 2013, p. 76). The design of the study included specific protocols and routines to maintain confidentiality and data quality as described next in Ethical Considerations and Issues of Trustworthiness

Ethical Considerations

The protection of human rights is paramount and researchers are obligated to conduct themselves accordingly. I presented a study design to Lesley University's Institutional Review Board (IRB) in an application that included specific protocols I would implement and follow to protect the rights of participants. The IRB approved my application on November 6, 2015.

The study design included only adult participants who would participate in face-to-face interviews. Participants would not experience a level of stress greater than normal daily activity. Participants agreed to the interview on their own freewill and they could withdraw from the study at any time. I protected participants' identifiable information during the analysis and in the presentation of the data by removing the information and employing pseudonyms.

Issues of Trustworthiness

Prior to starting this study, I completed a sociocultural perspective paper that provided a reflective opportunity to explore personal biases towards curriculum delivery. That process revealed that I have biases towards multi-modal learning and allowing students the opportunity to leverage their creativity to guide their own learning. For example, I wrote about the positive and memorable childhood experiences involving technology. My childhood was before the evolution of the NASA's Space Shuttle. Whenever, NASA sent astronauts into space, the whole world would seem to stop and watch the rocket launch. My memories include those moments in time when students and teachers would watch the wonder and awe around a television. That type of learning experience stayed with me. As an educator, I try to use technology to connect students to the outside world.

I also have biases towards using technology for creative expression. All through my childhood years, I enjoyed photography. In my sociocultural perspective paper, I wrote about

my love of photography and I grew up playing with an instamatic camera that required one of those disposable cubed-shaped flashbulbs. This love flourished when my father drove me across the United States in his tractor-trailer. Capturing pictures of people and landscapes was something that I enjoyed throughout our trip and I was proud of my own creativity. This love of photography is evident in my own teaching practice and without a doubt contributes to my comfort with technology. I believe that creating visual representations of concepts helps learners remember those concepts overtime. I also believe that engaging students in tasks that demand critical thinking and creativity adds authenticity to the learning process.

Those biases towards visual learning and creative expression influenced my desire to explore the topic of improving technology integration; I wanted to understand differences between teachers that influenced how technology was used and how principals helped teachers advance their use of technology to meet the expectations of the CCSS. However, recognizing these biases also helped me understand the challenges for teachers. I understand that I have a comfort with technology and an intrinsic motivation to integrate technology in ways that differ from many teachers. Recognizing the uniqueness of my own beliefs helped me to remain open-minded throughout this dissertation.

Regardless of my recognition of biases, protocols and procedures were utilized to minimize personal beliefs and to provide equity among participants and address issues of trustworthiness. Guba and Lincoln (1989) created an inquiry audit framework that includes four criteria of trustworthiness: *credibility*, *dependability*, *confirmability*, and *transferability*. The defined criteria are as follows:

- *credibility* is a conscious effort to construct meaning from participants experiences;

- *transferability* is dependent upon "the degree to which salient conditions overlap or match" (p. 241) across contexts;
- *dependability* is the "stability of the data over time" (p. 242) and requires the process to be tracked to document any changes in methodology; and
- *confirmability* is the researcher's ability to remove him/herself from the findings; findings are evidenced or grounded in the data.

For this dissertation, I managed each criterion to ensure accuracy of the data and to allow the experiences of all participants to emerge as evidenced in Table 6.

Table 6: Management of Trustworthiness by Criterion

Credibility	Transferability	Dependability	Confirmability
• multiple participants • peer debriefing • memoing to document construction of thought processes • member checks • systematic approach to inquiry using research questions to guide data gathering, analysis, synthesis and implications	• coding using broad themes as evidenced in memos • creating sub-code categories within broad themes to identify smaller units of meaning • compare across contexts with similarly aged students • multiple participants	• pilot study conducted • protocols and procedures implemented and followed • member checks • criterion-based participants • purposeful selection • findings are grounded in the evidence	• protocols and procedures implemented and followed • findings are grounded in the evidence

Chapter Summary

This chapter describes a qualitative research design employing a phenomenological approach to discover the knowledge, dispositions, and actions of the principals who were successful in creating a culture of high-levels of technology integration to learn from their "lived experiences" (Creswell, 2013, p. 76). I conducted face-to-face interviews with 13 middle school principals. After transcribing the interviews, I developed primary codes based on memoing notes and the Professional Standards for Educational Leaders. I used sub-codes to refine the data

and to gain a clearer understanding of the participants' experiences. I sorted the codes by theme to begin the process of synthesizing. Further analysis led me to create a fourth theme to capture the systematic approach of the principals in this study.

The design of the study included protocols and routines to ensure an ethical approach to research and establish trustworthiness of the data. The ethical considerations described researcher obligations as deemed necessary by Lesley University's Institutional Review Board (IRB). The issues of trustworthiness was defined and described using Guba and Lincoln (1989) inquiry audit framework.

CHAPTER FOUR: FINDINGS

This chapter presents the themes and findings to the guiding questions. Each question presented below contains an explanation of the theme that emerged and a summary of the findings. Findings include supporting graphs and participant quotes as appropriate to provide clarification to the reader. The graphs are intended to provide readers with quick summaries of outcomes and principal strategies. The participant quotes provide context to findings. The quotes do not reveal ownership because they are intended to express findings across several contexts. Chapter Five explains the implications of these findings with supporting literature.

The following research question aims to understand how principals create a culture of high-levels of technology integration to meet the expectations of the Common Core State Standards (CCSS), "What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" Participants were asked the following guiding questions:

1. Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?
2. How do you see yourself helping teachers integrate real-time collaborative tools to meet the CCSS?
3. Can you tell me about helping teachers overcome barriers to technology integration?

As explained in Chapter Three, three themes emerged from analyzing and synthesizing the matrices data, these technology-oriented principals:

- were knowledgeable about real-time collaborative tools and uses that influenced actions and decisions;

- provided teachers a supportive environment to achieve high-levels of technology integration; and
- contended with barriers that interfere with the improvement of technology integration.

Guiding Question One: Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?

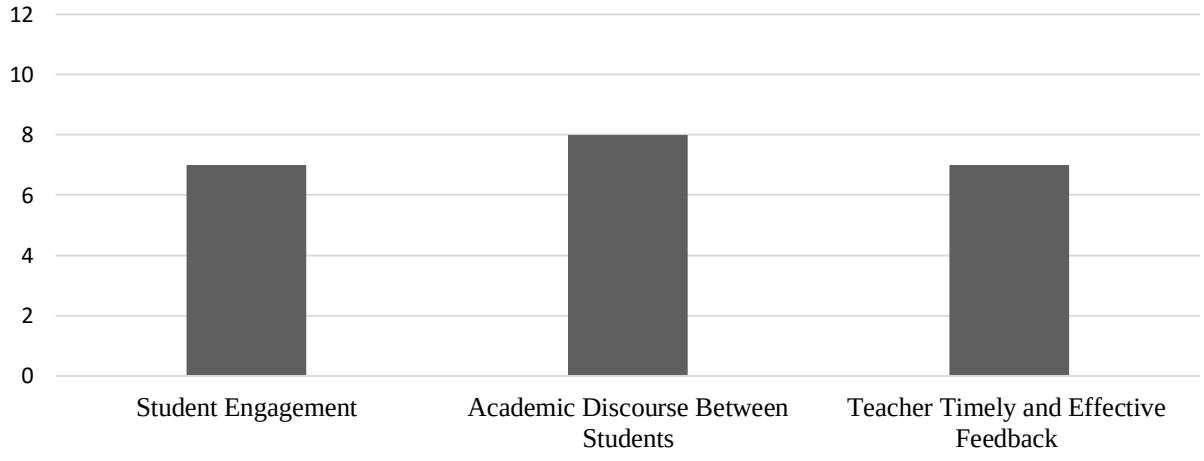
This guiding question revealed the theme that these technology-oriented principals were knowledgeable about real-time collaborative tools and uses that influenced actions and decisions. As explained in Chapter One, real-time collaborative tools are categorized as high-level technology tools and can support the technology expectations outlined the CCSS. Real-time collaborative tools allow multiple users to talk, video chat, type, and/or create together from different locations or devices. For these reasons, real-time collaborative tools served as the technology focus for this study. Two findings emerged: principals were knowledgeable about the ways real-time collaborative tools supported student learning, and principals' knowledge about high-level uses influenced organizational actions and decisions. These findings show that principals had an understanding about real-time collaborative tools and uses and they were self-motivated to keep their knowledge current. Principals' knowledge about student-centered, high-level technology integration influenced the principals' ability to model continuous learning with technology, plan and promote technology-related school-wide practices, change courses to embed contemporary technology skills, and engage families and community to solve technology-related problems.

Finding One: Principals Were Knowledgeable about the Ways Real-Time Collaborative Tools Supported Student Learning

The data shows that principals had a positive perception about real-time collaborative tools and they were self-motivated to keep their technology knowledge current. Principals shared examples of classroom observations that reflected high-level uses of technology. These examples showed that principals are knowledgeable about curriculum alignment using real-time collaborative tools and the perceived benefits to using real-time collaborative tools for learning. Findings also showed that principals were self-motivated to keep their knowledge about classroom approaches to technology integration current.

Perceived benefits of real-time collaborative tools. As shown in Figure 1, principals perceived the leading benefits to real-time collaborative tools as student engagement, increased academic discourse, and timely and effective feedback. Principals shared classroom observation examples included students using real-time collaborative tools to promote problem solving, critical thinking, communication, and collaboration.

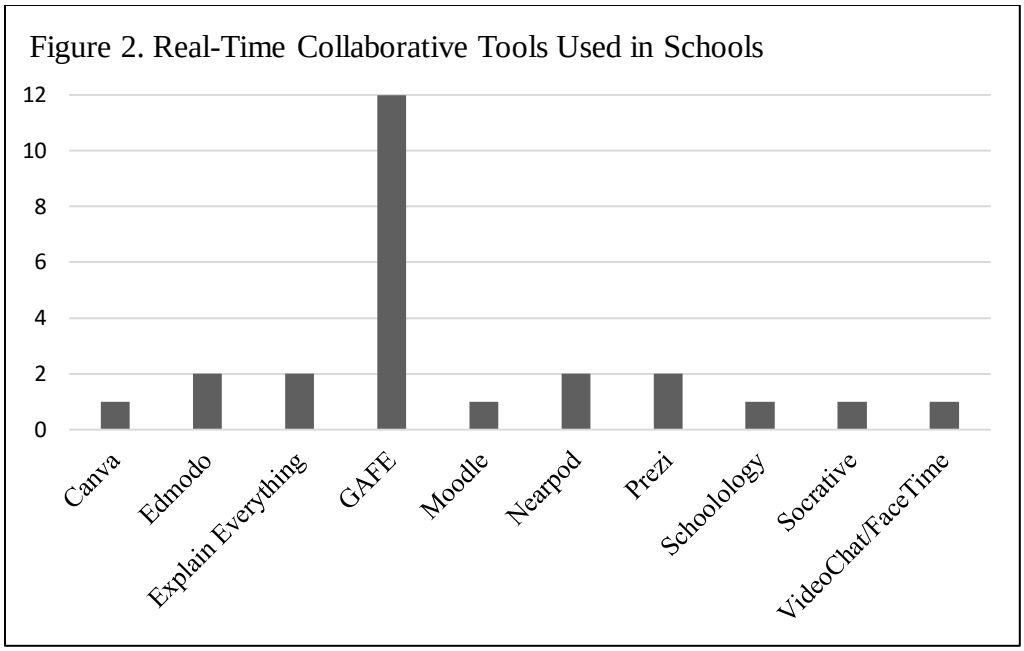
Figure 1. Perceived Benefits of Real-Time Collaborative Tools



Principal reflections included varying student-centered pedagogical approaches such as project-based learning, flipped-classroom models, inquiry-based learning, and research projects

leveraging a variety of real-time collaborative tools as shown in Figure 2. All 12 principals reported being a Google Apps for Education (GAFE, Google, 2016) school. GAFE is a suite of cloud-based, real-time collaborative applications that include Google Drive, Docs, Sheets, Drawing, and Classroom designed for schools, online collaboration, and 24/7 access. Observations were not isolated to real-time collaborative tools. Reflections typically included statements about a combination of technological resources involving real-time collaborative tools. Here is an excerpt a principal's project-based learning reflection that included multiple resources in addition to real-time collaborative tools:

> [The students] had to open up a Google Doc [and] they had to go with somebody, somewhere else in the classroom. They had to create a [brainstorming] Doc [about windmills] and share that with the class. That initial brainstorming [included ideas] on what would lead to a better design and what they think will go into this design. Then they were using Google Drawing, and they had to sketch and brainstorm together as a team. That launched into using an engineering level software program [to design a windmill].



Principals believed that real-time collaborative tools increased student engagement that enhanced learning. Eight principals specifically talked about students' increased engagement when using real-time collaborative tools and other student-centered technology. The principals reported that these tools inspired student creativity, authentic learning, and asynchronous learning that were not an option just a few years ago. These references to engagement were not about specific tools per se but rather high-levels technology integration as evidenced in the following excerpt:

> Shifting [classroom practices] to inquiry project-based learning, the tools have allowed us to do that. [Students] publish to our school-based YouTube channels [and] blog to show their thinking. Those tools I think are giving us opportunities to do what we want for our kids and allowing us to do things that we weren't able to do before, do it better, and to engage them.

This example highlights the beliefs of the principal that technology promoted active student participation and creative expression of knowledge. Real-time collaborative tools supported authentic learning tasks and offered easy avenues to share student work with broader audiences.

Principals perceived increased academic discourse between students as a benefit to real-time collaborative tools. Eight principals reported that students were collaborating with peers on school-related tasks in and out of school with greater ease. Video chat tools, such as FaceTime (Apple, 2016), fostered socialization beyond the school day, and allowed students to collaborate on academic tasks. People might view chat sessions as cheating if students are conversing about work that should be completed independently, but one principal argued that these instances support collaboration if students are supporting each other and not just providing answers. Principals also discussed how students leveraged the collaboration features in the Google Classroom and Google Drive applications to work on assignments with peers while in school and from home. These collaboration features included replies or posts on discussion boards, commenting on documents, peer editing, and document sharing.

Seven principals perceived teachers' timely and effective feedback as a benefit to real-time collaborative tools. Using the Google Apps for Education platform, teachers were able to provide feedback on assignments with greater efficiency as shown in the excerpt below:

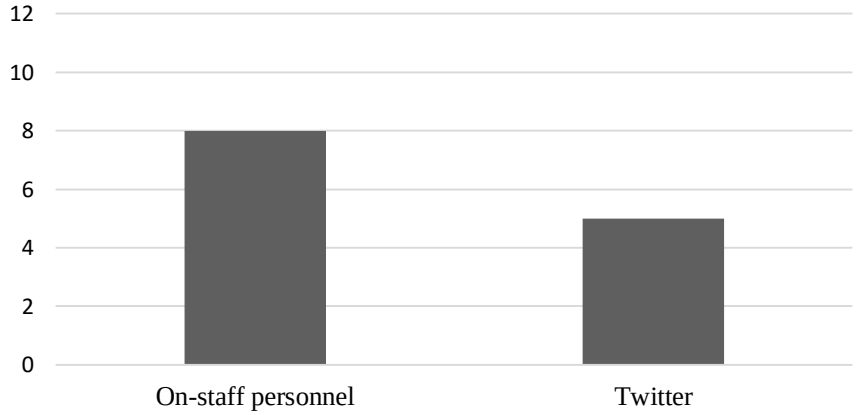
> I think [teachers] are finding that feedback is more instantaneous. They are able to put a comment on and it maybe they're doing it on a Sunday afternoon, and the kid may also happen to be on at the time and sees that comment. There can be a back and forth [between them]. I think that's a huge piece of the Google platform. That collaboration can happen at any time. The kid who might be a little less inclined to ask a question in

> class, because they're unsure of themselves or they just don't want to [talk], they do that on an environment where they are just talking one to one.

The typed feedback was permanent and served as a resource for future assignments and conversations with student. Principals also reported that teachers used the documented feedback to keep families informed on student progress. Although real-time collaborative tools are online resources, principals believed those tools have improved face-to-face feedback, too. Principals reported that teachers provided immediate face-to-face feedback to individual students or collaborative groups based on the real-time data in Google Classroom available on the teacher's computer. The technology allowed teachers to provide "just in time" support. This data indicates that principals were knowledge about the real-time collaboration tools and they perceived many benefits.

Self-motivated to keep technology knowledge current. As shown in figure 3, participants were dependent upon on-staff personnel with greater technological capacity to learn new classroom technology applications. The position held by on-staff personnel with the technical expertise varied district to district and included assistant principals, technology directors, technology integration specialists, instructional coaches, and teachers.

Figure 3. Principals Continual Learning Resources



The principals' motivation for educating themselves was primarily to learn a new classroom-related approach to model to the staff. Principals perceived that modeling helped teachers to see them engaged in the learning process, facing new challenges, and overcoming obstacles as explained by this principal:

> What I hope I'm conveying… to staff [and] what I hope…they're conveying to kids… is [to] take a risk. Take a risk with your learning. Try it. You don't have to go full boat but make a goal for yourself. Hold yourself accountable, and move forward a little bit.

Five principals also used Twitter to stay current on teaching and learning. Participants would locate articles and participate in Twitter chats to learn about current trends. They shared interesting or relative information with parents and/or teachers. Participants also viewed Twitter as a professional learning network where they connected to other educators around the globe and shared ideas. Conversely, two participants stated that Twitter was less valuable to them because it was too time consuming.

Principals were knowledgeable about real-time collaborative tools and how those tools helped students learn. They were self-motivated to stay abreast of ways to integrate technology with students. Their knowledge about these tools helped them model practices teachers can use in the classroom as explained next.

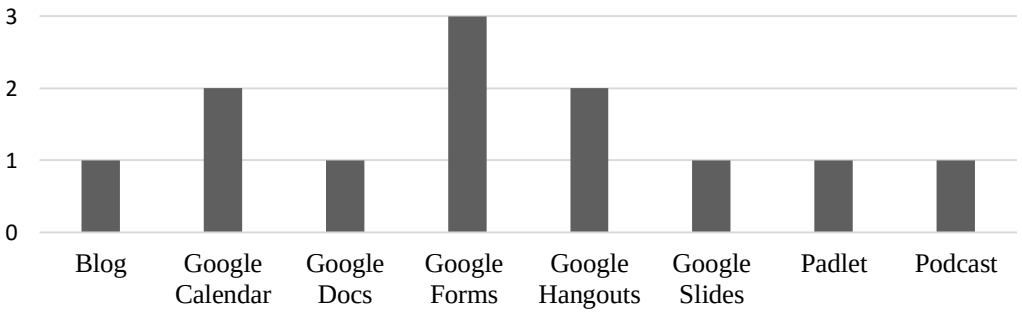
Finding Two: Principals' Knowledge about High-Level Uses Influenced Organizational Actions and Decisions

Data emerged that showed the how the principal's knowledge about high-level uses influenced organizational actions and decisions. Principals modeled continuous learning with technology, planned and promoted technology-related school-wide practices, changed courses to

embed contemporary technology skills, and engaged families and the community to solve technology-related problems.

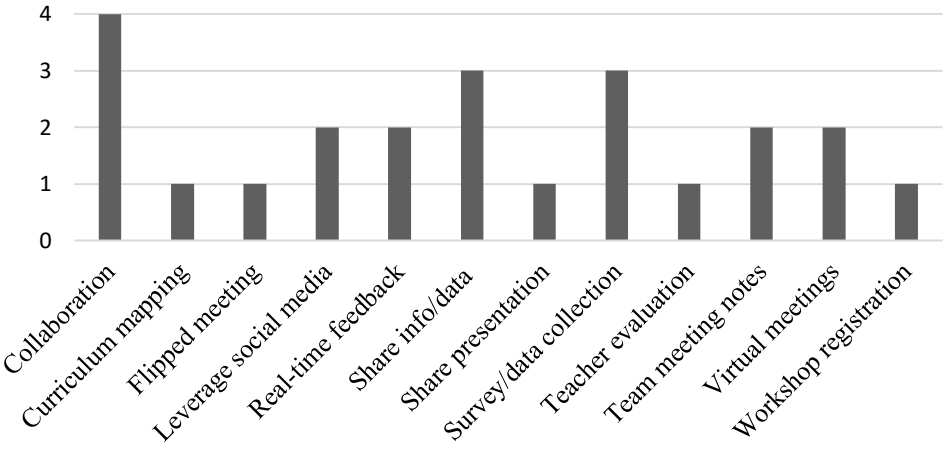
Modeled continuous learning with technology. Principals purposely modeled new approaches to technology integration that aimed to foster continuous learning among the staff. The data shows that a variety of resources were used for modeling as shown in Figure 4 but Google Apps for Education was most common. Principals modeled technology primarily at staff meetings and through administrative communication.

Figure 4. Classroom Tools Used for Modeling



Principals modeled technology to demonstrate ways the teachers could use the resources with students. They purposely embedded technological resources to complete administrative tasks that were applicable to the classroom. Figure 5 displays the various administrative tasks that included the use of real-time collaborative tools. The data shows that principals modeled the uses of technology for a variety of purposes. Examples included ways they obtained and shared information and ways they fostered collaboration and feedback. Here is an example of how one principal modeled feedback within Google Docs, "[Teachers are] expected to take their meeting notes … in Google [Docs]. I started commenting back [on the document]. I would read their notes and …they'd have questions so I'd answer them back."

Figure 5. Purposes of Modeling



Modeling often occurred during staff meetings to expose teachers to new approaches they could use with students. Here is an example of how one principal used current technology during staff meetings:

> I ask for a note taker at every group, they post [comments] onto Padlet or through Google Forms …so at the end of that hour-long meeting I have a pretty decent representation of the conversations. So it's a good way of saying, "Now you can do that in your classroom, too. It's a great way to get a sense of what those conversations were, have the kids record it."

Modeling during a staff meeting helps teachers see principals engaged in the learning process, facing new challenges when using technology, and overcoming obstacles as evidenced in the following excerpt:

> I feel, as the building leader, as the lead learner, you have to practice what you preach and model what you want teachers to do, and show risk-taking and show failure and things. Show you're struggling with it, show your own struggles with tools.

Staff meetings provided the ideal opportunity to model technology. One principal admitted not having enough technology knowledge to model and strove to learn about new applications to stay current and improve leadership skills:

> Quite frankly, modeling…is not a skillset of mine. I believe in it [and] I can speak to it, but I'm not the savviest person. I know how to use all of it in regards to being a leader in it [but] I wouldn't say that's my skillset. So that's why I went to that workshop, I need to continue to attend those.

In general, principals believed modeling was helpful to motivate their staff to try a technology resource or new technology-related approach with students.

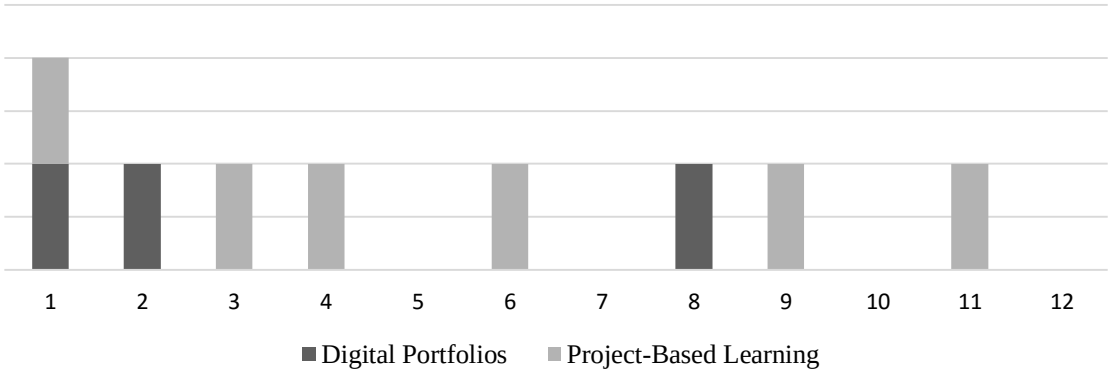
Promoted and planned technology-related school-wide practices. Eleven principals aimed to implement school-wide practices that moved teachers towards student-centered instruction by implementing project-based learning and/or digital portfolios, using technology integration frameworks to contextualize a student-centered vision, and/or including technology-related pedagogical goals on school improvement plans. As shown in Figure 6, eight principals planned to implement digital portfolios and/or project-based learning to foster student-centered instruction sometime in the future. Principals reported that these pedagogical approaches were already happening in small numbers and they planned to increase the number of teachers and students using them. Three principals believed that digital portfolios would help track student growth and that new technology has made that process easier than the prior paper-based portfolio methods. This excerpt describes the ease of digital portfolios with real-time collaborative tools:

> We're also starting to do online portfolios of work. So in eighth grade last year, students had all of their work in a Google folder, a Drive folder, and then they had to reflect on

certain pieces. Then parents came in at night and the children pulled out their iPads, or their laptops, and walk their parents through a portfolio conference.

Six principals stated that project-based learning was happening in some classrooms and they would like to promote more of it in the future. Project-based learning performance assessments may not always include technology-related resources. For instance, the product may be an action that does not require high-levels of technology such as a play or planting a garden. However, the learning process to reach the final product is heavily dependent upon high-level uses of technology as explained by this principal, "There's no way that [teachers are] going to be able to not have the technology just completely integrated into those projects. I can't see a way to separate those anymore." In one school, project-based learning was the focus of the current year's professional development. That same principal reported that project-based learning training helped teachers understand how to release control over the curriculum needed to reach high-levels of technology integration. This information shows a shifting mindset of principals to enhance project-based learning that will influence the pedagogical expectations for teachers under their leadership.

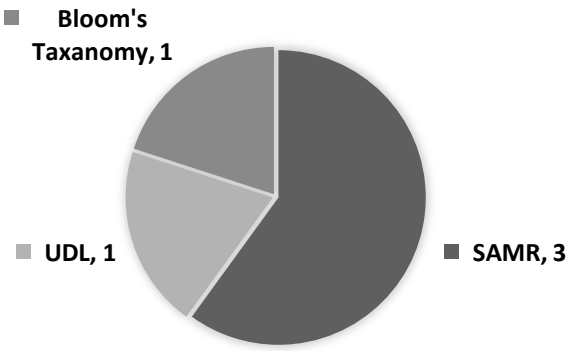
Figure 6. School-Wide Pedagogical Shift by Principal



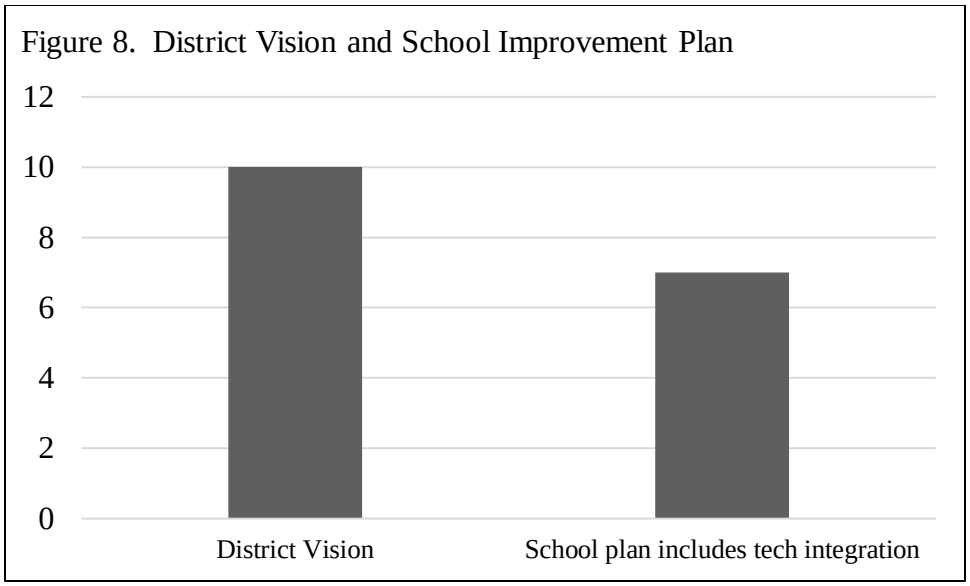
Five principals promoted the use of a technology integration framework to contextualize a student-centered vision (Figure 7). All five principals used these frameworks in conversations with teachers to help communicate what student-centered technology integration looks like. The frameworks aim to help teachers reflect on their own practices and guide them towards improved lesson designs. Three participants with a one-to-one device model used the Substitution, Augmentation, Modification and Redefinition model (SAMR, Puentedura, 2014a, p. 2). The steps of SAMR model advance on a continuum that begins with simplistic technology integration approaches to sophisticated and complex uses of technology. Another participant with a one-to-one device model used a Universal Design for Learning framework that helps teachers think critically about the digital resources used to reach learning objectives for individual students (CAST, 2011). The fifth principal referred to Bloom's Taxonomy to help teachers develop lessons that stimulates higher order thinking skills and creativity (Krathwohl, 2002; Literacy Teaching and Teacher Education, 2015). These frameworks provided principals with a tool to frame discussions with teachers about student-centered uses of technology to ignite critical reflection of pedagogical practices. One principal provided this description:

> We had done the professional development with the SAMR model. It was just a day where we introduced the SAMR model to them. Twenty minutes of just here it is. Then we asked them to come up with a lesson that they've taught and try to move it up the scale and augment it. They did one as a group. Then they would go off for guided practice or independent practice. Then we bring them back. So just kind of back and forth. We're constantly at department meetings and in faculty meetings encouraging people to just try one more.

Figure 7. Five Principals Referred to a Technology Integration Continuum Framework



Principals included technology-related pedagogical goals in the school improvement plan as shown in Figure 9. The vision is foundational to the district's strategic plan, which then serves as a framework for the school improvement plan (Kotter, 1996). Principals generally develop improvement plans in collaboration with other stakeholders such as teachers, parents, community members, and other administrators. As shown in Figure 8, ten participants reported that a district vision was in place; however, three of those principals mentioned a disruption in central office caused the vision to become outdated or not in the forefront of discussions. Among the 12 participants, seven had technology strategic plans in place and/or specific technology goals embedded in the school improvement plan. The two principals without a written district vision were in schools that have experienced significant technological change. These principals eluded that the change occurred with support or guidance of central office. In other words, although written visions were not in place in those buildings, verbal district visions seemed to guide technology decisions.



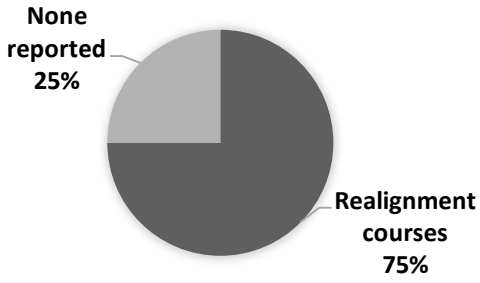
Among the 12 schools, seven principals included specific technology-related goals in the school improvement plan. Technology improvements included:

- increase authentic learning tasks using technology;
- implement digital portfolios;
- increase use of learning management systems;
- increase blended learning opportunities;
- provide self-selected online courses to students;
- improve curriculum alignment using technology resources;
- improve online feedback to students; and/or
- provide technology-related professional development to teachers.

The examples aimed to improve practices that included curriculum alignment, reflective teaching practices, flexible learning environments, and improvement of technology professional development. These technology-related goals were among schools with a long and short history of technology in the building.

Changed courses to embed contemporary technology skills. The data from the interviews document organizational changes that demonstrated the principals' strive towards student-centered instruction. Nine principals found ways to offer new elective courses that provided students with opportunities to develop contemporary technology-related skills as shown in Figure 9. Newer electives include coding, digital literacy, video production, and dynamic media courses. Seven principals discussed changes to engineering courses to implement a Science, Technology, Engineering, and Mathematics (STEM) approach, project-based learning, core content standards, and emerging technology skills. One principal mentioned that a cohort of STEAM electives were developed and aligned to each other. The cohort approach fosters deeper learning since students learn across cohort disciplines rather than the traditional silo approach to elective courses (Dewey, 1938). Six principals mentioned the elimination of the traditional Family Consumer Science course to offer current curricula. These changes in course offerings demonstrate the principals' depth of knowledge to improve curriculum outcomes and technology related-skills of students.

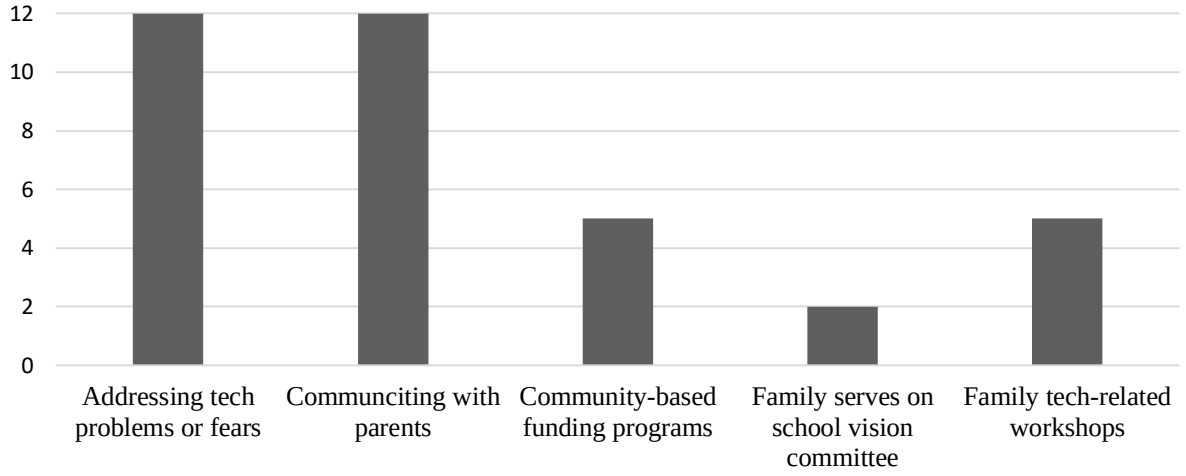
Figure 9. Realignment of Courses



Engaged families and community to solve technology-related problems. As shown in Figure 10, family and community engagement emerged across all contexts in varying ways. In general, principals engaged families and the community to solve technology-related problems. Principals organized various learning opportunities for families to help with specific technology

tools or technology-related concerns such as social media. Community education foundations provided financial resources to improve technology integration. The data revealed that families and community help schools improve student access to digital information and they are stakeholders that need technology support.

Figure 10. Engaging Family and Community



It is evident that keeping families informed and involved in the implementation of technology initiatives is important. All 12 principals discussed the importance of communicating with families to provide technology updates or to listen to parent technology-related concerns. Principals were unanimous in saying that parents want the support of the school to address their technology-related problems or fears. For instance, principals who have one-to-one device programs reported the need to develop alternative protocols for families who do not want the device brought home. Two principals mentioned the inclusion of families in the recent school visioning process. Five principals reported that they provided parents with technology-related workshops covering topics such as social media, software application training, and explanations of the district technology vision and technology-related programs.

Principals also discussed the need for a consistent learning management tool to streamline resources for students and families. All 12 principals said that their district adopted

Google Apps for Education; however, only 10 principals said Google Classroom was the preferred learning management platform. Other platforms used by teachers included Schoology (2016), Moodle (Dougiamas, 2016), and Edmodo (2016). Having teachers use a consistent platform helps students stay organized and keeps all school resources on one website. An interview excerpt helps to understand the problem of using of multiple platforms in a school:

> We found kids and teachers were using a variety of platforms. Then around semester time, we were getting some feedback from kids primarily, and also from parents in PTO and school council type of conversations, where it's like "Wow, you know, my kid's in six to seven different classes and they're using three or four different platforms. Is there any way you guys could come together and have a conversation?"

Mandating the use of one platform was a topic principals seemed to navigate carefully. Two principals stated that the language on the teacher contract keeps principals from mandating use and the teacher contract would need renegotiation to require teachers to use a specific technology. Another principal suggested that teachers already have so many mandates that posing another mandate needs careful consideration. The teacher contract is explained further in Finding Five. Regardless, the principals respected parent concerns about the multi-platforms and they were trying to contend with the challenge.

Five principals mentioned the role of the local education foundation in funding technology-related purchases. These community grants primarily help districts obtain hardware resources. One district receives grant funds annually to pay stipends to teachers who provide technology support and professional development in the school.

The finding family and community engagement suggests that principals are knowledgeable about the various ways parents and the community can support the learning

experience of students. Principals value the needs of families and build capacity of caregivers and school personnel by collaborating on problems that improve technology integration in school and at home.

The findings for this question show that principals' knowledge about student-centered, high-level uses influenced their ability to model classroom applications and address school-wide needs. The next question explains how principals help build the technology capacity of teachers to improve technology integration.

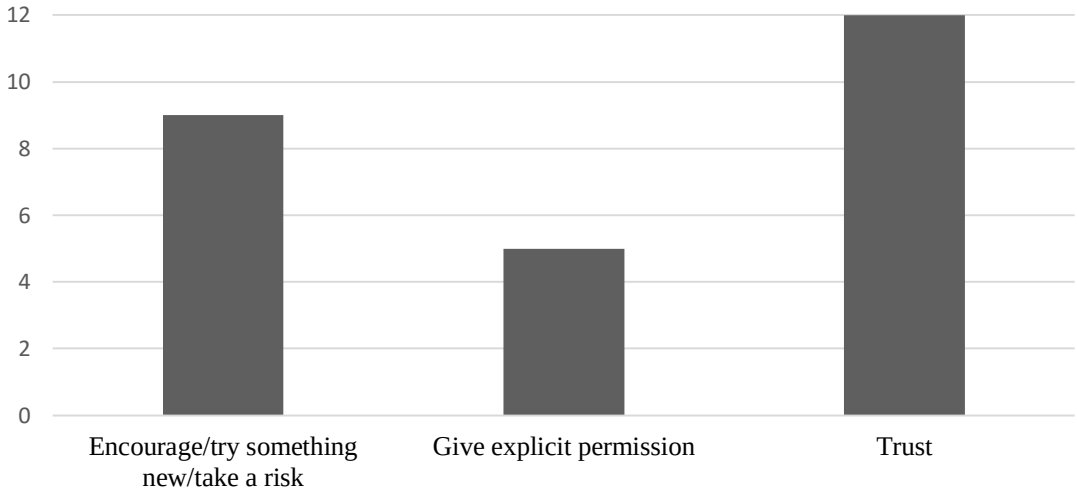
Guiding Question Two: How Do You See Yourself Helping Teachers Integrate Real-Time Collaborative Tools to Meet the CCSS?

This guiding question revealed the theme these technology-oriented principals provided teachers a supportive environment to achieve high-levels of technology integration. The three findings that emerged are principals encouraged experimenting with technology; principals supported flexible uses of technology and teacher autonomy but continuity of resources needed, and principals provided sustained technology-related professional development but comprehensive planning was not common. For the purpose of clarity, a person in a non-administrative role who supports technology integration and curriculum alignment is referred to as an instructional technology coach throughout this section. Principals referred to individuals with varying job titles but had similar responsibilities as learning coaches, digital literacy specialists, and technology integration specialists. Each finding is explained separately.

Finding Three: Principals Encouraged Experimenting with Technology

Principals encouraged experimenting with technology that included three interrelated beliefs as shown in Figure 11: trust needed to exist; teachers needed to be continuously encouraged to try new technology; and some principals believed that it was necessary to give teachers explicit permission to experiment.

Figure 11. Principal Encouraged Experimenting with Technology



Trust needed to exist. The need for trust emerged as an important part of the culture to improve technology integration. All principals believed that they needed trusting relationships to reduce fears and encourage risk-taking. Although some principals explicitly mentioned the impact of trust, others made statements that inferred it as found in this principal's comment: "[Teachers] can do it at their own pace but there's no pressure to [use the new technology]." This statement infers that the principal trusted the teacher's professionalism.

Trust was needed for different purposes to improve technology integration. A trusting relationship helped principals have open and honest dialogues with teachers about classroom observations and uses of technology. Teachers needed the principal's trust to try new technology and adopt technology-related practices at a suitable pace. The trust between them relieved the

teachers' worry if something went wrong during a lesson or if the teacher required a slower technology adoption rate. One participant made the following statement that illustrates the role of trust between a principal and teachers:

> Assure people in person, face-to-face, eye-to-eye, "You're doing the right thing. Thank you for taking a risk. There's not a hidden agenda here. I want you to push your kids to be more creative and critical thinkers."

Trust had to be established first – overtime – before teachers had the courage to try something new.

Teachers needed to be continuously encouraged to try new technology. Nine participants believed it was important to encourage the use of new technology regularly and take risks. Teachers were encouraged to try new technology based on their own comfort level when they were ready. A quote from one principal helps explain the need for encouragement:

> I think there will always be those teachers [who will try new technology] but if the leader can be explicit and encourage it, then you're going to have a greater volume of people who are willing to [take a risk].

Principals created a culture that trying something new with technology was expected and valued by celebrating teachers' progress in a variety of ways. Principals sent Tweets, invited teachers to share experiences at meetings, made positive comments in the educator evaluation, or made comments on a weekly email as ways to show technology uses.

Trust and encouraging experimentation were interdependent. This excerpt highlights the need to develop trust between a teacher and principal to foster experimentation:

> I think it's partly that we've established this climate where it's not a scary thing. We've gotten to point and we've said to teachers "Sometimes it's not going to work. But try it. If it doesn't work, then don't do it again. It's not a big bad thing."

Principals gave teachers explicit permission to experiment. Five participants stated that giving teachers explicit permission to experiment with technology resources was important to change classroom practices. Principals thought it was important to have purposeful discussions with teachers to ensure they knew integrating technology was a trial-and-error process and failure might occur as shown in this excerpt: "Giving them permission to fail in front of you, fail miserably, and feel comfortable with it [is important]. That was huge." Teachers who feared that students might act inappropriate with technology or feared not meeting a lesson objective needed explicit permission by the principal. Teachers needed to know that they would be held harmless if mishaps or unanticipated results occurred.

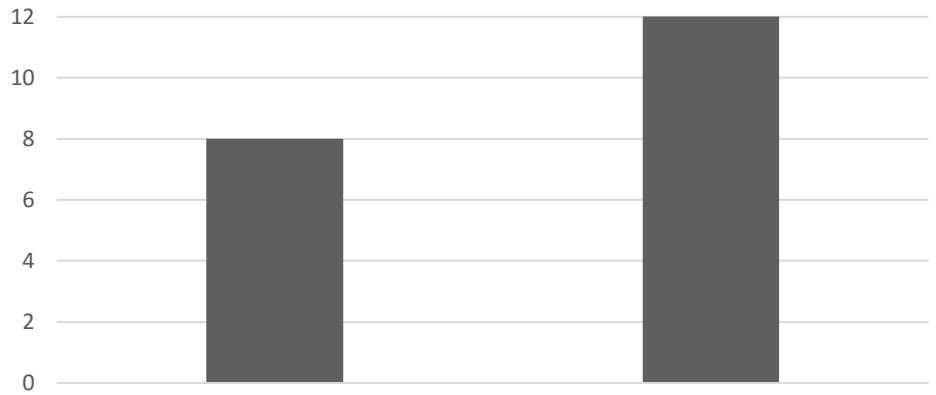
Principals helped teachers integrate technology by establishing a school culture that encouraged experimentation. From statements made by principals, experimentation was valued and failure was expected. As explained next, principals supported flexible uses of technology and autonomy that valued the range of skills and the time it took for teachers to learn.

Finding Four: Principals Supported Flexible Uses of Technology and Teacher Autonomy but Continuity of Resources Needed

Because Massachusetts and Rhode Island adopted the Common Core State Standards, I wondered if expectations around the use of technology existed in schools with high-levels of technology to cover the standards. The findings showed that principals were not prescriptive about technology integration and they leveraged the educator evaluation process to gain technology momentum as shown in Figure 12. Principals recognized that teachers acquired

technology skills at different rates that caused technology integration to look different across classrooms. As a result, principals demonstrated their appreciation for individuality and the teachers' need for autonomy.

Figure 12. Principals Supported Flexible Uses of Technology and Autonomy



Principals were not prescriptive about the use of technology but continuity with some resources needed. Principals were not prescriptive about how and when teachers use technology in content areas. Teachers have autonomy in what tools they choose to integrate and how. Principals did not restrict teachers to specific resources and encouraged teachers to explore resources not yet used by teachers within the school. For example, principals talked about having money available for teachers to pilot new technology. If teachers were willing to try new applications, principals believed that it was their job to support teachers' learning and enthusiasm. District applications such as student information systems and educator evaluation tools are mandated but teachers are free to choose technology tools that work for their content area.

Principals believed top-down mandates interfered with autonomy and a mandate became "another thing" that had to be done. Principals preferred that teachers influence each other with

technology integration in an organic manner, rather than a prescriptive manner as described by this principal, “It's [teachers] having conversations with one another and [it’s] not this top down [thing], [they] have to do it.” In four schools with one-to-one programs, principals stated that they expected teachers to integrate technology regularly but how often and for which purposes are not defined. Overall, principals reported that the non-use of technology was not an issue for them.

Although principals were unanimous about not being prescriptive, three principals mentioned a need for uniformity with key technological resources as mentioned in Finding Three. Given all the educational technology tools available, principals are responding to parent and student concerns regarding the diversity of applications used by teachers. This issue was primarily around learning management systems such as Google Classroom, Edmodo, and Schoology. As one participant stated:

> When we have [a team of] five, the kid has five different teachers and five different ways of getting information. That’s challenging for the kid and what the teacher doesn't realize is they're using it one way. They don't realize the kid has five different ways. So that’s where there needs to be some level of consistency.

The same participant also expressed concern about the diversity in skills among students because previous teachers were either using a wide-range of technology tools, not using some tools, or using tools differently. This excerpt helps explain the need for continuity of tools across classrooms:

> I think what's happening is, two or three teachers are giving some of the sixth graders the tools. So say it's half and half. Then they go seventh grade, and those two groups are together, half of them know it, and half of them don't.

When principals asked why they would not specify the use of specific digital tools, two participants suggested that the language in teacher contracts inhibited the principal from requiring teachers to use specific technology. For example, one principal stated:

> We narrowed it down to the top four [Learning Management System companies] and had those guys come back and present to the faculty. Then faculty made a decision on what they wanted and agreed to that, so that's where we are right now. And some of this is contractual stuff. Where we are right now is, everybody's [verbally] agreed if they are going to use a Learning Management System, that it has to be Schoology, but there's no directive that they have to use it.

Principals leveraged the educator evaluation process. To advance effective technology integration, eight principals leveraged the educator evaluation process. The data suggest that the evaluation process provided a valuable opportunity to celebrate the use of technology and to develop technology integration goals. Principals were careful not to penalize teachers on their evaluation regarding the use of technology during an observed lesson. They preferred to use the process to celebrate teachers' willingness to incorporate effective technology approaches as explained in the following excerpt, "I probably give them a good observation if they're trying it and doing it. As I keep telling them, I don't want to see them as the *Sage on the Stage*." The evaluation process also provided principals the opportunity to have conversations with teachers regarding the development of technology goals as shown in this excerpt:

> It's been individual situation for each of the teachers. Some of it came as a result of summative evaluations. [For instance], "You seem really uncomfortable with how technology lives in your classroom. I'd like you to be more comfortable with it. That would be a great professional practice goal for you."

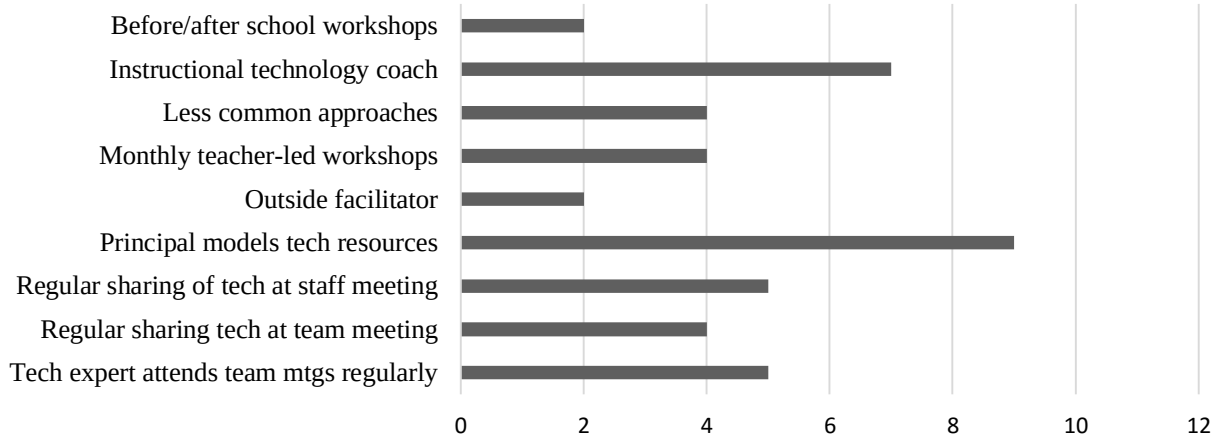
One principal mentioned that the benefit to the new evaluation system was that the process required principals to have conversations about teaching and learning with all staff members, whereas in the past principals might not have been as thorough.

Principals allowed teachers to adopt new technology meaningful to the teacher and to the teacher's content area. The flexibility in approach allowed teachers to adopt tools that they understood how to use and were appropriate for their content area. To help teachers develop their skills, principals provided a variety of learning opportunities, as explained in the next section.

Finding Five: Principals Provided Teachers Sustained Technology-Related Professional Development but Comprehensive Planning Was Not Common

Evidence exists to understand the various ways principals helped teachers integrate real-time collaborative tools to meet the CCSS. Principals in this study leveraged an assortment of professional development opportunities to increase the capacity of teachers. As shown in Figure 13, technology-related professional development models included district professional development days, monthly staff meetings, before/after school workshops, coaching, observing, and outside facilitators. However, comprehensive professional development over a school year was not common and only a few principals reported focused programming.

Figure 13. Technology-Related Professional Development Models



Principals involved in this study largely relied on contractual time throughout the year to provide professional development that targeted the technological capacity of teachers. Principals established a variety of routines to provide consistent support and exposure to new approaches to technology integration. Most principals established at least three models of technology-related professional development supported by on-staff personnel during contractual time.

As explained in the first guiding question, modeling effective approaches to technology integration was important to the role of principal. Principals modeled the use of technology themselves and believed modeling allowed teachers to see the principal learning new technology. Principals used a variety of resources, but they largely used Google Apps for Education products in ways the classroom teacher could use the applications. (Please refer to the earlier section for a complete explanation.)

Seven principals discussed the key role of an instructional technology coach. These individuals were considered peers and do not evaluate teachers on the use of technology. The job responsibilities of an instructional technology coach included helping teachers align curriculum standards to technology applications, co-teaching with teachers, and modeling the use of technology for teachers. Principals believed the individuals in these coaching positions

understood the varying needs of teachers, the curriculum, and educational technology resources. Principals reported that the coaches' personalities and technological skills helped teachers move out of their comfort zone and try something new. Principals managed these individuals by guiding them towards teachers who needed support, assigning them to team meetings to help teachers align curriculum, having them demonstrate the use of technology at meetings, and having them facilitate workshops. Principals also relied on these individuals for their own learning as explained in the first theme. The job responsibilities of these individuals varied from building-to-building to fit the needs of the context and, in some cases, their responsibilities included teaching technology-related elective courses. Two principals stated that the instructional technology coach also offered before or after-school workshops.

Four principals used a teacher-led workshop model for monthly building meetings that regularly included technology topics. Rather than a one-size-fits-all staff meeting, the workshop model allowed teachers to offer workshops that were relevant to teacher needs. Teachers self-selected which workshop to attend based on their own needs.

Five principals reported that someone with technology knowledge attended team meetings regularly to support effective technology integration. The person with the technology knowledge varied and included the assistant principal, learning coach, or technology specialist. Team meetings included Professional Learning Communities, cluster meetings, and grade level meetings. One principal stated that one grade level established its own routine of having the instructional technology coach attend weekly meetings, but that was not something the principal required. This principal believed that the grade level with the consistent technology support demonstrated a higher level of technology integration than the team that did not invite the coach.

Regular opportunities for teachers to share classroom experiences using technology were a common theme. Five principals took approximately 10 minutes for teachers to share classroom experiences during staff meetings. Four principals established sharing norms for Professional Learning Communities, cluster meetings, or grade level meetings. In addition to sharing classroom experiences, two principals required teachers who had attended technology conferences to share take-a-ways at a staff meeting. Teachers shared both positive and negative outcomes with the staff if they attended a conference.

Some principals used less common approaches to professional development that are worth mentioning. One principal discussed a professional development model that allowed attendees to develop their own topic areas spontaneously and workshops were created "on the fly." Another principal allowed teachers to exchange three monthly building meetings to pursue a self-directed Google Educator Certification. This same principal provided targeted professional development during contractual hours for teachers who needed novice-level training. That principal hired substitutes so teachers who needed additional technology support could attend the novice level training. In another district, the principal encouraged teachers to apply for a stipend independent study to develop curriculum units.

Comprehensive professional development over a school year was not common and only a few principals reported focused programming. Two schools used outside facilitators as part of a yearlong implementation program. The principals of these schools said that a group of teachers participated in a structured course with the understanding that they would share their knowledge with staff. The principals created regular routines to facilitate that sharing with colleagues. Another principal reported having a structured professional development involving all teachers

over the course of the year that focused on project-based learning. It is possible that other schools may had planned topics but principals did not share those themes.

Principals developed sustained technology-related professional development using a combination of school resources. The data relating to professional development showed that principals promoted the use of effective technology integration and valued teachers supporting teachers, as expressed by this principal:

> Honestly, I can reflect back to one faculty meeting, which was eight years ago, when I had one of my English teachers show the faculty how she had the kids do a podcast. From there a couple people asked her, "Oh that was pretty cool. How do you do that?" And it just took off from there.

The continuity between technology-related professional opportunities over a school year only emerged in a small number of schools. Although professional development models differed across all buildings, the principals' attention towards regular professional development opportunities was consistent across all contexts.

Principals supported experimentation, flexible approaches when using technology and autonomy, and sustained technology professional development to help teachers. Given that the principals involved with this study were successful in changing classroom practices and had the capability to provide resources, I was curious about the specific barriers they perceived as hindrances to technology integration. Those findings are explained next.

Guiding Question Three: Can You Tell Me about Helping Teachers Overcome Barriers to Technology Integration?

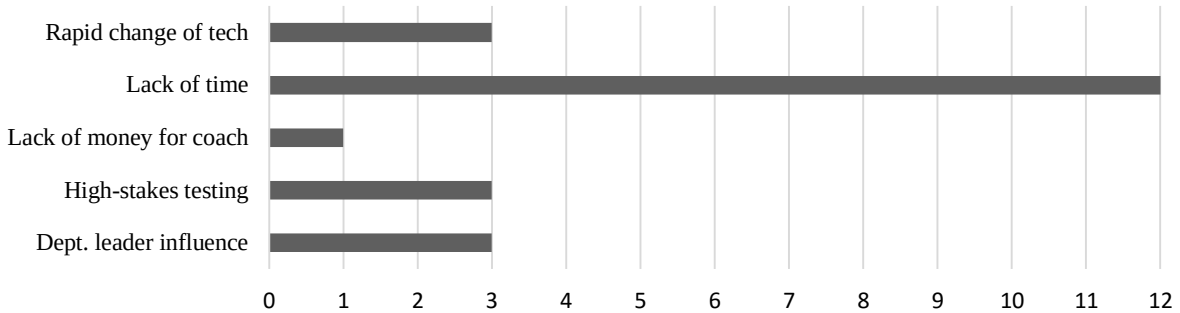
This guiding question revealed these technology-oriented principals with adequate technology resources contended with barriers that interfere with the improvement of technology

integration. The two findings that emerged are first order barriers continued to persist in schools with ample technology resources and slow implementation and colleagues helped slow adopters overcome second-order barriers but peer was coaching needed. Ertmer (1999) categorized barriers to technology integration into two groups – first-order and second-order barriers. The findings for the theme helping teachers overcome barriers to technology integration found that both first-order and second-order barriers persist even though access to technology is not a barrier. These barriers are explained separately.

Finding Six: First-Order Barriers Continued to Persist in Schools with Ample Technology Resources

External barriers are the influences outside of the teachers' control that impede the enhancement of technology integration. Ertmer (1999) describes external barriers as first-order barriers that include training, support, materials, and resources such as hardware and software. Although the principals in this study led in buildings that had many technological resources, external barriers emerged as shown in Figure 14. The principal with a long history of technology integration and a one-to-one program included all five external barriers in statements. The barrier of time was consistent across all contexts. All principals mentioned that changing the practices of teachers was a slow process and took a lot of time; teachers needed time to see their colleagues use a method in practice, to question the observation, and to try new approaches. A few principals mentioned that competing demands interfered with the time needed to improve technology integration.

Figure 14. Principal Perceptions of Teachers' Second-Order Barriers



These external barriers demonstrated a complex set of influences outside of the classroom and include:

- lack of time for peer observations;
- lack of money to have on-site technology instructional coaches;
- annual state assessments for teachers directly responsible for a tested content area;
- staying current on new technologies that rapidly changes was challenging for teachers and curriculum leaders;
- a high level of conformity required by some department leaders reduced teacher autonomy and experimentation and negatively influenced technology integration; and/or
- some department leaders did not model or incorporate technology integration because their beliefs and/or skills were not aligned with the vision.

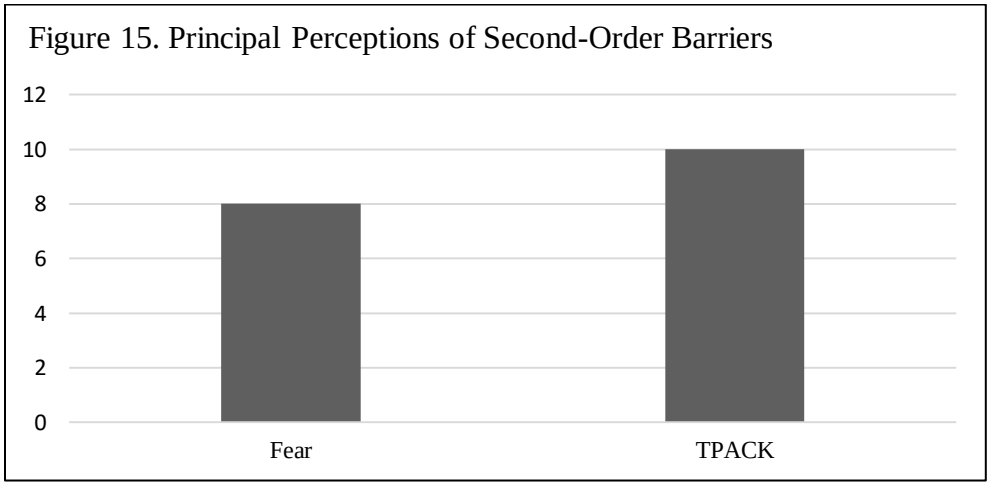
The schools involved in this study had adequate access to technological resources but other first-order barriers persist that inhibit technology integration. The list of first-order barriers could be a result of insufficient financial resources or other factors. As one principal stated, "The departments that don't have the high stakes hanging over them really, again, were trailblazers and still are in a lot of ways. They push the envelope. They have some freedom in

there that they're not so worried." Data also exist to understand second-order barriers of slow adopters as explained next. As described previously, department leaders can help or hinder the advancement of technology use.

Finding Seven: Slow Implementation and Colleagues Help Slow Adopters Overcome Second-Order Barriers but Additional Peer Coaching Was Needed

Internal barriers are beliefs or feelings that keep a teacher from implementing effective technology integration. Ertmer (1999) categorizes these barriers as second-order barriers that include beliefs about how students learn their confidence and self-efficacy to use new technology approaches, and their perceived value of technology in classrooms. In this study, principals perceived that the barriers of fear and technology-pedagogical-content knowledge impede technology integration for teachers who are hesitant to try new technology (see Figure 15).

Figure 15. Principal Perceptions of Second-Order Barriers



Barrier of fear. Eight principals believed that fear was a barrier to effective technology integration that included a range of vulnerabilities. Principals stated the following teacher fears:

- fear of changing held pedagogical practices;
- fear parents will have too much information;
- fear of technology problems arising;

- fear of negative comments appearing on educator evaluations;
- fear of not covering the content or not preparing students for the next grade;
- fear of making mistakes in front of students;
- fear of making mistakes in front of teachers;
- fear of losing information; and
- fear of doing something new and harming students.

This evidence indicates that teacher emotions influence slow adopters for a variety of reasons.

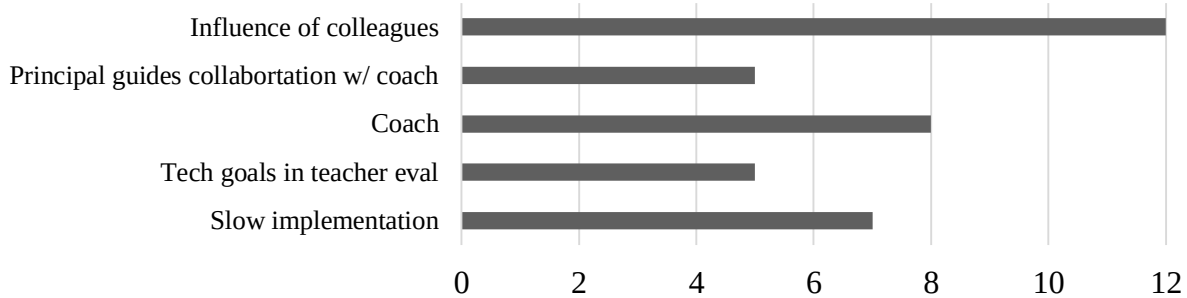
Barrier of TPACK. Ten principals believed that technological-pedagogical-content knowledge was a barrier to student-centered technology integration. Koehler et al. (2013) developed the Technological Pedagogical Content Knowledge (TPACK) framework to help educators better understand the essential variables to achieve successful technology integration. According to the Koehler et al., teachers need to combine technological knowledge, pedagogical knowledge, and content knowledge to implement effective approaches to technology integration. A weakness in any one area would have a negative effect on technology integration. In this study, the data did not reveal principal concerns over teachers' levels of content knowledge per se but rather the teachers' abilities to understand how to create student-centered approaches with available technological resources in a given content area. As an example of technology, pedagogy, and content knowledge barrier, one principal stated, "It wasn't really resistance as much as much as unsure about it. That they just didn't know that they could do it and they just didn't feel comfortable around it." From the principals' perspectives, the following barriers relating to teachers' technological-pedagogical-content knowledge emerged:

- the tradition of teaching is what teachers knew and understood;
- teachers did not have a student-centered pedagogical mindset;

- teachers felt uncomfortable or unsure about student-centered approaches with technology;
- teachers believed they need to control content;
- teachers believed teacher-centered instruction is easier to manage logistically; or
- teachers believed teacher-centered instruction helped control students' behaviors.

Helping slow adopters. Principal responses to the question, "Can you tell me about helping teachers overcome barriers to technology integration?" revealed that principals used a variety of approaches to contend with second-order barriers as shown in Figure 16. Principals were unanimous regarding the influence of colleagues. Two principals suggested that a healthy "peer pressure" motivated slow adopters to try new technology. When everyone else is using a new tool, an obligation to learn among slow adopters arose.

Figure 16. Principal Methods to Overcome Second-Order Barriers



All principals perceived that colleagues had the greatest influence helping teachers overcome barriers to technology integration. Principals established regular opportunities for sharing as explained in the second theme. This approach allowed learning to be self-guided, but principals ensured that regular opportunities existed. (Please refer to the second theme Helping Teachers Integrate Real-Time Collaborative Tools to meet the CCSS for a detailed explanation of the regular routines established by principals).

Eight participants had an instructional technology coach on staff and believed those roles were integral to improving technology integration and overcoming barriers for teachers. Principals praised individuals within these positions because of their approachability, enthusiasm, technology knowledge, and abilities to adjust their practice to meet teacher needs. Two principals also mentioned that the non-evaluative aspect of instructional technology coaches removed the barrier of evaluator that made them less threatening.

Across all contexts, principals believed that seeing effective technology strategies in use by colleagues had the greatest impact on adoption. Four principals believed a structured peer-observation program would also help teachers improve their technology practice, and three of those principals had an instructional technology coach on staff. None of the schools involved in this study had a peer observation program in place other than one principal who used peer observations for teachers on an educator improvement plan.

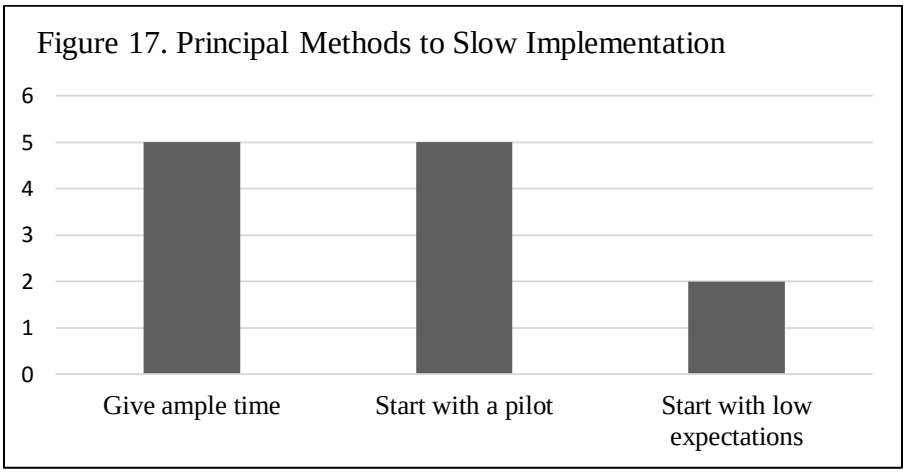
Principals purposely established a slow implementation process to allow teachers to self-regulate the adoption of new technological-pedagogical approaches. Principals acknowledged that the technology adoption rate differed for teachers, as evidenced in the excerpt:

> I think allowing them to go at their own pace…for the first year that we were bringing all this in. [We were] just showing them, letting them hear from other people, how they're doing it, and then [they] just gradually brought it in.

According to these principals, slow implementation included the following:

- gave ample time for teachers to learn and adopt skills;
- established low expectations for technology integration because setting high expectations created barriers for teachers; and
- used pilot programs to initiate interest and develop understanding.

As shown in Figure 17, principals believed that slow implementation was important and it did not prohibit early adopters from implementing at a faster pace. Principals planned for a slow adoption rate to reduce barriers for those who needed more time.



This theme shows that first-order and second-order barriers persisted in schools with ample technology resources. Principals perceived that colleagues and slow implementation were the most effective strategies that helped slow-adopters overcome second-order barriers. According to principals, teachers' positive technology experiences provided the motivation to try the technology again.

Chapter Summary

This chapter presented data to answer the research question, "What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" The findings show that principals were highly involved with the implementation of technology. Principals were knowledgeable about real-time collaborative tools that supported student-centered learning, they engaged in continuous learning, they modeled current technology resources to help improve technology integration, they planned and promoted school-wide pedagogical approaches to improve student-centered instruction with technology, changed courses to embed contemporary technology skills,

and engaged families and the community to solve technology problems. Principals provided a supportive environment to help teachers achieve high-levels of technology integration. They supported flexible uses of technology and teacher autonomy but principals believed continuity with some technology resources is needed. Principals provided sustained technology-related professional development but comprehensive planning was not common. Findings showed that first-order barriers continued to persist in schools with ample technology resources. Principals believed that colleagues and slow implementation helped slow adopters overcome second-order barriers to technology integration through a variety of approaches, but peer coaching was needed. These findings show that these technology-oriented principals were actively involved in the improvement of technology integration to help all teachers implement high-level uses of technology.

These findings also show that the improvement of technology integration was an ongoing effort. Principals in this study included pedagogical improvements in the building improvement plan, they helped teachers who needed additional technology support, and they envisioned new school-wide student-centered technology practices. Additionally, principals provided consistent resources to support teaching and learning with technology on a regular basis. The findings show that a continuity of some technology resources was needed across classrooms to streamline resources and standardize some technology skills. Although technology-related professional development was provided regularly, comprehensive programming that provided focused learning over a school year was not common.

CHAPTER FIVE: STUDY SUMMARY, DISCUSSION, FUTURE RESEARCH, AND FINAL REFLECTION

This chapter concludes this study and includes four sections. The first section is the study summary that provides an overview of the study and the findings. This section includes practical implications for stakeholders interested in improving technology integration in schools. The next section is the discussion that summarizes and interprets the findings with supporting literature. Explanations include how findings reaffirm literature or provide new insights. The summary section also revisits the assumptions, delimitations, and limitations surrounding this study. The third section offers future research recommendations to advance understandings relative to high-levels of technology integration. The chapter concludes with a researcher reflection expressing personal thoughts about the outcomes of this dissertation.

Study Summary

This section summarizes the study. The statement of the problem, purpose of the study, review of the literature, design of the study, and findings are reviewed. The significance of the findings and practical implications to stakeholders are explained.

Statement of the Problem

Technology integration includes both teacher-directed approaches and student-driven approaches (Hennessy, Ruthven, & Brindley, 2005); however, teachers are primarily using teacher-directed approaches that foster low-level thinking. Low-level thinking tasks such as "skill and drill" simply will not prepare students for their future nor meet the demands of the Common Core State Standards (CCSS, Ertmer & Ottenbreit-Leftwich, 2010; Levin et al., 2012; McLeod & Richardson, 2013). Teachers need knowledge and skills to integrate high-level, student-centered technology approaches. This level of technology integration is designed to be

open-ended and requires students to use creative, analytic, and investigative skills (Ertmer & Ottenbreit-Leftwich, 2010; Kim et al., 2013; Koehler et al., 2013). The literature did not yet explain the ways principals create a culture of high-levels uses of technology in classrooms.

Purpose of the Study

The purpose of this study was to discover the experiences of principals who have been successful in creating a culture of high-levels of technology integration to have a better understanding of how they influenced the pedagogical practices in classrooms. The following research question aimed to understand how principals created a culture of high-levels of technology integration to meet the expectations of the CCSS, "What actions, decisions, and relationships do principals perceive contribute to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" The three guiding questions that focused my research were:

1. Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?
2. How do you help teachers integrate real-time collaborative tools to meet the CCSS?
3. How do you help teachers overcome barriers to technology integration?

Given that various types of technology tools exist, I chose to focus on real-time collaborative tools. Real-time collaborative tools allow students to collaborate with peers and teachers online and instantaneously while at school or from home. This category of technology has the capability to foster collaboration, communication, and student-driven learning as outlined in the CCSS. My assumption is that defining student-centered tools helps to define the level of technology integration aimed in this study. Technology integration has different meanings (An

& Reigeluth, 2012; Earle, 2002; Groff & Mouza, 2008); as a researcher, I wanted to remove the ambiguity for participants, readers, and this study by providing a framework.

Review of the Literature

The literature review included three topic areas to explain influences on technology integration. One topic area explained the state and federal policies NCLB, CCSS, and Race to the Top (RTTT) that influence teaching and learning with technology (Common Core State Standard Initiative, 2015; Jerald et al., 2008; U.S. Department of Education, 2001). Research that investigated how NCLB positively and negatively influenced teaching practices was explained (Byrd-Blake et al., 2010; Valli & Buese, 2007). The second area explored literature regarding principals' role in schools. Professional Standards for Educational Leaders (PSEL) and International Society for Technology in Education for Administrators are two frameworks used by educational leaders that specify job responsibilities of today (International Society for Technology in Education, 2009; National Policy Board for Educational Administration, 2015). The second area examined barriers to technology integration and the influence of principals' knowledge and skills on those barriers (Bobbera, 2013; Draper, 2013; Fisher, 2013; Foiles Kiel, 2014; O'Dwyer, 2005; Stegman, 2014; Wisniewski, 2010). The final topic area examined the literature to understand transformational learning and the essential conditions that foster transformational learning. The tenets of transformational learning are explained in this section (Illeris, 2002, 2013; Kegan, 1994; Merriam & Caffarella, 2007; Mezirow, 1991; 1997). The essential conditions that foster transformational learning for adults asserted by Lamm (2003) and Mezirow (1991) are outlined.

A review of the literature showed gaps in qualitative research that provided specific ways principals helped teachers move from teacher-centered technology integration to high-level,

student-centered as outlined by the CCSS. Studies that aimed to understand a principal's role to improve technology integration did not include high-level technology integration with defined technological resources and the Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991). The goal of this dissertation was to make contributions that addressed those gaps.

Design of the Study

Phenomenological qualitative research was employed in this study to give principals the opportunity to explain their role and the cultural conditions that improved teaching and learning with technology. A plethora of research exists to support the assertion that school culture influenced learning among teachers (Ertmer et al., 2002; Fullan, 2014; Mezirow, 1991; Somekh, 2008). This study aimed to learn about the cultural "norms, rules, institutions, values, and interpretations" (Mezirow, 1991, p. 57) embedded into how people work and interact (Kotter, 2012). Analyzing the similarities across contexts helped define the phenomenon of high-level technology integration that occurred in some schools.

Thirteen principals from Massachusetts and Rhode Island public middle schools participated. The middle school level was chosen because of the NCLB mandate that all students should be technologically literate by the end of eighth grade (U.S. Department of Education, 2001). Principals were invited to participate through snowball sampling (Polkinghorne, 2005). Principals self-reported that they met three criteria: high-levels of technology integration existed in their school, the principal had been successful in implementing high levels of technology integration and influenced pedagogical practices to meet the CCSS; and at least one real-time collaborative tool was available and utilized. One principal was considered an outlier because

the criteria were not met. Interviews were conducted using a semi-structured interview protocol. All interviews were conducted face-to-face, audio recorded and transcribed verbatim.

The analysis and synthesis of the data was not a linear process in qualitative research and included repeated readings and reanalysis of documents (Creswell, 2012). Qualitative research software was utilized to code transcriptions. Field notes and memos stored my questions, salient points, and ideas. Matrices were utilized to bind the data and cross-reference participant responses relative to codes. As a result, the data on the matrices led to the findings.

Findings

The analysis process that included the use of coding, matrices, and memoing as described in Chapter Three revealed findings for the guiding questions.

Guiding question one: Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?

This guiding question revealed the theme that these technology-oriented principals were knowledgeable about real-time collaborative tools and uses that influenced actions and decisions. Two findings emerged that described the principals' understanding of real-time collaborative tools and classroom application of those tools. The findings show that these principals were knowledgeable about the ways real-time collaborative tools support student learning that influenced planning, promotion, course changes, and the ways families and the community were engaged.

Finding one: Principals were knowledgeable about the ways real-time collaborative tools supported student learning. The data showed that principals had a positive perception about real-time collaborative tools and they were self-motivated to keep their technology knowledge current. Principals shared examples of classroom observations that reflected high-

level uses of technology. These examples showed that principals were knowledgeable about curriculum alignment using real-time collaborative tools and the perceived benefits to using real-time collaborative tools for learning. Findings also showed that principals were self-motivated to keep their knowledge about classroom approaches to technology integration current. Principals leveraged Twitter and on-staff personnel to stay abreast of emerging technologies.

Finding two: Principals' knowledge about high-level uses influenced organizational actions and decisions. Data emerged that showed the how the principal's knowledge about high-level uses influenced organizational actions and decisions. Principals modeled technology use to promote continuous learning among staff. They planned and promoted technology-related school-wide practices that included the adoption student-centered technology practices, utilization of technology integration frameworks to guide teaching practices, and technology-related goals on the school improvement plans. Principals also changed courses to embed contemporary technology skills and engaged families and the community to solve technology-related problems. This finding shows that these principals were "future-oriented" and the improvement of technology integration was ongoing.

Guiding question two: How do you see yourself helping teachers integrate real-time collaborative tools to meet the CCSS? The findings show that these technology-oriented principals provided a supportive environment to achieve high-levels of technology integration. Their actions, decisions, and relationships align with Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991). The three findings that emerged are principals encouraged experimenting with technology, principals supported flexible uses of technology and teacher autonomy but continuity of resources was needed, and principals provided sustained technology-related professional development but comprehensive planning was not common.

Comprehensive professional development over a school year was not common and only a few principals reported focused programming. The principal provides a system of conditions to help teachers achieve high-levels of technology integration. The transformational learning conditions outlined by Mezirow (1991) and Lamm (2003) found in this study are:

- trust;
- exploration;
- critical reflection;
- feedback;
- diversity;
- comprehensive programming;
- personal goals; and
- repeated team collaboration.

The essential condition of comprehensive programming was inconsistent and the essential condition of acceptance of collective consensus was not captured.

Finding three: Principals encouraged experimenting with technology. Principals encouraged experimenting with technology that includes three interrelated beliefs: trust needed to exist; teachers needed to be continuously encouraged to try new technology; and some principals believed that it was necessary to give teachers explicit permission to experiment. Principals created a culture that trying something new with technology was expected and valued by celebrating teachers' progress in a variety of ways. Teachers were encouraged to try new technology based on their own comfort level when they were ready. This finding shows that principals believed that technology use begins with them. If principals do not promote and

encourage new technology approaches, teacher practices will not evolve. This finding supports the Essential Conditions of Transformational Learning: trust and exploration.

Finding four: Principals supported flexible uses of technology and teacher autonomy but continuity of resources was needed. The findings showed that principals were not prescriptive about technology integration and they leveraged the educator evaluation process to gain technology momentum. Principals recognized that teachers acquired technology skills at different rates that caused technology integration to look different across classrooms. As a result, principals demonstrated their trust in teachers and appreciation for individuality and need for autonomy. Principals used the educator evaluation process to have conversations with teachers regarding the development of technology goals and celebrate technology use. A few principals mentioned a need for uniformity with key technological resources to standardize technology skills and streamline access of information for students.

The need for teacher autonomy was important, but inconsistencies exist in the data. Four principals, with one-to-one device programs, stated that teachers were expected to integrate technology. One-to-one programs were funded by the school system or the community so a level of expectation may have been placed on the principal to ensure the technology is used. The other reason may have been to establish a culture that embraces technology given the current standards. Two principals suggested that the teacher contract prevented them from mandating the use of required technology tools. I did not probe those principals further to clarify meaning but it is possible that the district would need to provide professional development on mandated resources. The time and money needed for training may have influenced principals' decisions to mandate specific technology. Those reasons are my personal assumptions and further investigation would help to understand those discrepancies.

This finding shows conflicting needs. On one hand, principals believed teachers need autonomy to experiment but on the other hand, teachers need to adopt uniformed practices to streamline resources and standardize technology skills for students. This finding supports the Essential Conditions of Transformational Learning: trust, critical reflection, exploration, feedback, and personal goals. This finding also shows the essential condition of comprehensive programming with technology resources occurred in some schools.

Student data privacy is also an emerging concern in the field of education (Privacy Technical Assistance Center, 2015). The use of applications not under contract with districts potentially endangers student data. How principals protect student data privacy and foster teacher autonomy was not captured in this study.

Finding five: Principals provided teachers sustained technology-related professional development but comprehensive planning was not common. Principals in this study leveraged an assortment of professional development opportunities to increase the capacity of teachers. Technology-related professional development models included district professional development days, monthly staff meetings, before/after school workshops, coaching, observing, and outside facilitators. Principals involved in this study largely relied on contractual time throughout the year to provide time targeting the technological capacity of teachers. Principals established a variety of routines to provide consistent support and exposure to new approaches to technology integration. Most principals established at least three models of technology-related professional development supported by on-staff personnel during contractual time. The comprehensive technology-related professional opportunities with focused topics over a school year only emerged in a small number of schools. This finding supports the following Essential Conditions

of Transformational Learning: diversity and repeated team collaboration. The essential condition of comprehensive programming was inconsistent.

Guiding question three: Can you tell me about helping teachers overcome barriers to technology integration? This guiding question revealed these technology-oriented principals with adequate technology resources contended with barriers that interfere with the improvement of technology integration. First-order barriers relative to time, money, and additional professional development continued to persists in schools that had ample technology. Principals believed that slow implementation and colleagues helped slow adopters overcome second-order barriers but peer coaching was needed.

Finding six: First-order barriers continued to persist in schools with ample technology resources. External barriers are the influences outside of the teachers' control that impede the enhancement of technology integration. Ertmer (1999) describes external barriers as first-order barriers that include training, support, materials, and resources such as hardware and software. Although the principals in this study led in buildings with ample technological resources, external barriers emerged. The barrier of time was consistent across all contexts. All principals mentioned that changing the practices of teachers was a slow process and took a lot of time; teachers needed time to see their colleagues use a method in practice, to question the observation, and to try new approaches.

First-order barriers also included organizational influences such as a structure for peer observations, department leaders' limited technology skills absence of technology-related goals, and limited financial resources to hire adequate technology support. The pressure of high-stakes testing also emerged as a barrier. A few principals mentioned that competing demands interfered with the time needed to improve technology integration.

This finding shows that schools with ample technology resources, including a technology-oriented principal, still contend with first-order barriers that impede technology integration. These barriers need the attention of district leaders and policy makers to improve practices with technology.

Finding seven: Slow implementation and colleagues helped slow adopters overcome second-order barriers but peer coaching was needed. Internal barriers are beliefs or feelings that keep teachers from implementing strategies using technology. Ertmer (1999) categorizes these barriers as second-order barriers that include beliefs about how students learn, their confidence and self-efficacy to use new technology approaches, and their perceived value of technology in classrooms. In this study, principals perceived that the barriers of fear and technology-pedagogical-content knowledge impeded technology integration for slow adopters. Principals purposely established a slow implementation process to allow teachers to self-regulate the adoption of new technological-pedagogical approaches. They perceived colleagues as the greatest influence helping teachers overcome barriers to technology integration. Some principals believed structured peer-observation programs would also help improve technology integration practices, and three of those principals had an instructional technology coach on staff. This finding shows that these principals were dependent on the internal expertise of staff to build the capacity of staff members. This finding also shows that principals believed that peer observation programs could help improve practices in ways that instructional technology coaches cannot.

The findings in this study answer the research question, "What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" The outcomes of these findings show that these technology-oriented principals were very attentive to the evolution of technology in their

schools. They were knowledgeable about the high-level tools and uses, and they were self-motivated learners to keep their knowledge current. The principals' actions, decisions, and relationships to support teachers align with Essential Conditions for Transformational Learning (Lamm, 2003; Mezirow, 1991). The findings also showed that principals with ample technology resources contended with first-order barriers. Principals believed colleagues and a slow technology adoption rate helped slow adopters overcome second-order barriers.

Principals in this study were "future-oriented" (National Policy Board for Educational Administration, 2015, p. 3). They included pedagogical improvements in the building improvement plan, helped teachers who needed additional technology support, and envisioned new school-wide student-centered technology practices. Some principals used a technology integration framework to guide the improvement of technology integration.

These principals provided a supportive environment with action, decisions, and relationships that align with most Essential Conditions for Transformational Learning (Lamm, 2003; Mezirow, 1991). Principals promoted the exploration of resources, encouraged experimenting with technology, and teacher autonomy. They provided sustained technology-related professional development mostly relying on the expertise of the diverse on-staff personnel. These opportunities occurred during regular meeting times. Principals recognized that teachers acquired technology skills at different rates that caused technology integration to look different across classrooms. As a result, principals demonstrated their trust in teachers and appreciation for diversity and autonomy. Principals used the educator evaluation process to have conversations with teachers regarding the development of technology goals and celebrate technology use. These opportunities supported feedback and critical reflection.

The findings also showed the challenges in providing all Essential Conditions for Transformational Learning. Technology-related professional development was provided regularly but comprehensive programming that provided focused learning over a school year was not common. Principals suggested that competing demands inhibited the amount of time they dedicated to technology-related professional development; principals allocated time for other initiatives or programs. The barrier of time was consistent across all contexts but other barriers included organizational influences, such as a lack of peer observations and department leaders without technology-related goals. These types of barriers influenced repeated team collaboration and the ability to address the diversity of needs among the staff. The pressure of high-stakes testing also emerged as a first-order barrier for tested content-area teachers. The worry about achievement outcomes influenced teachers' ability to explore new teaching approaches. The condition of acceptance of collective consensus did not emerge in the data. These challenges illuminate barriers for principals, teachers, and ultimately students. Stakeholders need to collaborate on these issues to improve teaching and learning with technology for all students.

Findings for the research question, "What actions, decisions, and relationships do principals perceive contribute to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" show that principals use a systematic approach to achieve high-levels of technology integration. As shown in Figure 18, the findings suggest that principals apply all Professional Standards for Educational Leaders (PSEL) to improve technology integration to meet the demands of the CCSS. The standards are as follows:

Standard 1: Mission, Vision, and Core Values;

Standard 2: Ethics and Professional Norms;

Standard 3: Equity and Cultural Responsiveness;

Standard 4: Curriculum, Instruction, and Assessment;

Standard 5: Community of Care and Support for Students;

Standard 6: Professional Capacity of School Personnel;

Standard 7: Professional Community for Teachers and Staff;

Standard 8: Meaningful Engagement of Families and Community;

Standard 9: Operations and Management; and

Standard 10: School Improvement (National Policy Board for Educational Administration, 2015).

Figure 18. Principal Reported Activities that Support PSEL	**PSEL**									
	1	2	3	4	5	6	7	8	9	10
Principals were knowledgeable about the ways real-time collaborative tools supported student learning				•						
Principals' knowledge about high-level uses influenced organizational actions and decisions	•		•	•		•	•	•	•	•
Principals encouraged experimenting with technology		•								
Principals supported flexible uses of technology and teacher autonomy						•				•
Principals provided teachers sustained technology-related professional development but comprehensive planning was not common		•	•		•	•	•		•	
First-order barriers continued to persist in schools with ample technology resources					•				•	
Slow implementation and colleagues helped slow-adopters overcome second-order barriers but peer coaching was needed.			•		•				•	

Leithwood, Harris, and Hopkins (2008) suggest that all successful school leaders use the same four leadership qualities and practices across contexts regardless of the initiative or mandate. Successful school leaders: (1) build vision and establish direction; (2) understand people and build capacity; (3) change organization resources and structures; and (4) promote learning, commitment, and favorable working conditions. As explained below, these qualities have been emulated by the technology-oriented principals in this study.

Like successful school leaders, the technology-oriented principals in this study built a student-centered technology integration vision that is acted upon and verbalized. They used a vision to build support for a changing school culture among the entire school community (Bryk & Schneider, 2003; Fisher, 2013; Foiles Kiel, 2014; Marzano et al., 2005; National Policy Board for Educational Administration, 2015). Principals showed the value of high-level uses of technology by modeling current classroom approaches, sharing school-based success stories, and creating organizational structures that support sustained learning opportunities among teachers. They had a future-oriented perspective that aimed to improve teaching and learning with technology.

These technology-oriented principals are successful school leaders because they understood people and built their capacity. These principals provided teacher autonomy to allow teachers to choose technology resources and strategies that are relevant to teachers professionally. They provided ongoing professional development from different sources to help address the variety of learning needs among teachers. They allowed teachers to develop their own technology-related goals to improve instruction. Principals planned for a slow adoption to allow an appropriate amount of time for fast adopters and slow adopters to build confidence and capacity with new uses of technology.

The principals in this study experienced success because they changed organization resources and structures as needed. These technology-oriented principals improved technology integration by making school-wide changes. They realigned courses, used technology integration frameworks to stimulate pedagogical reflection, and created school-wide technology-related goals. They built partnerships with instructional technology coaches, teachers, administrators, families, and the community to improve teaching and learning with technology.

Like successful school leaders, these technology-oriented principals promoted learning, commitment, and favorable working conditions with norms and rules surrounding the use of technology. Principals in this study were knowledgeable about high-levels of technology, which helped them make decisions with teachers' needs and fears in mind. Principals provided regular professional development and discussions about ways to align technology and curriculum week-to-week and month-to-month with diverse on-staff personnel. They shared the responsibility of improving teaching and learning with the staff to foster change in an organic, meaningful manner opposed to top-down (Fullan, 2014). Principals supported flexible uses of technology and autonomy that allowed teachers to adopt practices that are meaningful to their content area. They also established a variety of norms to reward teachers' for the using technology. These celebratory norms help build trust and confidence that support risk-taking.

Although the findings showed some potential barriers, these principals provided a supportive culture to transform practices. These principals were engaged in the promotion and planning of high-levels of technology. They built mutual respect and trust to create healthy school cultures that could adapt to change – technology-related or other (Bryk & Schneider, 2003).

Practical Implications to Stakeholders

Different audiences in the field of education may be interested in the outcomes of this study.

District Administration. Given the technological demand of the CCSS, school district leadership teams can use this study to identify strengths and weaknesses in district practices to improve technology integration. This study identified the barriers principals face regardless of access to technology that may help readers identify unknown barriers in their context. The findings in this study included ways to build a culture that values high-levels of technology integration that can be utilized at the district level. This dissertation also provides information about the knowledge needed by new and existing administrators to improve technology integration for all students.

Principals. Principals can use this dissertation to learn about successful strategies to build a culture of high-levels uses of technology. Strategies included ways principals promoted, encouraged, and supported experimenting with technology in classrooms. Principals can also use this study to learn about potential barriers that exist in a context with or without ample technology resources. This study provides theoretical explanations to technology that can be used to understand differences between sources and purposes.

Teachers. Teachers may find this dissertation helpful to understand their own experiences with technology and to understand the hidden barriers to technology integration. This dissertation can also provide teachers with an understanding of the technology knowledge needed by new and existing administrators to help teachers contend with changing expectations.

Families and Community. Families and community members can use this dissertation to understand the challenges principals have when implementing technology. This study shows

that schools with ample technological resources still contend with barriers that make effective technology integration difficult to achieve. Schools need the help from families and the community to resolve those persistent barriers to advance technology integration.

Educational Policy Makers. This dissertation should call attention to the challenges schools face when attempting to change teaching practices with technology. Barriers emerged that show the influence of NCLB and RTTT on instructional decisions that hindered the advancement of technology integration. CCSS demand high-levels of technology integration that require a lot of time and resources to achieve. Adding to the problem, colleges and universities do not provide adequate technology integration training for new teachers or administrators. Educational policy makers can use this study to address issues in higher education and public schools to strengthen training programs.

Higher Education Institutions. Higher education institutions can use this study to understand the complexity of high-levels of technology integration to meet the expectations of the CCSS. This study can help college professors understand relationships between pedagogical orientations and technology integration to improve pedagogy of preservice teachers and increase the knowledge of aspiring administrators. Higher education institutions can also use the outcomes of this study to help prepare school administrators contend with the challenges of technology integration**.**

Discussion

This section explains the significance of the findings with supporting literature to answer the research question, "What actions, decisions, and relationships do principals perceive contribute to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?" Findings are then categorized into two groups: reaffirmation of existing literature

or new insights. Assumptions, limitations, and delimitations follow to remind the reader of constraints and influences surrounding this study.

Guiding Question One: Can You Tell Me about Your Understanding of Real-Time Collaborative Tools and Their Applications for Learning to Meet the CCSS?

This guiding question revealed the theme that these technology-oriented principals were knowledgeable about real-time collaborative tools and uses that influenced actions and decisions. Two findings emerged that described the principals' understanding of real-time collaborative tools and classroom application of those tools. The findings show principals were knowledgeable about the ways real-time collaborative tools support student learning and principals' knowledge about high-level uses influenced organizational actions and decisions. Principals' technology knowledge was foundational to creating change in classrooms. Key outcomes of their knowledge about technology integration included self-motivation to keep their knowledge current, model current technology in front of staff to show the value of technology in classrooms and ignite pedagogical reflection, and use technology integration frameworks that show teachers the difference between current and future technology practices.

Previous literature found principals' depth of knowledge about technology integration influenced the use of technology (Bobbera, 2013; Draper, 2013; Stegman, 2014). Their knowledge about current technology resources, options for curriculum integration, and the legal and ethical issues surrounding technology influenced actions and decisions regarding technology integration. In an experimental quantitative study, Bobbera (2013) found that as 12 principals' technology-related skills and knowledge increased, technology integration increased in classrooms. Draper (2013) conducted an exploratory/quantitative descriptive and correlational doctoral dissertation study that included 29 principals. Draper found a correlation between

principals' perceived technological knowledge and their ability to create a digital learning culture. Principals of that study believed that their self-efficacy influenced their technology-related decisions. Stegman's (2014) research included four case studies and found principals' knowledge in technology curriculum alignment critical to improving classroom practices. Both these quantitative and qualitative studies found principals' knowledge about technology integration important to the improvement of classroom practices.

Principals that aim to be technology leaders need to be self-motivated learners to keep their knowledge current (Ertmer et al., 2002; Schrum, Galizio, & Ledesma, 2011; Stegman, 2014; Townsend, 2013). Stegman (2014) conducted a multi-case study to understand the knowledge, disposition, and actions of principals who improved the alignment between the Common Core State Standards and technology. The researcher found that principals were self-motivated learners and would collaborate with others to gain the knowledge needed. Research also shows that school administrators typically do not have technology integration training as part of an administrator licensure program (Schrum et al., 2011). Findings of that study show that approximately 7% of leadership preparation programs included a technology course covering data-driven instruction and online assessment tools. Administrator licensure programs do not include student-centered technology integration topics, which leaves school administrators on their own to learn how to improve technology integration in classrooms.

Modeling current technology approaches is an important part of the principalship (International Society for Technology in Education, 2009; National Policy Board for Educational Administration, 2015). Teachers observing principals model new approaches ignite pedagogical reflection that can motivate them to learn and try a new approach (Blasé & Blasé, 2000; Fullan, 2014). Modeling also promotes the "school's mission, vision, and core values" (National Policy

Board for Educational Administration, 2015, p. 9) by demonstrating to the staff that technology is valued and has purpose. Research shows that modeling helps to inspire technology integration in a non-threatening manner (Blasé & Blasé, 2000; Fullan, 2014).

Recent studies support the assertion that modeling by the principal influences the use of technology in classrooms (Bobbera, 2013; Galster, 2013; Stegman, 2014). Bobbera (2013) found that as 12 principals' technology-related skills and knowledge increased during an experimental quantitative study, modeling and promoting the use of technology also increased. Stegman (2014) found that principals influenced technology integration by modeling the use of technology and facilitating professional development. Teachers in that study reported that the modeling helped them think about new classroom approaches using the technology.

Some of the principals used technology integration frameworks to help teachers critically reflect on classroom practices and establish a vision for technology. Technology integration frameworks share the characteristic that technology integration begins with teacher-centered approaches and ends with more sophisticated, student-centered approaches (CAST, 2011; Florida Center for Technology Integration, 2011-2015; Koehler et al., 2013; Puentedura, 2014a). Although five principals in this study used a technology integration framework to guide teacher practices, previous studies that investigated the influence of school leadership on technology integration do not include these frameworks in the literature or among their findings (Bobbera, 2013; Brunson, 2015; Fisher, 2013; Foiles Kiel, 2014; Stegman, 2014). From the evidence in this finding, it seems that the technology integration frameworks can help guide, plan, and assess student-centered school-wide technology improvements. These frameworks can serve as a resource when developing educator evaluation goals and school improvement goals.

The answer to guiding question, "Can you tell me about your understanding of real-time collaborative tools and their applications for learning to meet the CCSS?" shows that principals' are very knowledgeable about high-levels of technology integration and their knowledge influenced their ability to be technology leaders and create change. Given the principals' attentiveness towards the improvement of technology integration in this study, this finding supports the assertion that technology-oriented principals have a "future-oriented perspective" (National Policy Board for Educational Administration, 2015, p. 3). Principals today must be visionary to transform practices using technology (Ahmad & Aqeel Raza, 2011; Office of Educational Technology, 2016; Somekh, 2008).

Guiding Question Two: How Do You See Yourself Helping Teachers Integrate Real-Time Collaborative Tools to Meet the CCSS?

This guiding question revealed that technology-oriented principals provided teachers a supportive environment to achieve high-levels of technology integration. Their actions, decisions, and relationships to support teachers align with the Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991). The three findings that emerged are principals encouraged experimenting with technology, principals supported flexible uses of technology and teacher autonomy but continuity of resources was needed, and principals provided sustained technology-related professional development but comprehensive planning was not common. The essential condition of comprehensive programming was inconsistent and the essential condition of acceptance of collective consensus was not captured.

Mezirow (1994) posits that transformational learning occurs when a person has "context awareness, reflectivity, and more effective participation in discourse and interpretations which are more inclusive, differentiating, permeable, and integrative of experience" (p. 59). Lamm

(2003) adapted Mezirow's transformational learning to include beliefs that lead to new ways of thinking and decisions that are "more differentiated, inclusive, reflective, complex and empathic, patient, humble and tolerant" (p. 274). The essential conditions that foster transformational learning outlined by Mezirow (1991) and Lamm (2003) are:

- trust;
- exploration;
- critical reflection;
- feedback;
- diversity;
- comprehensive programming;
- personal goals; and
- repeated team collaboration;
- acceptance of collective consensus;

To promote transformational learning, principals need to establish an active community of learners where members are encouraged to share perspectives and understandings to construct meaning together (Marshak & Grant, 2008).

Research shows that transformational leadership competencies have a positive influence on technology integration (Brunson, 2015; Foiles Kiel, 2014). This literature defines transformational leadership as competencies that establish trust, high expectations, motivation, and staff commitment to foster change. Foiles Kiel (2014) used an autoethnographic approach to document changes with technology integration while implementing a one-to-one laptop program over an eight-year period. Foiles Kiel used the former version of the Professional Standards for Educational Leaders known as the Interstate School Leaders Licensure Consortium (Council of

Chief State School Officers, 2008) to guide her practice and found that having a transformational leadership style with a student-centered pedagogical vision contributed to the positive implementation of technology. The establishment of an inspiring school culture, supportive relationships, and meaningful professional development improved technology integration in classrooms.

Brunson (2015) surveyed 132 elementary principals in one large school district as part of a quantitative study. The researcher utilized an assessment tool intended to measure the International Society for Technology in Education (2009) standards for administrators. Most items on the survey aligned to either shared leadership or transformational leadership. The researcher found that the existence of transformational leadership competencies were a strong predictor of technology leadership competencies over shared leadership competencies.

Rather than using principal competencies, this study compared the findings to the conditions originally outlined by Mezirow (1991) and Lamm (2003) to include all the factors that help teachers adapt to changing expectations. For instance, the previous literature does not include exploration, repeated team collaboration, and comprehensive programming in the discussions about transformational leadership. The essential conditions are explained separately with brief descriptions of findings and supporting literature.

Trust. The principals in this study built trust. They allowed teachers to implement technology in ways that are meaningful to them professionally. They supported teacher autonomy and exploration or experimentation with technology that required principals to trust teachers' professionalism. Readers outside of the United States should know principals and teachers have a hierarchical relationship in public education. Principals hire and evaluate teacher performance, and establish teacher expectations. Principals in this study were cognizant about

this relationship and tried to reduce teachers' worries by recognizing individual strengths and needs. The existence of trust contributed to a supportive environment.

The condition of trust enables individuals to open themselves to vulnerability (Lencioni, 2002). Trust fosters autonomy and minimizes self-doubt (Mezirow, 1991). In an autonomous environment, participants are free to ask questions to clarify meaning or gain more information (Mezirow, 1991) without fear of conflict (Lencioni, 2002). Relational trust is the "highest form of organizational trust" (City, Elmore, Fiarman, & Teitel, 2009, p. 163). Trust develops between two people over time with repeated encounters that formulate predictable responses (2009). Early encounters test that can build trust. If trust is formulated, unconditional support for one another is developed (2009). Trust between a principal and a teacher was necessary to support risk-taking with technology (Galster, 2013).

Exploration. Principals encouraged experimenting with technology that includes three interrelated beliefs: trust needed to exist; teachers needed to be continuously encouraged to try new technology; and some principals believed that it was necessary to give teachers explicit permission to experiment. Principals' communication about experimenting with new technology approaches helped build a supportive environment.

The condition of exploration requires teachers to be encouraged to explore and evaluate ways of teaching and learning (Mezirow, 1991). Exploration placed teachers in unfamiliar situations that help increase awareness and minimize reliance on previous knowledge (Lamm, 2000, 2003). The ability to explore is contingent upon the condition of trust and autonomy (Mezirow, 1991). Teachers will only try new approaches when provided autonomy to experiment and fail without worry about being penalized by the principal. Self-Determination Theory (Ryan & Deci, 2000) submits that autonomy increases teachers' self-efficacy or

perceived competence that builds an internal motivation for self-directed learning. Principals can build that motivation to learn about new technology approaches by establishing purpose, value, or need. They can creating context that increases teachers' feelings of interest, enjoyment, or satisfaction that become internalized and form the basis of motivation.

Studies show that principals' promotion of exploration increased technology use among teachers (Ahmad & Aqeel Raza, 2011; Galster, 2013). Ahmad and Aqeel Raza (2011) conducted a quantitative study that investigated leadership styles and the use of educational technology. The study showed that principals' coaching and promotion of technology had greater influence on the adoption of new practices than directive/telling and shared leadership approaches.

Galster (2013) conducted a mixed-method study to investigate principal behaviors that encouraged innovative teaching practices in high performing schools. The researcher believed that these schools contended with barriers that made the implementation of innovative practices difficult because of accountability pressures. The findings showed the principals' clear communication, honesty, and approachability helped teachers to be risk-takers and implement innovative practices. Findings from this study also showed that principals provided teachers with autonomy and empowerment to explore new teaching practices. These studies show the interdependency between trust, autonomy, and exploration needed to support high-levels of technology.

The issue of teacher exploration and autonomy was more prevalent in this study than in similar studies. Bobbera (2013), Fisher (2013), and Foil Kiel (2014) investigated the role of principal in addressing second-order barriers; however, exploration and autonomy were not included in the findings.

Critical reflection, feedback, and personal goals. The findings in this study show that principals used the educator evaluation process to have open and honest discussions about classroom practices. These types of conversations can cause people to reflect on their own beliefs and create an opportunity to develop new understandings (Drago-Severson, 2009). Principals celebrated successes with technology and established goals on an individual basis. They were unanimous in not using the evaluation system to penalize technology mishaps or the non-use of technology. These opportunities and conversations support critical reflection, feedback, and personal goals among teachers to help develop teachers' technology knowledge and skills.

The conditions of critical reflection, feedback, and personal goals is required for growth and development. Principals promote the condition of critical reflection through discussions that prompts teachers to think about their own experiences, attitudes, opinions, and beliefs and the ways they integrate technology (Mezirow, 1991; Polly & Hannafin, 2010). Principals promote the condition of feedback with private and honest conversations with teachers regarding classroom observations and technology use. A norm of giving and receiving honest feedback holds people accountable to expectations (Lamm, 2003). The condition of personal goals is promoted when teachers are provided the opportunity to develop goals that are relevant to their needs (Bill and Melinda Gates Foundation, 2015; Polly & Hannafin, 2010).

Principals in this study stated that they do not penalize teachers for non-use or mishaps on an evaluation. Principals celebrated any use of technology to praise growth regardless of degree. According to research, celebrating small achievements provides emotional support that has a positive impact on a school culture that embraces change (Galster, 2013; Kotter, 1996).

The consistent encouragement by the principal helps teachers find the courage to experiment with new technology approaches (Blasé & Blasé, 2000).

Existing literature on the educator evaluation process has contrasting outcomes. The new evaluation system has been criticized because of the inclusion of achievement scores as part of the overall rating score (Donaldson, 2012; Fullan, 2014). Literature suggests that ratings based on student achievement scores promote a culture of performativity that negatively affects curriculum decisions, relationships with students, and colleague collaboration (Network for Public Education, 2016). A culture of performativity is created when "…a mode of regulation that employs judgments, comparisons and displays as means of incentive, control, attrition and change-based on rewards and sanctions (both material and symbolic)" (Ball, 2003, p. 216) is put into place.

From principals' perspective, the educator evaluation process had a positive effect on technology integration. Galster (2013) investigated principal behaviors that support innovative practices and found that principals perceived observations, evaluations, and feedback helpful to inspire new classroom practices; however, that study also found that teachers did not find those practices helpful. O'Dwyer et al. (2005) conducted a quantitative study that included administrators and middle school and high school principals and teachers from 22 Massachusetts districts. The purpose of that study was to understand organizational characteristics associated with an increased use of technology for teaching and learning. The findings showed that principals who included technology integration as part of the educator evaluation process influenced the rate of technology use in classrooms. The findings of this study agree with the principals' perspectives of previous research that the educator evaluation process can support technology-related growth and development.

Diversity. Principals in this study leveraged an assortment of professional development opportunities to increase the capacity of teachers throughout the school year during contractual hours. Schools involved in this study offered at least three methods of professional development and most schools offered four methods on a regular basis. Most professional development opportunities were from internal resources that included modeling, co-teaching, coaching, and sharing of practices.

The condition of diversity is promoted when staff members with varying experiences collaborate and learn from each other (Lamm, 2003). All staff members work as a community of learners where social powers are minimized (Mezirow, 1991). Polly and Hannafin (2010) describe effective professional development for technology integration as sustained meaning-making opportunities that focus on effective tools, techniques, or approaches that students use. Given the regularity of sharing and professional development training by a variety of colleagues and administrators with different experiences, skills, and knowledge, the environments captured in this study promoted learning (Lamm, 2003; Polly & Hannafin, 2010). According to the recent study by the Bill and Melinda Gates Foundation (2014) that involved interviews and surveys with 1,300 teachers, teachers were more satisfied with professional development when they chose the method or workshop that met their needs rather than the one-size-fits-all model. This literature supports findings in this study that principals helped teachers advance their technology integration skills and knowledge by offering consistent support from a variety of internal resources.

Comprehensive programming. Principals in this study leveraged an assortment of professional development opportunities to increase the capacity of teachers; however,

comprehensive professional development over a school year was not common and only a few principals reported focused programming.

The condition of comprehensive programming is extensive training over time with support and opportunities for action and reflection (Lamm, 2003). Repeated exposer and practice builds confidence and proficiency. Other researchers defined sustained professional development as opportunities for repeated exposure to targeted concepts and skills to affect student learning (Bill and Melinda Gates Foundation, 2014; Harwell, 2003; Moeller et al., 2011).

Research shows a distinct correlation between the depth and length of experience and proficiency levels (Ericsson & Charness, 1994). Research suggests that sustained professional development should include 49 hours over the course of the year and 20 separate instances of practice (Darling-Hammond et al., 2009; Moeller et al., 2011). To provide optimal professional development, principals need to plan for cohesive learning opportunities. A concerted professional development model will provide more opportunities to share, learn, and strategize (Groff, 2013).

As explained in the findings, four principals wanted to implement a structured peer-coaching program and three of those principals have an instructional technology coach on staff. The Bill and Melinda Foundation (2014) study showed that teachers prefer to learn from other teachers who understand their needs and their content areas. It is possible that instructional technology coaches do not have content area knowledge, time, or relationships to co-teach or model in the same ways as content area peers. The Bill and Melinda Foundation study found that peer coaching occurs less frequently than other types of professional development. This type of program might provide teachers with a flexible learning environment and additional professional development time needed to gain confidence and proficiency.

Repeated Team Collaboration. The schools involved with study followed a traditional middle school model with collaboration time built in. Teams met regularly according to grade level or content area. Principals established team norms that included sharing approaches to technology integration and ensuring that someone with technology expertise was involved. Some principals reported that department leaders without technology skills or goals negatively influenced the improvement of technology integration in their department. The regularity of collaboration with technology specific norms provided teachers with support.

The condition of repeated team collaboration supports action, reflection, and dialogue that improve instructional practices (An & Reigeluth, 2012; Lamm, 2000, 2003). These instructional teams are intended to build capacity. Highly effective teams agree try out new ideas, develop shared meaning, and provide a forum for critical feedback (Drago-Severson, 2009). Principals or team leaders need to cultivate the conditions that make instructional teams thrive with expectations, respect, and norms that develop trust and guide the conversation (Drago-Severson, 2009). Repeated team collaboration can be a powerful mechanism to discuss and try new approaches to technology integration. In highly collaborative groups, a sense of "peer pressure" (Lencioni, 2002, p. 213) motivates team members to reach expectations.

Acceptance of collective consensus. The condition of acceptance of collective consensus (Mezirow, 1991) is not present in the data. Principals did not disclose information about teachers' acceptance of a technology-oriented vision for teaching and learning. Readers could argue that data exists in support of acceptance of collective consensus because principals disclosed that teachers shared technology-related practices with colleagues. Readers could view the act of sharing as a demonstration of collective consensus; however, doing so would assume the teachers' perspectives. Mezirow asserts that the condition of acceptance of collective

consensus fosters an openness where individuals are accepting of "informed, objective, and rational consensus as a legitimate test of validity" (Mezirow, 1991, p. 198). As a researcher, I felt it would be necessary to obtain data from teachers to assess the existence of this condition.

The findings for "How do you see yourself helping teachers integrate real-time collaborative tools to meet the CCSS?" suggest that the actions, decisions, and relations align with the Essential Conditions of Transformational Leadership (Lamm, 2003; Mezirow, 1991). They provide various learning opportunities, norms and routines, and an emotionally supportive culture.

In Illeris' (2013) Three Dimensions of Learning Model, individuals experience transformational learning at the point where a balance between new information or content and emotion intersects with the individual and society. Learners experience a change in attitudes, judgments, or beliefs when an appropriate level of personal motivation or openness combines with new information relative to needs of the surrounding environment. Illeris' model illustrates the interrelationship among three dimensions and highlights the critical role of emotion in the learning process. Too much stress or too little motivation can create barriers to learning and can impede transformational growth. The principals involved in this study seem to understand these tenets. They did not lead with a top-down management style, but created a balanced environment that would support learning with technology.

Guiding Question Three: Can You Tell Me about Helping Teachers Overcome Barriers to Technology Integration?

This guiding question revealed these technology-oriented principals with adequate technology resources contended with barriers that interfered with the improvement of technology integration. The two findings that emerged are first-order barriers continued to persist in these

schools with ample technology resources and slow implementation and colleagues helped slow adopters overcome second-order barriers but peer was coaching needed.

First-order barriers: Although the principals in this study led in buildings with ample technological resources, several first-order barriers emerged. Barriers included time for teachers to observe other teachers teaching students using technology, a lack of adequate funding for technology support personnel, annual state assessments that hindered teacher autonomy, the rate of technology change, and the influence of department leaders without necessary skills or department goals.

First-order barriers are the influences outside of teachers' control that impede the enhancement of technology integration that include training, support, and resources such as hardware and software (Ertmer, 1999). This finding is a reminder that school structures contribute to the barriers teachers face (Lunenburg, 2010). Schools are systems and each component of the school – whether it is the principal, department leaders, federal and state mandates, or other – influence teaching and learning. Stakeholders need to identify first-order barriers to seek ways to problem solve.

The influence of department leaders is a finding not documented in studies that investigated the principals' role in improving technology integration. One excerpt from this study explains the barrier of some department leaders:

> The principals for the most part I think are on board, but then if you take it one-step down to the department head level, we've got a lot of people who have been doing it for a really long time and doing it a certain way and probably less interested in doing the technology.

O'Dwyer et al. (2005) is the only study identified that investigated the principal's role in addressing first-order barriers at the middle school level. The influence of department leaders is not among the research findings.

Research also shows that school administrators typically do not have technology integration training as part of an administrator licensure program (Schrum et al., 2011). Findings of that study show that approximately 7% of leadership preparation programs included a technology course covering data-driven instruction and online assessment tools. Administrator licensure programs do not include student-centered technology integration topics, which leaves school administrators on their own to learn how to improve technology integration in classrooms. Principals cannot assume that administrators who work with their teachers and influence classroom practices do not need technology integration professional development.

Second-order barriers. Principals believed that slow implementation and colleagues helped slow adopters overcome second-order barriers but peer was coaching needed. Two second-order barriers of slow adopters emerged in this study: the barrier of fear and the barrier of technological – pedagogical – content knowledge (TPACK, Koehler et al., 2013). Principals reported that teachers feared the educator evaluation process, changing classroom practices, and making mistakes in front students and/or colleagues. Principals also reported that teachers' abilities to understand how to create and manage student-centered approaches with available technological resources in a given content area created barriers.

Second-order barriers are beliefs or feelings that keep a teacher from implementing effective technology integration. These barriers include teachers' beliefs about how students learn and gain knowledge, their confidence and skills using new technology, and the role of technology in the classroom (Ertmer, 1999). Previous studies assert that professional

development can reduce the barrier of fear by building confidence (Ertmer & Ottenbreit-Leftwich, 2010; Wachira & Keengwe, 2011). Foiles Kiel (2014) asserts that principals can reduce the technology integration fears with a "compassionate response" (p. 149). Although the literature might be true, evidence in this study suggests that teachers also need to have the sense of courage to try a new technology approach (Baylor & Ritchie, 2002; Howard, 2013). A teacher's ability to take risks to try new approaches stem from both innate characteristics such as genetics and hormones that influence emotions, as well as environmental influences from the school system and society (Gower, 2010; Shane, 2010). Teachers need to be emotionally prepared and have the correct environmental supports to take risks.

Individuals do not adopt new approaches at the same rate. Rogers' Innovation Theory Model (Rogers & Scott, 1997) supports the assertion that a slow adoption rate is an inclusive approach to leadership. Rogers' Innovation Theory Model describes the diffusion of an innovation across a social setting. The people in the social setting will adopt the innovation in a predictable manner based on intrinsic factors. Innovators are the first 2.5% of people to adopt an innovation and are risk takers. Early adopters are the next 13.5% and are considered leaders and role models. The early majority follows and make up 34% and they adopt an innovation just prior to the average individual. Late majority adopters are cautious and skeptical about innovations and make up 34%. These individuals adopt an innovation just after the average individual because of an increased sense of social pressure. Laggards are last 16% of people to adopt and they are not risk takers. These individuals want insurances that the innovation will not fail. For the purpose of this study, slow adopters represent the laggards. These teachers are hesitant to try new technology and lag behind their peers in relation to technology integration.

Principals in this study seemed to understand these tenets and provided ample time to support laggards.

The barrier of technological – pedagogical – content knowledge (TPACK, Koehler et al., 2013) emerged as the second barrier for slow adopters; specifically technological and pedagogical. The level of knowledge in any one of the domains affects the success of technology integration. In this study, principals believed that teachers had difficulty knowing how to use available technology in their content area, but colleagues and coaches helped slow adopters contend with TPACK. Observations, workshops, and co-teaching were various ways slow adopters could experience successful examples of technology integration. These experiences initiated a change of beliefs that would provide motivation to try the approach. Principals provided regular professional development opportunities from a variety of resources to support reflection opportunities and learning (Lamm, 2003; Polly & Hannafin, 2010).

In today's classrooms, teachers need to apply varying pedagogical approaches to create the most suitable learning experience (Ertmer & Newby, 2013; Groff, 2013). Behaviorism and constructivism differ in approach but they both benefit learning in specific ways. Teacher-centered approaches to technology integration are highly structured activities that require low-level thinking but can help build foundational skills (An & Reigeluth, 2012; Enonbun, 2010, Matthews, 2003). Student-centered approaches are designed to be open-ended and require high-level thinking such as creativity, analysis, and investigation (Ertmer & Ottenbreit-Leftwich, 2010; Kim et al., 2013; Koehler, Mishra, & Cain, 2013). To reach high-levels of technology integration, teachers need student-centered pedagogical knowledge and beliefs to create student-centered learning environments (Becker, 2000; Ertmer et al., 2012; Kim et al., 2013).

Principals in this study were knowledgeable about the opposing pedagogies and made statements about traditional teaching styles and student-centered beliefs in relation to technology integration. Principals did not disclose having explicit professional development about the differences and purposes of pedagogical theory in relation to technology integration. Literature suggests that professional development should include pedagogical applications to meet teachers' needs (Fullan, 2014; Guskey, 2002; Koehler et al., 2013). The lack of training that aligns pedagogy to technology resources is also present in teacher preparation courses (Ertmer & Newby, 2013). Research shows that only 2% of teacher preparation programs offer theory-based technology integration courses (Ertmer & Newby, 2013). The outcomes of this study in combination with existing literature suggest a consistent lack of pedagogical alignment to technology resources in college courses and professional development courses.

The literature for third guiding question, "Can you tell me about helping teachers overcome barriers to technology integration?" show that barriers to technology integration are resolvable with the support of the principal, time, money, and professional development; however, principals need to be knowledgeable about various barriers. The literature highlights the absence of training in pedagogical alignment with technology resources in higher education and in schools. The findings of this study support that literature

Reaffirmation of Existing Literature

Some of the findings above reaffirm existing educational literature outcomes. These connections to existing literature add validity to the overall research outcomes of this study.

Technology-oriented principals' depth of knowledge about effective approaches to technology integration is foundational to improving teaching and learning with technology (Fisher, 2013). Previous literature found that principals' depth of knowledge had a positive

influence on teachers' use of technology (Bobbera, 2013; Draper, 2013; Stegman, 2014). If schools are aiming to achieve high-levels of technology integration, principals need to be knowledgeable about approaches to high-levels technology integration.

Technology-oriented principals need to be self-motivated learners (Ertmer et al., 2002; Schrum et al., 2011; Stegman, 2014; Townsend, 2013). Principals leveraged available resources to stay current and they mostly rely on-staff personnel with greater technology knowledge. Technology changes rapidly and principals need to be motived to stay abreast of new applications that can support student learning.

This study found that modeling current technology approaches is an important part of the principalship (Bobbera, 2013; Galster, 2013; International Society for Technology in Education, 2009; National Policy Board for Educational Administration, 2015; Stegman, 2014). Technology-oriented principals understand that modeling ignites pedagogical reflection among teachers and demonstrates the value of learning (Blasé & Blasé, 2000; Drago-Severson, 2012; Fullan, 2014). The simple task of modeling current technology cannot be underestimated. It affects the ways teachers perceive the value of technology and helps build a student-centered technology vision. Modeling also demonstrates risk-taking and learning with technology.

Technology-oriented principals encouraged experimentation with technology. Previous studies also show that encouraging technology use and taking risks increased the use of new approaches and innovative practices (Ahmad & Aqeel Raza, 2011; Galster, 2013). As one participant said, "Constantly having [technology] in front of people. And those are some of the ways that we're always pushing forward."

From the principals' perspectives, the educator evaluation had a positive influence on technology integration and values individualized learning needs and pathways. This finding

echoed O'Dwyer et al. (2005) finding that principals who included technology integration as part of the educator evaluation process influenced the rate of technology use in classrooms. Principals in this study used the educator evaluation process to engage in dialogue about technology use and celebrate technology-related successes use in classrooms.

The principals in this study offered regular opportunities to learn technology integration skills. They provided teachers with the flexibility to choose workshops or resources that met their needs. Polly and Hannafin (2010) describe effective professional development for technology integration as sustained meaning-making opportunities that focus on effective tools, techniques or approaches that students use. Given the regularity of sharing and professional development training by variety of colleagues and administrators with different experiences, skills, and knowledge, the environment created by these principals promoted learning (Lamm, 2003; Polly & Hannafin, 2010). According to the recent study by the Bill and Melinda Gates Foundation (2014) that involved interviews and surveys with 1,300 teachers, teachers are more satisfied with professional development when they choose the method or workshop that meets their needs.

This study shows that trust is an important part of improving technology integration. Principals need to build trust with teachers to support autonomy and exploration. The existence of trust minimizes the teachers' vulnerability and self-doubt when considering a new classroom practice with technology (Lencioni, 2002; Mezirow, 1991).

This study also reaffirms findings from the Bill and Melinda Foundation (2014) study that peer coaching occurs less frequently than other types of professional development. Teachers continued to face barriers that impeded their ability to observe colleagues and engage in follow-up conversations and support.

New Insights

New insights emerged that contribute to existing literature. Some insights highlight the need for additional research.

Five principals used technology integration frameworks to guide student-centered technology integration discussions. The use of these frameworks was not included in previous literature that explored the role of principal contending with second-order barriers. Educational leaders can use these frameworks to guide, plan, and assess student-centered technology integration school-wide.

This study used the updated PSEL to assess technology-leadership qualities. The updated version adds professional responsibilities that include an enhanced role of the educator evaluation system, greater attention to all aspects of the school to improve learning for students, and a call for a "future-oriented perspective" (National Policy Board for Educational Administration, 2015, p. 3) to transform teaching and learning. This study found that technology-oriented principals have a "future-oriented perspective" and improve many aspects of the school to encourage technology integration and keep teaching practices relevant.

The issue of teacher autonomy was more prevalent in this study than in similar studies. Bobbera (2013), Fisher (2013), and Foiles Kiel (2014) investigated the role of principal in addressing second-order barriers and teacher autonomy was not a factor in those studies. The findings from this study illustrate a need for principals to balance teacher autonomy with continuity of technology resources to improve technology integration. Teachers need autonomy to experiment with new resources; however, numerous applications used by teachers can cause ineffective technology integration. The use of applications not under contract with districts potentially endangers student data privacy. Principals in this study did not share how their

districts managed student data privacy concerns and teachers' autonomy in trying new technologies. The literature does not yet engage this discussion.

The Bill and Melinda Foundation (2014) study found little evidence to suggest one model of coaching over another. However, outcomes of this study suggest a value of having classroom teachers coaching other teachers exists – a value that does not exist with instructional technology coaches. Principals with building-based instructional technology coaches in this study aimed to initiate a peer observation program in the future. This evidence suggests that content area peers fill a need that cannot be attained by instructional technology coaches.

This study found that in some instances department leaders created barriers to technology integration. Barriers included lack of skills, knowledge, and rigid leadership styles that reduced teacher autonomy. The O'Dwyer et al. (2005) study is the only study identified that investigated the principal's role addressing first-order barriers to technology integration at the middle school level. The influence of department leaders is not among their research findings. Administrator licensure programs typically do not include technology integration and this barrier highlights a need to ensure that technology professional development includes all members. Principals cannot assume that administrators who work with their teachers do not need technology integration professional development.

There was no evidence to suggest that teachers are given training in aligning pedagogy to technology resources. The lack of explicit training is also present in teacher preparation courses (Ertmer & Newby, 2013).

Most of the Essential Conditions of Transformational Learning (Lamm, 2003; Mezirow, 1991) emerged in the findings; however, weaknesses in some conditions reveal potential barriers that impede the improvement of technology integration. The outcomes of this finding suggest

that principals can use the Essential Conditions of Transformational Learning to evaluate the learning conditions for teachers. Self-assessing strengths and weaknesses of the conditions can identify potential organizational barriers.

Assumptions Revisited

In pursuing this dissertation, I assumed that the role of principal is critical to the success of technology integration to improve student learning (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014; Fullan, 2014; O'Dwyer et al., 2005; Stegman, 2014; Wisniewski, 2010). Although other individuals play a role, the principal is the leader of change who establishes the routines, the norms, and expectations to improve and foster effective uses of technology. I also assumed that schools with high-levels of technology integration were not common (Ertmer et al., 2012). I assumed that high-level technology tools could support the desired technology-related outcomes for the CCSS. I assumed a culture of high-levels of technology integration occurred with principals who value the role of technology in the classroom and applied a systematic approach to improve teaching and learning (Bobbera, 2013; Fisher, 2013; Foiles Kiel, 2014). My assumption was that a principal's actions and decisions helped create a culture that fosters high-level uses of technology that exists in some schools. These assumptions guided the study design and influenced the data analysis.

Limitations and Delimitations of the Study Revisited

Limitations and delimitations of the study surround this study. I acknowledge that these are known weaknesses in the study and specific steps were taken to reduce their affect.

Limitations. This section describes three limitations to the study: participants' self-assessment, participants' self-reporting, and the focus on the role of principal.

Participants were selected to participate based on the principals' self-assessment in meeting the study criteria. It is possible that participants over-emphasized the level of technology integration that occurred in their schools to meet the CCSS. To contend with this limitation, specific codes helped identify the technology resources and pedagogical approaches that align with high-levels of technology integration. One participant without principal experience and sufficient technology resources to support high-levels of technology integration was categorized as an outlier.

Self-reporting is a limitation in qualitative studies (Polkinghorne, 2005). It was possible that the participants did not accurately explain personal accounts, and the principal and researcher had different understandings of word meaning. The study included several participants and open-ended interview questions to contend with this limitation. This approach allowed participants to explain and describe experiences with details. Participants revisited topics, provided examples, and asked clarifying questions when needed. Likewise, I was also able to revisit topics to dig deeper into statements made by a participant and ask clarifying questions. The findings of this study emerged from an analysis across settings and their commonalities.

Because principals have the ability to improve student learning by attending to the structures that can "shape and enhance the practice of teachers" (Hallinger, 2011, p. 133), this study only included principals. It is possible that other school personnel contributed to the success of high-levels of technology integration such as assistant principals, technology integration specialists, and learning coaches. Specific codes addressed this limitation by gathering data on roles other than the principalship to understand their influence on high-levels of technology integration.

Delimitations. Delimitations are important to understand because they explain to the reader "the conditions or parameters that the researcher intentionally imposes in order to limit the scope of a study" (Bloomberg & Volpe, 2012, p. 8). Delimitating a study increases the transferability to other contexts that share the same characteristics (2012).

This study only included principals from non-charter public middle schools within Massachusetts and Rhode Island. Some aspects of the study would have been improved if teacher perspectives were included. For example, I could not assess the existence of acceptance of collective consensus, an essential condition for transformational learning (Mezirow, 1991). Mezirow asserts that the condition of acceptance of collective consensus fosters an openness where individuals are accepting of "informed, objective, and rational consensus as a legitimate test of validity" (Mezirow, 1991, p. 198). As a researcher, I felt it would be necessary to obtain teachers' perspectives to assess the existence of this condition.

Only principals who perceived that high-levels of technology integration is occurring in their school participated. This study gathered data mostly from the face-to-face interviews that added an unintentional delimitation. Classroom observations or teacher interviews might have gleaned different information about the conditions of transformational learning. Classroom observations could have provided an opportunity to observe and document the application and frequency of CCSS technology-related standards.

Real-time collaborative technology resources served as focal point of the interviews to target high-levels of technology integration. Other student-centered tools exist such as virtual learning and simulations. Those types of tools were not discussed.

Future Research

The outcomes of this study add to the body of literature regarding the principal's role in creating a culture of high-levels of technology; however, many research questions remain that educational leadership researchers may wish to explore further:

- Repeat this study at the elementary or high school to understand the barriers that impede technology integration when resources are adequate.
- Repeat this study in two years' time with new technology resources to understand the ways principals promote and support use.
- Conduct a case study with one of the schools involved in this study to obtain teacher perspectives and observation data.
- As a researcher, I would enjoy an opportunity to repeat the study with the outlier in two years or more to analyze pedagogical changes in the school.
- Study teachers' fears when implementing new innovative practices and the ways principals identify and address those fears.
- Study the ways principals maintain or promote teacher autonomy while implementing an innovation across a team or school.
- Study the ways principals maintain or promote teacher autonomy while adhering to student data privacy laws.
- A study to understand if differences in expectations between one-to-one and Bring Your Own Device programs exist and why.
- Research to understand the ways principals provide peer coaching to improve technology integration would be helpful. Exemplary peer collaboration models exist

outside the United States that aim to improve teaching with technology can help guide new models (Venezky, 2004).

- More research is needed to understand the effectiveness between coaching models (Bill and Melinda Gates Foundation, 2014).
- Research that explores ways principals provide comprehensive programming to improve technology integration would add to the body of literature. Technology integration professional development with repeated exposure to targeted concepts and skills to affect student learning is needed (Bill and Melinda Gates Foundation, 2014; Harwell, 2003; Moeller et al., 2011).
- Additional research to create a publication for principals that identifies contemporary technology resources and ways to integrate those resources into practice.
- Research to understand the effect of physiology on pedagogy and technology integration would help to understand differences between teachers and instructional approaches.
- Research that involves principals formally implementing a technology integration framework to improve practices school-wide might glean new insights.
- Research to understand if training in aligning pedagogical theory to technology resources is helpful to improving technology integration is needed.

Final Reflection

Teaching with technology has always been important to me because of my belief that technology can engage students in the learning process. Technology can be a powerful resource for students when they are trying to contextualize abstract concepts and developing authentic, technology-related assessment products; however, in my roles as classroom teacher and

technology integration specialist, I have seen technology used inconsistently across classrooms. This dissertation evolved from my curiosity to understand differences between teachers that influenced how technology was used and how principals helped teachers advance their use of technology to meet the expectations of the CCSS.

This dissertation journey has been a rewarding experience. This research project provided me with an opportunity to reflect deeply on educational leadership, technology integration, and public education. The outcomes are already immeasurable.

Interviewing 13 highly regarded principals is a process that I wish every educational leader could experience. Each principal was willing to talk to me and give me the time I needed. They welcomed me without any sense of feeling rushed or annoyed. What I learned from each them, was nothing short of invaluable. They changed many beliefs I had about teachers, leadership, and technology integration and as a result, I am a better educator, colleague, and human being.

As I have said, using technology is important to my teaching practice and I was curious as to why colleagues did not use technology in the same way. I believed this lack of technology use was because of a lack of professional development. While that might be partially true, I now know that teacher fear is a large obstacle. Understanding this, I provide a better balance of nudging teachers forward by providing them with low expectations, encouragement, and support to foster conditions that support risk-taking.

Aligning the data to Professional Standards for Educational Leaders (National Policy Board for Educational Administration, 2015) and the Essential Conditions for Transformational Learning (Lamm, 2003; Mezirow, 1991) was a powerful learning experience. I was truly amazed at the presentation of data for each construct and the complexity of supporting teachers.

Transformational learning was not a phrase that principals or I used during the interviews so I especially surprised by the emergence of the conditions. The practical strategies documented in this dissertation that transformed teacher practices have influenced conversations with educational leaders in my district. For example, I am collaborating with principals in my district to provide targeted professional development for small groups of teachers during contractual hours. I hope readers also find the strategies valuable since they were intended to contextualize the actions and decisions that lead to improved technology use.

I have also recognized that there is benefit to aligning pedagogical theory to technology resources. Prior to this study, I did not label technology resources as behaviorist or constructivist. Reading the literature about theoretical underpinnings of technological resources created new understandings for me. I believe that having teachers critically reflect on those theoretical orientations would help them recognize if students are provided with balanced learning opportunities that incorporate both behaviorist and constructivist approaches to technology integration. Both approaches to technology integration play a role in classrooms to support different learning needs.

The outcomes of this study provide new insights for me personally, and I hope to the field of education. High-levels of technology integration is difficult to achieve given the tradition of teaching, student achievement pressures, and limited time, funding, and professional development. To overcome these barriers, principals can use the practical strategies based on the experiences of technology-oriented principals. Principals can also use the Essential Conditions for Transformational Learning (Lamm, 2003; Mezirow, 1991) to identify strengths and weakness in current professional development models.

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Appendix A

Professional Standards for Educational Leaders

Professional Standards for Educational Leaders (PSEL)	
Standard Number and description	Standard details
Standard 1: Mission, Vision, and Core Values	Effective educational leaders develop, advocate, and enact a shared mission, vision, and core values of high-quality education and academic success and well-being of each student.
Standard 2: Ethics and Professional Norms	Effective educational leaders act ethically and according to professional norms to promote each student's academic success and well-being.
Standard 3: Equity and Cultural Responsiveness	Effective educational leaders strive for equity of educational opportunity and culturally responsive practices to promote each student's academic success and well-being.
Standard 4: Curriculum, Instruction, and Assessment	Effective educational leaders develop and support intellectually rigorous and coherent systems of curriculum, instruction, and assessment to promote each student's academic success and well-being.
Standard 5: Community of Care and Support for Students	Effective educational leaders cultivate an inclusive, caring, and supportive school community that promotes the academic success and well-being of each student.
Standard 6: Professional Capacity of School Personnel	Effective educational leaders develop the professional capacity and practice of school personnel to promote each student's academic success and well-being.
Standard 7: Professional Community for Teachers and Staff	Effective educational leaders foster a professional community of teachers and other professional staff to promote each student's academic success and well-being.
Standard 8: Meaningful Engagement of Families and Community	Effective educational leaders engage families and the community in meaningful, reciprocal, and mutually beneficial ways to promote each student's academic success and well-being.
Standard 9: Operations and Management	Effective educational leaders manage school operations and resources to promote each student's academic success and well-being.
Standard 10: School Improvement	Effective educational leaders act as agents of continuous improvement to promote each student's academic success and well-being. (National Policy Board for Educational Administration, 2015)

Appendix B

International Society for Technology in Education Standards for Administrators

ISTE Standards for Educational Administrators	
Standard Number and Title	Standard Description
Standard 1: Visionary leadership	Educational 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.
Standard 2: Digital-age learning culture	Educational Administrators create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students.
Standard 3: Excellence in professional practice	Educational 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.
Standard 4: Systemic improvement	Educational Administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.
Standard 5: Digital Citizenship	Educational Administrators model and facilitate understanding of social, ethical, and legal issues and responsibilities related to an evolving digital culture. (International Society for Technology in Education, 2009)

Appendix C

Interview Protocol-Principal

Date _____ School ID _____

Introduction

- Introduce yourself
- Discuss the purpose of the study
- Provide informed consent
- Provide structure of the interview
- Ask if they have any questions
- Test audio recording equipment

General Background Information

1. Tell me about this school in terms of demographics and structure.
2. Tell me about your career and the motivations that led you to the principalship.

Research Questions

The overarching research question is, "What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS"? I'm going to ask four open ended questions:

1. This study focuses on high-level technology tools that are associated with learner-centered or constructivist practices and allows students the opportunity to learn more deeply through investigative, analytic, and collaborative approaches. Real-time collaborative tools, such as Google Drive products, VoiceThread, and Wikispaces are Internet resources that allow at least two users to collaborate simultaneously from different locations to support learning objectives and the development of communication skills. Can you tell me about your personal understanding and

experiences with real-time collaborative tools and their applications for learning as outlined in the CCSS?

   a. Provide examples of how you have seen real-time collaborative tools utilized in classrooms and how they help support learning standards.
   b. Other than real-time collaborative tools, what other tools do you feel support a student-centered approach, foster collaboration, communication, and critical thinking?

2. Do you see yourself helping teachers integrate real-time collaborative tools as outlined in the CCSS, and if so how? In other words, what are the various ways you help teachers align their pedagogical approach with the curriculum, and technology?
   a. Explain how you use real-time collaborative tools in your position as principal.
   b. Explain your role in helping teachers integrate real-time collaborative tools.
   c. What support or resources do you provide teachers that foster high-level technology integration?
      i. Does a level of expectation exist to use real-time collaborative tools?
      ii. What collaboration time is allocated to learning about real-time collaborative tools?
      iii. Does the district vision include a student-centered approach to teaching and learning?
      iv. How do the district's professional development opportunities support the use of real-time collaborative tools?

v. What technology purchases have been made to support real-time collaborative tools?

vi. What school policies help to support real-time collaborative tools?

d. Who was responsible for initiating those structures and implementing them?

e. Do artifacts and documents exist that provide evidence of those structures?

3. Can you tell me about helping teachers overcoming the barriers of student-centered approaches to technology integration, and helping them to do so?

    a. Explain the barriers that inhibit high-level technology integration.

    b. Identify the barriers that are most difficult to overcome.

    c. Explain your role to help overcome those barriers.

4. Do you have suggestions and recommendations to principals who are trying to reach high-levels of technology integration?

    a. Based on your experience, what are some general areas that might help other principals move from low-level technology integration to high-level?

Concluding Statement

- Thank him/her for participating
- Ask if he/she would like a copy of the dissertation after it has been approved
- Record any observations, feelings, thoughts and/or reactions about the interview

Appendix D

Sample Letter to a Referred Principal

Dear < referral >,

<contact first and last name> suggested that I contact you because of your technology leadership skills at the middle school level. <contact first name> and I were colleagues at <district name >.

I am a Ph.D. candidate in the Educational Leadership program at Lesley University and I am looking for middle school principals to interview for my dissertation. The focus of my dissertation is on the principal's role in supporting high-levels of technology integration to meet the CCSS. The purpose of this study is to hear the experiences of middle school principals who have been successful in integrating technology to understand how they have influenced the pedagogical practices in classrooms. For the purpose of this study, I will be focusing on how principals foster the use of real-time collaborative tools that allow the students to have control over the content to promote higher-level thinking, require the use of communication skills, and allow for simultaneous collaboration with a web-based platform for ubiquitous access and flexible use. Glogster, Google Drive products, Popplet, Scriblar, Skype, VoiceThread, and Wikispaces are examples of the real-time collaborative tools aimed in this study.

Do you think that you are a principal who meets the criteria? I would love to hear your feedback on this and if you would like to talk more about this, please let me know.

I hope to hear from you soon.

Best,
Darlene

Darlene Foley
< email address >

Appendix E

Follow-up Emails to a Referred Principal

<participant name>,

Thank you for agreeing to participate. We will need to set up an appointment for a face-to-face interview. The interview takes about an hour, but in some instances, it has taken 75-90 minutes. My schedule is flexible the week of December 14th with the exception of Tuesday morning.

I look forward to hearing from you.

Best,
Darlene

<participant name>,

Perfect! I will see you on <date> at <time>.

Here is the framework for the interview to help you prepare:
1. Tell be about this school in terms of demographics and structure
2. Tell me about your career and the motivations that led you to the principalship

The overarching research question is: What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS?

I am going to ask four open ended questions:
1. Can you tell me about your personal understanding experience with real-time collaborative tools and their applications for learning as outlined in the CCSS?
2. Do you see yourself helping teachers integrate real-time collaborative tools as outlined in the CCSS, and if so, how?
3. Can you tell me about helping teachers overcoming the barriers of student-centered approaches to technology integration, and helping them to do so?
4. Do you have suggestions and recommendations to principals who are trying to reach high-levels of technology integration?

Thank you for your time and I am truly looking forward to our meeting. Please let me know if you have questions.

Sincerely,
Darlene

Appendix F

CONSENT TO PARTICIPATE IN RESEARCH

Technology Resources Underutilized: The Principal's Role in Supporting High-Level Uses

You have been asked to participate in a research study conducted by Darlene Foley from the Educational Studies Ph.D. program at Lesley University. The purpose of the study is to learn from principals of middle schools that have high-levels of technology integration. You were selected as a participant in this study because you perceive that your school effectively integrates technology. Please read the information below and feel free to ask any questions or voice any concerns that you may have.

• This interview is voluntary. You have the right not to answer any question, and to stop the interview at any time or for any reason. The interview will take about 90 minutes. In some cases, a short follow-up interview may be needed to clarify information.

• You be compensated with a $25 gift card for this interview.

• Your participation and knowledge will contribute to the field of educational technology and principalship.

• The information you tell me will be confidential. You, your school, and the district will not be identifiable in the research.

• The interview will be recorded so that I can use it as a reference while proceeding with this study.

• Artifacts and documents to support the research questions may be collected and will only be collected with your permission. The information on the artifacts and documents such as names, school identity, and the district will not be identifiable in the research.

All interview recordings will be stored in a secure workspace for one year beyond the completion of the dissertation. All audio recordings will be deleted at that time, too.

I understand the procedures described above. My questions have been answered to my satisfaction, I agree to participate in this study, and allow this data to be included in the researcher's dissertation and any publications resulting from this study. I have been given a copy of this form.

Name of Subject _____

Signature of Subject _____ Date _____

Investigator Contact Information: Darlene Foley, dfoley5@lesley.edu

Please contact Nancy Wolf, Ph.D. with any questions or concerns. Email: nwolf@lesley.edu

If you think you have been treated unfairly, or you have questions regarding your rights as a research subject, you may contact either co-chairman of the Committee on the Use of Humans as Experimental Subjects, Robyn Cruz (rcruz@lesley.edu) or Terry Keeney (tkeeney@lesley.edu), Lesley University, 29 Everett St., Cambridge, MA 02138, phone 1-617-349-8517

Appendix G

Ethics Law for the Giving Gifts

To show my gratitude for participation, each participant received a $25 gift card at the time of the interview. The gift card did not violate state ethics laws since it was under $50 according to Massachusetts law and not greater than $25 according to Rhode Island law (State Ethics Commission, 2016; State of Rhode Island Ethics Commission, 2016).

Appendix H

Professional Standards for Educational Leaders and Primary Code Matrix

Standard Number and Title	Primary Codes													
	alignment	barriers	equity	expectations	family/community	learning communities	norms	own learning	prof. learning frequency	professional learning	vision/mission/core values	technology continuum	technology resources	Who supports technology?
Standard 1: Mission, Vision, and Core Values											•			
Standard 2: Ethics and Professional Norms		•		•			•							
Standard 3: Equity and Cultural Responsiveness		•	•				•			•				
Standard 4: Curriculum, Instruction and Assessment	•		•											•
Standard 5: Community of Care and Support for Students	•		•				•							
Standard 6: Professional Capacity of School Personnel						•		•	•	•				
Standard 7: Professional Community for Teachers and Staff						•	•							
Standard 8: Meaningful Engagement of Families and Community					•									
Standard 9: Operations and Management		•	•						•	•				
Standard 10: School Improvement												•		

Appendix I

Code Families

alignment

alignment_assessment

alignment_collaboration

alignment_curation

alignment_differentiation

alignment_engaged

alignment_feedback

alignment_presentation

alignment_problem/proj

barriers

barriers_fear/control

barriers_risk-taking

barriers_structural

barriers_technological/ease

barriers_TPC knowledge

equity

equity_PD

equity_pedagogy

equity_technology

expectations

expectations_ use peer pressure

expectations_dialogue

expectations_evaluation

expectations_use

expectations_use curriculum alignment

family/community

learning communities

norms

norms_dialogue

norms_risk-taking

norms_structural

norms_structural capacity

norms_structural relationships

norms_trust

own learning

professional learning frequency

professional learning

professional learning_co-teaching/collaboration

professional learning_mentor

professional learning_modeling

professional learning_observing

professional learning_PD

professional learning_pilot

professional learning_principal communication

professional learning_sharing

Professional learning_staff meeting

school vision/mission/core values

school vision/mission/core values_princ beliefs ldshp

school vision/mission/core values_princ beliefs peda

school vision/mission/core values_princ beliefs tech

technology continuum

technology continuum_organizational change

technology continuum_pedagogical shift

technology continuum_strategic implementation PD

technology continuum_strategic implementation Tech

technology resources

technology resources_courses for students

technology resources_management

technology resources_technical

Who supports technology in the building?

Who supports technology in the building?_administration

Who supports technology in the building?_coach

Who supports technology in the building?_students

Who supports technology in the building?_teachers

Appendix J

Code Family Assignment to Guiding Question

What actions, decisions, and relationships do principals perceive contributed to a classroom culture that utilizes high-levels of technology to meet the expectations of the CCSS in order to improve the learning process of students? The three guiding questions that focused my learning are:		
1. Tell me about your personal understanding of real-time collaborative tools and their applications for learning in order to meet the CCSS?	2. How do you see yourself helping teachers integrate real-time collaborative tools to meet the CCSS?	3. Tell me about helping teachers overcome barriers to technology integration?
alignment	prof lrng frequency	prof lrng frequency
alignment_assessment		
alignment_collaboration	professional learning	professional learning
alignment_curation	professional learning_co-teaching/coll	professional learning_co-teaching/coll
alignment_differentiation	professional learning_mentor	professional learning_mentor
alignment_engaged	professional learning_modeling	professional learning_modeling
alignment_feedback	professional learning_observing	professional learning_observing
alignment_presentation	professional learning_PD	professional learning_PD
alignment_problem/proj	professional learning_pilot	professional learning_pilot
	professional learning_princ communication	professional learning_princ communication
own learning	professional learning_sharing	professional learning_sharing
	Professional learning_staff meeting	Professional learning_staff meeting
school vision/mission/core values		
ldshp	expectations_ use peer pressure	barriers (misc)
school vision/mission/core values_princ beliefs peda	expectations_dialogue	barriers_fear/control
school vision/mission/core values_princ beliefs tech	expectations_evaluation	barriers_risk taking
	expectations_use	barriers_structural
technology continuum	expectations_use curriculum alignment	barriers_technological/ease
technology continuum_organizational change		barriers_TPC knowledge
technology continuum_pedagogical shift	norms	
technology continuum_strategic implementation PD	norms_dialogue	norms
Tech	norms_risk taking	norms_dialogue
	norms_structural	norms_risk taking
family/community ties	norms_structural capacity	norms_structural
	norms_structural relationships	norms_structural capacity
	norms_trust	norms_structural relationships
		norms_trust
	learning communities	
		learning communities
	technology resources	
	technology resources_courses for students	equity
	technology resources_management	equity_PD
	technology resources_technical	equity_pedagogy
		equity_technology
	Who supports technology in the building?	
	Who supports technology in the building? Admin	Who supports technology in the building?
	Who supports technology in the building? coach	Who supports technology in the building? Admin
	Who supports technology in the building? students	Who supports technology in the building? coach
	Who supports technology in the building? teachers	Who supports technology in the building? students
		Who supports technology in the building? teachers