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The Effect of Coaching on Teachers’ Instructional Technology Use in a 1:1 Environment

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The Effect of Coaching on Teachers’ Instructional Technology Use in a 1:1 Environment

By

Michael L. Mitchell

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The Effect of Coaching on Teachers Instructional Technology Use in a 1:1 Environment

ABSTRACT

Current research has reported the benefits of integrating technology into the learning experience for students to promote greater engagement and collaboration. Schools across the country have begun implementing one-to-one learning environments in which each student uses a mobile computing device. However, use of technology in the classroom has failed to produce the expected transformational benefits. In order for technology to be integrated effectively, current research suggests that teacher pedagogy must adjust to the one-to-one classroom approach, and requires professional development to facilitate growth in their instructional practices while integrating technology. Research shows that coaches working one-to-one with teachers can be effective in bringing about the evolution of instructional practice needed to reap the benefits of technological integration in the classroom.

The purpose of this quantitative study is to determine the extent to which access to a technology coach or technology integration specialist affects the instructional practices of teachers in a 1:1 environment. This study builds on the research of Joyce and Showers (2002) and Knight (2007), which illustrated the effect of coaching on teachers, though not in the context of teachers’ ability to innovate instruction in a 1:1 environment. This study’s sample consisted of 320 certified middle school and high school teachers from sixteen middle schools and sixteen high schools in New Jersey that reported using a 1:1 teaching approach. Each participating teacher completed a 49-question survey, including 9 questions related to the quantity and type of coaching teachers received in the last twelve months, teachers’ professional and personal characteristics (including years of teaching experience, teacher content area, grade level, and gender), and the schools’
organizational characteristics, including school size and type. It also included 40 questions that measure the level of teaching innovation with technology using the Levels of Teaching Innovation (LoTi) survey.

The results of the study revealed no statistically significant difference in level of technology integration as measured by LoTi between the teachers who had technology coaches and those who did not. The other control variables, personal characteristics and organizational characteristics, failed to yield a statistically significant difference, with the exception of medium-sized schools. However, while the association between coaching and technology integration did not attain statistical significance, the findings suggested that who had coaches were likely to score higher levels on the emerging categories of the LoTi instrument: awareness, exploration, and infusion. This study also revealed that over 90% of teachers reported meeting with their coaches only several times per month or less frequently. Furthermore, close to 80% of teachers surveyed reported meeting with coaches for a duration of less than one hour per month. These results indicate that if schools choose to invest in a technology coach, the continued involvement of administrators is needed to ensure the effective use of technological coaching as a tool to facilitate innovating instruction in a 1:1 environment. Coaches must be included as part of an interdisciplinary and cross-curricular team of professional development providers. This inclusion increases the probability that teachers acquire an understanding of the interrelatedness of technology, pedagogy, and content knowledge, which in turn allows them to integrate technology into their teaching in more relevant and meaningful ways.
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Finally I want to thank God for carrying me through this doctoral program. I pray that what I have learned through this process will help make me a better servant for you and the important work we are called to do with our gifted time.
DEDICATION

To my wife, Lynn, for your unconditional love, support, and patience with me.

To my children, Meredith, Charlotte, and Patrick, always know that learning is an exercise that requires resilience and being willing to live outside your comfort zone, for that is where our growth comes from that helps us love and live more fulfilling lives.

To my mother, Bonnie, thank you for your love, support, and for always providing me with opportunities to pursue my dreams and passions in school and outside of it. I am both blessed and fortunate to have you as my Mom.

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In memory of my grandparents:
To Hazel Mitchell, you were such a compassionate loving grandmother who always smiled and reminded me that I was a “good boy” even when I was naughty!

To Luther Mitchell, you were legally blind as a child, but were resilient enough in life to find love, marry and raise my amazing father.

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Chapter 1

Introduction: Problem Background

Today, the majority of students want to engage in active learning. Students want to be challenged to think, and to solve problems that are not easily solved. It is important to students that what they are learning is relevant, and that they know why they are being asked to learn something. In order for this kind of engaged learning to occur, technology and its accompanying resources can be used to establish learning environments that students find engaging and relevant (Wagner, 2014, pps. 99, 26). Schools across the country have been implementing a one to one learning environment, where each student uses a mobile computing device. A question that naturally arises from this shift in the learning environment is: What does learning look like when each student has a technological device to communicate, collaborate, create, and learn?

The ubiquity of technology allows students across the globe to connect and learn like never before. These students around the world desire the same jobs and lifestyles of their American counterparts. With technology in hand, they can more easily attain these jobs and lifestyles (Greaves, 2012). Yong Zhao (2012) discusses the need for a different kind of learning for our students in the context of global competition in his book World Class Learners: Educating Creative and Entrepreneurial Students. He argued that if the United States continues to attempt to compete with globe continuing to use the same metrics of high stakes testing, American students will lose: “If all children are asked to master the same knowledge and skills, those who cost less will be much more competitive than those who cost more” (Zhao, p. 43). As Seymour Papert remarked, “It is no longer good enough for schools to send out students who know how to do what they were taught. The modern world needs citizens who can do what they were not taught. We call this learning learning” (Greaves, xvi.). Former Governor of Maine elaborated on Paper’s suggestion: “To achieve this, we need change that is big and
transformational, not gradual and incremental. It means twice the educational output, however measured, at something less than today’s cost. And it means education that is at once more rigorous and more engaging, more collaborative and more inclusive” (Greaves, xvi). Research points to the benefits of integrating technology into students’ learning experience to promote greater engagement and collaboration. The more K-12 teachers use technology in the classroom, the more they begin to witness the strong positive effects of integrating technology on student learning and engagement (Grunwald, 2010).

Currently, school districts spend more than $3 billion per year on technology related resources (Herold, 2015). Despite the increased spending on devices, the evidence shows that teachers have been slow to transform their teaching practice (Cuban, 2006). The National Center for Education Statistics 2009 report on Teachers’ Use of Educational Technology in U.S. Public Schools supports this finding. Students are using technology to prepare written text, conduct Internet research, and learn or practice basic skills, rather than to create, design, produce, conduct experiments, or write blogs (NCES, 2009). When transformation does take place it is usually limited, incremental, and variable, perhaps having more to do with general teaching practice than technology use (Weston & Bain, 2010). More comprehensive technological integration into instruction and classroom learning should allow for a significant redefining of student learning and creation of new ideas and tasks not possible in the absence of technology (Jacobs-Israel, M., & Moorefield-Lang, H. 2013).

While teachers report that increased use of technology leads to greater benefits to student learning, they also acknowledge the vital need for training when it comes to effective integration of technology (Grunwald, 2010). Research also tells us that teachers who are more socially savvy, or who can negotiate the social aspects of their school culture, are more likely to integrate
technology in a transformative way. Socially savvy teachers are aware of the social dynamics of their schools, and know where to find the type of support needed for transforming their instruction (Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L., 2002).

The use of technology coaches in classrooms is on the rise. While in the past coaches met with teachers outside of the school day to plan, rehearse, and reflect, they are now becoming a steadier fixture inside classrooms. Their role ranges from observing to co-teaching, as well as passing on their technological knowledge to improve teacher productivity and effective integration of technology to transform the way they teach (Flanigan, 2017). The research to date suggests that technology has failed meaningfully transform teaching practice, despite its presence in the classroom. However, there a gap in literature exploring the impact of coaching on teachers’ ability to transform the learning in a 1:1 environment.

**Statement of Problem**

A 2010 study commissioned by the Richard W. Riley College of Education and Leadership at Walden University reported that teachers who use technology frequently to support learning in their classrooms report greater benefits to student learning, engagement, and skills than teachers who spend less time using technology to support learning, particularly in the area of 21st century learning (Grunwald, 2010). While schools continue to place technology in the classroom in the hope that it will benefit teachers and students simply through its presence (OECD, 2010), the expected transformational benefits have not been realized (Cuban, 2006). Unless school districts change the processes they employ to integrate technology, sustainable innovation will not occur. Rather than introducing opportunities to rethink practices and learning designs, the integration of technology is far more likely to be used as an add-on to existing teacher workload. (Daniels, Jacobsen, Varnhagen, & Friesen, 2014).
Teachers who receive little to no professional development on technology integration rarely use tools such as laptops, Chromebooks, or iPads, rendering one to one initiatives ineffective (Brodzik, 2012). In order for technology to be integrated effectively, current research suggests that teacher pedagogy must evolve in the one-to-one classroom, which is made possible through professional development that facilitates growth in instructional practices while integrating technology (Stephens, 2012).

However, most attempts to change the status quo with respect to definitions of teaching are usually unsuccessful or limited to small scale endeavors (Elmore, 1996). Elmore (1996) remarks, “Innovations that require large changes in the core of educational practice seldom penetrate more than a small fraction of U.S. schools and classrooms, and seldom last for very long when they do”. The typical one-time conference sessions conducted in and out of schools are not very effective. This kind of professional development fails to garner more than a 10% implementation rate of the strategy, knowledge or skill teachers are provided with. Thus, it is not that teachers resist the change that the professional development promotes; rather, teachers resist poorly designed professional development programs (Knight, 2009).

Researchers have found that the most effective strategies involve working one-to-one with teachers when a change in instructional practice is sought. Those who work one-to-one with teachers—coaches—are effective at listening, demonstrating empathy, engaging in dialogue, and communicating honestly (Knight, 2000). A state-wide action research project, conducted by the North Carolina Governor and the North Carolina Department of Public Instruction (NCDPI), demonstrated that teachers found face-to-face meetings with coaches more helpful (79%) than online meetings (54%) with respect to receiving individualized and prompt feedback, provision of resources, and coach-led small meetings (Soni and Taylor).
There is an abundance of research exploring the impact of coaching in various content areas. For example, Truesdale (2003) studied differences between teachers who simply attended a workshop and teachers who attended a workshop and were then coached following the workshop. This study found that teachers who were coached were able to transfer the newly learned teaching practices, but teachers who only attended workshops and received no follow-up did not continue to implement what they learned. Similarly, a study by Knight and Cornett (2017) found that teachers who received coaching in addition to a workshop were significantly more likely to use the new teaching practice in their classes than teachers who attended a workshop with no follow-up coaching. However, scholarly literature has yet to investigate the role of coaching to determine how their role can impact the instruction and learning that occurs in a 1:1 environment. In particular, how does the role of the coach impact instruction and learning in the context of professional and personal characteristics of teachers being coached as well as the organizational characteristics of the school? Using the LoTi® (Levels of Teaching Innovation) Framework, this study will examine the effect of coaching on the instructional practices of teachers in a 1:1 environment.

**Purpose of the Study**

The purpose of this quantitative study is to determine the extent to which access to a technology coach or technology integration specialist affects the instructional practices of teachers in a 1:1 environment using the LoTi Framework as a measure of the dependent variable. The researcher will administer a survey based on the LoTi Framework to teachers in schools that have implemented a 1:1 initiative that has existed for more than one year. Teachers who have technology coaches (technology integration specialists or TIS) and meet with them will be compared to teachers without access to coaches in a 1:1 setting. As schools continue to place
more devices in students hands across New Jersey, this study aims to inform understandings of how schools can assist teachers to better leverage this technology to transform learning.

**Research Questions**

**Question 1.** Controlling for all other factors, is coaching significantly related to technology integration?

**Question 2.** How do other factors, including teacher and school characteristics, relate to technology integration?

**Question 3.** Among those schools with coaches, does the type of coaching (modeling; co-teaching; observing; planning) and amount of time spent with the coach affect technology integration?

**Significance of the Problem**

In the past twenty years, the federal government, via the No Child Left Behind Act and the Race to the Top initiative, both reauthorizations of the Elementary and Secondary Education Act (ESEA), have encouraged and offered funds for educational technology. While ESEA reauthorizations have primarily been a source of funding for preparing, training, and recruiting high quality educators via Title II funding, Part D of the Title II funding package, also known as the Enhancing Education Through Technology Act (EETT), has been the only source of federal funding in NCLB that specifically supported educational technology (Nagel, 2008; Part D-Enhancing education through technology, 2004; Title II-Preparing, training, 2004). This type of funding at the federal level demonstrates an understanding of the types of training teachers need to transition to 21st-century practices that will help students grow and develop 21st century skills.
More recently, the Student Support and Academic Enrichment (SSAE) program, authorized under subpart 1 of Title IV, Part A of the Elementary and Secondary Education Act (ESEA), as amended by the Every Student Succeeds Act (ESSA), is providing State educational agencies (SEAs), school districts, and schools the flexibility to shape investments based on the needs of their particular student populations (South, 2017). According to South (2017), “In addition to supporting a well-rounded education and safe and healthy schools, a portion of the SSAE program funds must be used for increasing effective use of technology to improve the academic achievement, academic growth, and digital literacy of all students. The U.S. Department of Education (ED) has issued guidance regarding the use of these funds”.

The Partnership for 21st Century Learning, P21, is another organization that recognizes a need for change in educational practice. The P21 was founded in 2002 as a coalition of the business community, education leaders, and policymakers to help influence teaching practices with a view to better preparing students for the future by kick-starting a national conversation on the importance of fostering 21st century skills. P21 has been a thought leader for 21st century readiness over the past decade and its members, which include the State of New Jersey, play an essential role in guiding policy and activities on 21st century readiness for every student. Members of P21 reinforce the mission of the organization in order to enact change at the local, federal, and state levels to shift the conversation for kids and ready them for leadership and to take on 21st century challenges through rethinking teaching and the skills students need to succeed (Dorame, K., 2017).

This investigation may benefit school districts currently employing a 1:1 approach, or considering a shift to a 1:1 environment, and seeking to provide meaningful rich professional development impacting teaching in way that transforms learning. According to the Hechinger
Report, districts spend on average $18,000 on professional development per teacher annually, yet only a small fraction of teachers improve with district-led professional development (Mader, 2015). It is beneficial to learn how to better utilize funds to transform learning, as well as to develop a better understanding of what effective professional development looks like—professional development that will assist teachers in transforming the way they teach. The question of whether technology integration specialists or technology coaches are effective at helping teachers innovate in their instruction is relevant to school districts, because it may justify the observed increase in technology integration specialists and the expectations for learning that come with placing a device in every student’s hands (Flanigan, 2017). In the end, if teachers are more receptive to coaches, they can help teachers transform their teaching practice, which may result in more innovative learning opportunities for students made possible via technological devices.

This study has the potential to offer insights useful to middle and high school teachers, in addition to school leaders, with respect to increasing technological integration and innovation using technology integration specialists or technology coaches. Analyzing the data from this study may help school leaders understand the effect of coaches on teachers who report low, moderate, and high on the LoTi Framework and make better decisions to improve and innovate instructional practices in 1:1 environments. As this study has shown, significant funds are being used to supply students with devices (Shapley et al., 2010). With this increase of technology in the classroom, schools have undergone a paradigm shift in how they deliver professional development to better integrate and innovate with technology (Plair, 2008). However, the traditional model of professional development comprised of workshops, seminars, and in-service days tends to be passive, intermittent, and lacking the continuity and collaborative effort that
teachers need and can receive from coaching, allowing them to develop the digital proficiencies required to integrate and innovate with technology (Plair, 2008; Stewart, 2014). While there is significant research dedicated to increasing levels of technology integration and innovation in schools, this study provides data regarding the impact of coaches on teaching instructional practices. The next chapter, Literature Review, will provide a survey of books, scholarly articles, and any other sources relevant to the many ways professional development is carried out in schools. In doing so, the next chapter will provide a description, summary, and critical evaluation of the various works surveyed in relation to the research problem being investigated in this study. The following chapter, Research Method, will describe the actions this study took to investigate research questions outlined in Chapter One, and will provide the rationale for the choice of methodologies.
Chapter 2: Literature Review

Introduction

This chapter reviews selected literature related to professional development, job embedded professional development, instructional coaching, and the redefining of learning with technology via frameworks used to measure innovation, such as the SAMR model and the LoTI Framework. The literature reviewed will support the problem statement and research questions outlined in Chapter 1 of this research study.

This literature review draws on scholarly books, peer reviewed journals and articles, dissertations, and state websites. I used Seton Hall University’s library and virtual library to research and download peer reviewed journals and articles in addition to relevant dissertations. I also used Seton Hall University’s eRepository to research and download relevant dissertations written by Seton Hall graduates. Key words and/or phrases such as instructional coaching, technology integration specialists, innovation in instruction, the 4 C’s, and job-embedded professional development were used to guide my review of the literature.

Background of Study - Technology is Changing the World

We live in a transformational world in which technology is accelerating change and shifting the ways we communicate, create, collaborate and think. This raises questions concerning the implications of this shift for schools and the learning and teaching that occurs within them (Jacobs, 2010). Children will always need to learn to read, write and do math. However, reading, writing, and math are the product of social adaptation that occurred prior to the technological changes, innovations, and inventions we live with daily (Jacobs, 2010). Literacy in 2017 involves more than the traditional components of reading, writing, and arithmetic that students of the 20th century were taught in their schools (Sadik, 2008; Schrum &
Levin, 2011). It is the nature and relevance of reading, writing, and math that change as we enter this new era (Jacobs, 2010). Students today need and want to be actively involved in gathering, analyzing, interpreting, synthesizing, and presenting information. Educational systems in the 21st Century must provide students with digital literacy skills (Prensky, 2008; Sadik, 2008; Solomon & Schrum, 2007). Social production and creation are examples of the type of digital literacy skills needed. In the last decade, the cost of publishing and reaching a global audience has dropped to zero with the vast majority of those producing and creating on the web being amateurs (Jacobs, 2010). Students will no longer be merely consumers of content; they will also be creators, so an education system that helps students foster these skills will better enable them to thrive in a changing world.

Since the beginning of educational history, teachers have been the curators and disseminators of content. The best technology that may have existed in past classroom for curating and disseminating information was the Encyclopedia Brittanica, a series of thick books with pictures. If a student wanted to learn, the teacher was the source of learning. Richard Elmore offers this perspective on the role of teaching; “The teacher, who is generally the center of attention in the classroom, initiates most of the talk and orchestrates most of the interaction in the classroom around brief factual questions, if there is any discussion at all” (Elmore, 1996). He adds that the teacher is the “main source of information”, and suggests that their job involves sharing this knowledge with students (Elmore, 1996). Today, access to information which was previously housed in the minds of teachers in the classroom, is now available to all students with a device that connects to the internet. Since information is everywhere, can be accessed at any time, through any number of portals, is dissemination of information the driving purpose of a teacher in the 21st century? In addition, technological change is not only the appointing of
students as content creators of content that about by technology but students can now collaborate and communicate in ways they never could before with cell phones, iPads, Chromebooks, and other devices that connect us to the web. Furthermore, technology in the hands of students impacts “real world” preparation; students from 1:1 high schools have been observed to outperform non-laptop students in 21st-century skills needed to be successful in the workplace and in post-secondary educational opportunities (Penuel, 2006).

1:1 is the term used to describe environments in which each student in a school has an internet-connecting computing device at their disposal. The growth of schools that are 1:1 are growing each year. Molnar (2015) suggested that by the 2015-16 school year, more than 54% of schools will be 1:1. As the number of devices in student’s hands change, will the role of teachers change in response to the increasing ubiquity of internet-connecting computing technology? How prepared are teachers to lead and teach in a world that does not require them to be curators and disseminators of content?

According to Alan November regarding 1:1 schools, “In every case of failure I have observed, the one-to-one computing plan puts enormous focus on the device itself, the enhancement of the network, and training teachers to use the technology. Then, teachers are instructed to go! But go where? That’s the critical question that must be addressed first” (November, 2016). He argues that in the absence of a fundamental change in the culture of teaching and learning, a 1:1 will not lead to significant improvement unless goals across the curriculum are implemented and met. The changes need to be not about the device; rather, a shift focusing on the limitless opportunities that a 1:1 can provide for student learning is needed (November, 2016).

Research reveals that the current model of technology professional development in-service sessions has had minimal impact on classroom technology integration (Darling-
Hammond et al., 2009; Schrum, 1999; SETDA, 2008). Larger, one-time professional development offerings often lack opportunities for teachers to follow-up or collaborate with one another on how to integrate technology into their lessons and daily instruction. Learning for teachers should be ongoing and include follow-up opportunities (Brooks-Young, 2007; Darling-Hammond et al., 2009; Levin & Wadmany, 2008). Collaboration between teachers can have a positive impact on the success of the professional learning a school provides for its staff (Bourgeois & Hunt, 2011; Foulger & Williams, 2007; Overbay, Mollette, & Vasu, 2011; Wright, 2010). In a 1:1 environment where students have access to limitless learning, professional development that focuses less on technology and more on pedagogy is key (Sykora, 2014). As Sykora (2014) remarks, “Technology is only effective as a learning tool when educators have the skills to use it in an instructionally sound and pedagogically effective way”.

Innovation

The process of adoption of innovation has been researched for over forty years, and Everett M. Rogers’ Diffusion of Innovation model is recognized as the most significant adoption model (Sahin & Thomson, 2006). According to Rogers (2004), diffusion of innovation refers to the process by which an innovation spreads through various communication channels between members of a social system. While the term “innovation” is used interchangeably with the term “technology” in the literature (Parashos & Messer, 2006), it is defined in Everett Rogers’ landmark research Diffusion of Innovation as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003, p.12). Parashos and Messer (2006) suggest that innovation is disruptive because it can lead to a redefining of ordinary procedures, and is sustaining when it leads to a better way of doing things. Lundblad’s study (2003) discusses innovation as the adoption and implementation of new ideas and processes.
According to Rogers (2003), once an individual experiences innovation, the adoption process begins; information is gathered, and the innovation is tested to see if it yields results worth the time and effort expended. Therefore, how the innovation is perceived by the adopters is significant. The studies of Wilson and Stacey (2004) and Loogma et al., (2012) speak to innovativeness as a behavioral change.

Several diffusion of innovation studies have found that 2.5% of teachers are classified as innovators, 13.5% are classified as early adopters, 34% are classified as early majority adopters, 34% are classified as late majority adopters, and laggards or late adopters comprise the final 16%. Rogers's (2003) findings stipulate that in order to diffuse the innovation, staff development needs should focus on individuals that fall into category of laggards and late majority. Roger’s research reveals that teachers will fail to adopt the innovation until the practices become a commonality in the teaching community (Rogers, 2003).

Zhao (2002) conducted a study investigating conditions that affect classroom technology innovations. The study examined factors affecting technology innovation in the classroom. These eleven factors the author identified fit into three domains: the innovator, the innovation, and the context of the innovation (Zhao et al, 2002). The first domain, the innovator, speaks to how proficiency with technology is an essential factor associated with the innovator teacher. Proficiency refers not only to teachers’ ability to use technology, but also to the conditions that may lead them towards integrating that technology (Zhao et al, 2002).

Innovation, the second domain, deals with implementation. Implementation varies according to distance and dependence. Distance refers to how close or far the desired innovation is from the culture of the school, current classroom practices, and availability of technological resources such as Chromebooks in a 1:1 (Zhao et al, 2002). Dependence refers to reliance on
people within or outside the innovator’s control. Zhao’s study (2002) found that innovations requiring little cooperation, participation, or support from others outside the control of the innovator were most successful when it came to integrating technology innovatively.

The third domain, the context of the innovation, refers to the human and technological infrastructure and social support. Ideally, an effective human infrastructure in a school would include a staff member that could help with understanding and using the technology effectively in instruction. It is also essential that this staff member can help translate how integrating the technology fits into teacher’s pedagogical practice (Zhao et al, 2002). Ultimately, schools that aim to innovate benefit from having the ideal conditions in place for implementing change. Among other factors, professional development, the system in place to support teacher learning, is essential to implementing technology integration in order to innovate instruction (Zhao et al, 2002).

**Professional Development**

Events such as the 1983 publication of *A Nation of Risk* as well as the *No Child Left Behind Act* provided an impetus for reform that led to the goal of improving professional development for teachers (Cornett & Knight, 2017). However, the implementation of professional development until that time was restricted to workshops, conferences, classes, and/or lectures provided by outside experts (Collinson & Ono, 2001). Darling-Hammond and Richardson (2009) called this kind of learning a “drive-by” approach to professional development. More recently, the focus on professional development has become so important that some states and districts have made specific types mandatory. For example, mentoring, a master’s degree, and/or an individual professional development plan are part of many states’ standards and policies. The rift between rhetoric (standards and policies) and the reality (teacher
practices) continues (Collinson & Ono, 2001). Cole (2004) elaborates on the problems associated with professional development (PD), stating that most formal PD training is development for performance in acquiring knowledge, skills, and attitudes as opposed to development of performance that supports a change in practice. Furthermore, if the goal of PD is to support teachers in optimizing student learning, it follows that PD should provide teachers with the tools to improve their teaching practice (Cole, 2004). Similarly, Harvard professor Richard Elmore (1996) points out:

Innovations that require large changes in the core of educational practice seldom penetrate more than a small fraction of U.S. schools and classrooms, and seldom last for very long when they do. By “the core of educational practice,” I mean how teachers understand the nature of knowledge and the student’s role in learning, and how these ideas about knowledge and learning are manifested in teaching and classwork. The “core” also includes structural arrangements of schools, such as the physical layout of classrooms, student grouping practices, teachers’ responsibilities for groups of students, and relations among teachers in their work with students, as well as processes for assessing student learning and communicating it to students, teachers, parents, administrators, and other interested parties.

Michael Fullan argues that teachers must be able to learn in the setting in which they work. This requires professional development that identifies the learning needs of each individual, and responds accurately with focused instruction and professional learning to meet those needs of those teachers (Fullan, 2016). He also remarks, however, that workshops or professional development opportunities taking place outside of the classroom often fail to produce significant changes in teacher practice when teachers return to the classroom (Fullan,
as cited in Collinson & Ono, 2001, p.230). A change in teacher practice is key, and should be made the focus of professional development activity.

Linda Darling-Hammond’s research also confirms this. Only a small minority of teachers participated in the kind of sustained and continuous professional development that was seen to produce a change in teaching practice and lead to an improvement in student achievement. A recent study from 2008 showed that a majority of teachers in the United States received yearly professional development in the form of workshops that took place within time frames of eight hours or less. Studies have shown that professional development conducted in time frames shorter than fourteen hours appear to have no effect on teacher effectiveness. This suggests that not only is the kind of professional development teachers receive important, but time allocated for it is equally crucial in shifting teacher practice (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

As it relates to integrating technology into teacher instruction, professional development exists to support teachers. However, knowledge gained through professional development is often not transferred to the classroom (Plair, 2008). When knowledge and practices regarding technology integration are not accepted or adopted, no change will occur in classroom practice (Wiske, Perkins, & Spicer, 2006). A more recent study by Ertmer and Ottenbreit-Leftwich (2010) also argues that today’s teachers fail to harness technology to its full extent and to meet expectations concerning technological integration. The most significant challenge associated with integrating technology takes after the professional development session ends and implementation begins (Guskey, 2000).

Professional development in general is vital for teachers to learn how to effectively embed 21st century knowledge and skills into their instructional practices and curriculum (Kay &
Honey, 2006). The U.S. Department of Education (2010) has acknowledged the need for sustained, school-based professional development programs that prepare teachers for technology integration. Research conducted by the Department of Education reveals that when teachers are provided the opportunity to learn and practice new instructional strategies before implementing them in the classroom, student learning is improved (U.S. Department of Education, 2005).

Studies exploring the use of professional development for technology integration have identified some core features that improve its application to classroom practice and curriculum. One of these features to is focusing on content, which includes subject matter, technical, and pedagogical concepts (Curwood, 2011; Desantis, 2012; Gerard et al., 2011; Unger, 2012). Another feature is providing access to current technologies (Lawless & Pellegrino, 2007). The need for a shared vision and technology plan is also essential (Desantis, 2012; Unger, 2012). Teachers also need to be provided with time to explore, implement, and evaluate (i.e., reflect on) what they have learned (Borko et al., 2010; Desantis, 2012; Gerard et al., 2011; Rives, 2012).

Meanwhile, around the globe teachers engage in professional learning far more than teachers in the United States. In other countries, time is set aside for professional development during the work day. This is possible because in most European and Asian Countries, instruction takes up less than half of a teacher’s working time, leaving far more time for the kind of professional learning necessary to transform teacher practice (NCTAF, 1996, OECD, 2006).

Schools in Denmark, Finland, Hungary, Italy, Norway, and Switzerland provide time each week for teachers to collaborate with one another on issues related to instruction (OECD, 2004). In Finland, teachers meet once week in the afternoons to plan and create curriculum. Schools within these areas are encouraged to not only share their work, but also to find time to collaborate. Among other OECD nations, professional development is built into every teacher’s
work day or week in more than 85 percent of schools in Belgium, Denmark, Finland, Hungary, Ireland, Norway, Sweden, and Switzerland (OECD, 2004). Building time for professional development into teachers’ schedules means that their learning “can be ongoing and sustained and can focus on a particular issue or problem over time” (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

In Asian countries such as Japan, Singapore, and South Korea, we find similar professional development practice. For example, In South Korea teachers spend 35% of their work time teaching, with their remaining time dedicated to collaborative planning, lesson study, peer observation, and action research (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

In the United States, the majority of teacher work time is spent on teaching or instructional hours. Teachers have little remaining time to interact with colleagues, and are not expected to disseminate their knowledge or learning (Little, 1987). Teachers on average have three to five hours per week to plan lessons, which is usually done independently (NCTAF, 1996). In the United States, teachers devote far more time over the course of an academic year to instructional hours (1080 hours) with students than any other OECD nation, which average 803 hours in primary schools and 664 hours in secondary schools (OECD, 2007). The net result of this is that U.S. teachers have far less time to plan, learn together, and develop high-quality curriculum and instruction than other OECD countries (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

While finding time for professional development presents a problem for U.S. schools, the results of some studies have identified strategies that have been shown work in this kind of environment. While there is no single model for effective professional development in the
United States or around the globe, certain features are essential for enhancing teacher practice and professional learning (Seed, 2008). One of these features is collaboration, which is mentioned in almost all research on the subject as a key component for implementing effective professional development (Wei, Andree, Darling-Hammond, 2009). It is also essential for improving teaching (Brownell, 2006). Another feature for enhancing teacher practice and professional learning is empowerment (Seed, 2008). Teachers who are empowered are more likely to improve their teaching practice. “Teachers who are empowered become involved in such activities as hiring staff, determining budget priorities, planning professional development activities, and evaluating teaching” (Keiser, Shen, 2000). Empowered teachers tend to assume roles such as team leader, action researcher, curriculum developer, and in-house trainer. This involvement and increased responsibility in their school’s decision-making process leads to improved morale and helps to generate better solutions to the problems teachers encounter (Seed, 2008). Lastly, reflection is a common feature found in professional development that enhances teacher practice and professional learning. The reflective practice empowers teachers to carefully consider their current teaching practice and to explore and envision new and innovative approaches to how they teach, assess, and develop curriculum. This practice begins with the belief that the teacher’s efforts are worthwhile, which encourages them to carefully examine their actions and thought processes. Additionally, when teachers share their reflections, it helps to promote empathy and create a positive school climate (Langer, Colton, 1994). Reflection is also a vital part of the relationship between coach and teacher.
Job-Embedded Professional Development

According to the National Comprehensive Center for Teacher Development, job embedded professional development for teachers is defined as school-based or classroom-based teacher learning that is grounded in day-to-day teaching practice and intended to enhance teachers’ instructional skills for the purpose of improving student learning (Darling-Hammond and McLaughlin 1995, Hirsh 2009). Job-embedded professional development is learning that occurs as while educators are engaged in their daily work activities. This kind of professional development can be formal or informal and can includes discussion with others, coaching, mentoring, study groups, and action research (Galloway, 2002) The term “job-embedded professional development” comes from research on the most effective practices derived from staff development. The concept of job-embedded staff development is not new. What is new is identifying and utilizing job-embedded methods (Sparks, 1997).

Another way of understanding job embedded professional development comes from the Mid-Atlantic Comprehensive Center and the National Staff Development Council. They suggest that job-embedded learning can be conducted in a range of ways and can be applied in a range of situations. For example, it can be conducted in real time in the classroom with students, or it can take place in the classroom without students present. It can be conducted before or after instruction without students present (Croft et al. 2010). In other words, job embedded development is designed to be dynamic and, to some degree, an attempt to differentiate and personalize professional development to provide the educator with the knowledge, practice, and learning styles best suited for them and the environment in which they teach (Owens, Pogodzinski & Hill, 2014).
The research of Guskey and Yoon (2009) found that four requirements must be in place for job-embedded professional development to be effective. The first requirement is that measurable goals must be established for professional development, and assessment must be used to measure its impact. The second requirement is that before adopting professional development, schools must examine research that supports its implementation. The third requirement is that new strategies should be piloted in small groups to minimize wasted resources.

Macneill, Cavanagh, and Silcox (2005) conducted research on the role of leadership in job-embedded professional development. Their study illustrates the importance of taking an instructional leadership role and building a distributive leadership community of teachers (Macneill, Cavanagh, and Silcox, 2005). Distributed leadership helps to foster the job-embedded collaborative support necessary for the implementation of new teaching strategies (Spillane, 2006). In addition, teachers’ coaching or mentoring role is essential to generating the kind of sustained impact professional learning can provide other teacher participants. Lastly, the research of Yost, Vogel, and Liang (2009) provided evidence that job-embedded professional development positively impacts teacher efficacy and student learning.

Relevance is one of the important criterion for job embedded professional development. This is due to the fact that adult learners have unique learning needs (Garet et al. 2001, Zepeda 2012). Therefore, professional development must align with these needs in order to be relevant. (Knowles, 1980, Dalellew and Martinez 1988, Zepeda 2012). Knowles (1980) coined the term ‘andragogy’ to describe the ways in which adult learning differs from child learning. Effective andragogy seeks to accomplish for adults what sound pedagogy accomplishes for children. Adults in a work setting tend to represent a wider range of age, experience, skills and other
characteristics than do the more common age-cohort-based groups of children in schools. Thus, methods employed for adult learning should both acknowledge and capitalize on adult learners’ diversity (Zepeda 2012).

While adult learning needs and the approaches used to teach them differ, Knowles et al. (2005) asserted that adult learners tend to share common motivations such as success, value, and enjoyment that are linked directly to their work experiences. Dalelew and Martinez (1988) described common principles of adult learning that include self-direction, relevance to current work/life situation, and life experiences that shape current readiness to learn. Zepeda (2012) asserted that job-embedded learning must be relevant to the work needs of adults, based in the context of the work setting and tied to specific student learning outcomes. She noted that job-embedded learning happens more readily when opportunities for such learning are efficient and relevant. Professional development policies should include data collection and analysis to ensure that the professional development is relevant to adult learning needs (Blank et al. 2008, Wenglinsky 2000, Garet et al. 2001, Zepeda 2012).

According to research from Dennis Sparks, the emeritus executive director of the National Staff Development Council, 80 percent of professional development should be school-based and job-embedded. Only 20 percent should be dedicated to formal training sessions (Mather, 2000). It is necessary for school-based professional development programs to move away from formal one-day workshops and begin providing the majority of professional development within the context of the school (Sparks & Hirsch, 1999). Personalizing professional development in this manner allows teachers to collaborate and solve problems they face daily in the classroom together (Davies, 2011).
The research of Garet, Porter, Desimone, Birman, and Yoon (2002) reveals how job-embedded professional development is effective in changing teachers’ knowledge and classroom practice. Their research states that job-embedded professional development provides opportunities for active, hands-on learning with a focus on specific learning goals; participation of groups of teachers from the same school, grade, or subject; and professional development that is sustained and not limited to a “one-and-done” workshop. Windschitl and Sahl’s (2002) research found that teachers often learned about technology integration through more formal and traditional professional development programs. However, teachers learned how to integrate these new technologies into instruction through informal conversations with colleagues that happened as a result of job-embedded professional development or coaching.

Some other suggestions from a recent study on job-embedded professional development illustrate the extent of innovation that is possible when technology is integrated effectively (McGinn and Song, 2018). McGinn and Song (2018) recommended that teachers should observe fellow colleagues integrating technology into their classrooms, collaborate with more innovative teachers to help design lesson plans leveraging technology, participate in the many professional learning communities found on social media to arrange regular meetings and receive technological and pedagogical support, and seek support from a technology coach acting as a co-teacher in a lesson integrating technology (McGinn and Song, 2018).

It is worth noting that recently, some unique approaches to job-embedded professional development have suggested that teachers use the 21st century skills they aim to foster in their instructional practices and curriculum as their professional development practice. Research conducted by Rybakova and Witte (2016) centered on this idea that professional development should not only embody content related to instructional technology and digital tools, but should
also be embodied through the use of these 21st century tools. In this study, participating teachers used blogging as their digital tool of choice. Their study provided evidence that supported the effectiveness of learning 21st century skills by practicing them. The teachers who chose to participate in blogging were engaged in the very practices that researchers from the NCTE (2013) outlined as necessary for successful professional development: engaged, extended, and collaborative practices.

Dousay, et al. 2018 conducted a study that also exemplifies teacher job-embedded professional development fostered through the practice of skills teachers seek to incorporate, which highlights the use of social media for professional development. Boyd (2015) was among the first to report a shift from discouraging and dismissing social media to embracing its role in the digital world. Grosseck and Holotescu (2008) were among the first researchers to share the value of Twitter as an educational tool. A few years later, the research of Forte, Humphreys, and Park (2012) found that teachers were found to be early adopters of social media for learning because it helped them form and establish PLCs. The authors remarked, “It is within the idea of PLCs that specific notion of teacher professional development emerged. Specifically, popular media outlets, like Edutopia, and professional organizations, like the International Society for Technology in Education (ISTE), emerged as vocal proponents for Twitter chats to bring together educators and administrators for real time, just in time learning” (Forte, Humphreys, and Park, 2012). A few years later, the State of Wyoming actually approved the awarding of professional development credit to teachers who engage in Twitter chats (Wyoming Department of Education, 2015).
Coaching

In 2004, the Annenburg Institute for School for School Reform released a comprehensive study on instructional coaching that outlined the importance of coaching as a professional development model. Coaching is derived from a body of research that suggests professional development is most effective occurs when it happens in the school and is embedded in the work of the teacher, as well when it increases teachers’ understanding of their work they are being asked to do (Miller 1995). The research also tells us that when support is collaborative and designed to meet to the needs of teachers, teaching methods are more likely to improve (Darling-Hammond and McLaughlin 1995). The support that coaching provides helps to build leadership and continuously improve teacher instructional capacity due to the embedded nature of the work and people engaged in it (Barr, Simmons, and Zarrow 2003).

The Annenburg research outlines some of the impacts of effective coaching. At its core, coaching should encourage a reflective and collaborative process between the coach and teacher (Annenburg, 2004). Through this process, effective coaching can shift learning away from the “sit and get” sessions that teachers often receive in workshops and conferences, which are removed from the practical context of what teachers do, towards a model where they can apply what they have learned with greater depth, frequency, and consistency, leading to an improvement in the teacher’s instructional capacity. (Neufeld and Roper 2003).

Effective coaching promotes positive cultural change and can be an impetus for shifting the culture of learning in a school, which may lead to positive changes beyond improving instruction. Teaching is often described as an isolated profession, but an effective coach can mitigate teachers’ feelings of isolation and help foster a positive school culture where teachers can improve their instruction practice (Neufeld and Roper 2003).
Effective coaching leads to an increase in teachers’ use of data to inform practice (Aguilar, 2013). The Annenberg report found that when coaching programs are guided by data, strategic areas of need, such as integration of technology, can become the focal point based on evidence (Aguilar, 2013). Coaches can be selected for their expertise and ability to meet the needs of the teachers, helping to grow the effective practice in those areas (Annenburg, 2004).

Coaching supports collective, interconnected leadership across a school system. Annenburg (2004) remarks, “An essential feature of coaching is that it uses the relationships between coaches, principals, and teachers to create the conversation that leads to behavioral, pedagogical, and content knowledge change” (Annenburg, 2004). Effective coaching structures advocate for a collaborative culture where significant numbers of teachers and other school personnel such as Principals, District Administrators, etc. feel ownership and responsibility for leading change in the ways of teaching and learning. Coaching attends to the “social infrastructure” issues of schools and systems, such as school climate, teacher isolation, insufficient support, and limited instructional leadership capacity that often make it more challenging to create deep and lasting changes (Payne 1998). In turn, schools can become organizations where the focus is on learning and growing instead of complying.

The research of Wilson and Alaniz (2015) revealed that coaches need to be seen as respected teaching colleagues with no assessment authority. Coaches must also establish trust with their teachers and find ways to build relationships with teachers by being inviting, empathetic and patient (Sugar, 2005). The coaching process needs to be a partnership. Both the coach and the teacher learn from each other when the coaching model works. Conversations should be focused on the learning goals, use supportive and cautious language, and maintain
respect (Knight, 2009). The coach becomes “not just a provided resource but also a co-planner, co-teacher and embedded professional developer” (Finch & Halter, 2011).

Elena Aguilar’s research and work showed that in order to develop and create an effective professional development program in a school, coaching must be part of the process. Coaching is able to have more of an impact on teachers changing the way they teach because it can accomplish what more traditional professional development struggles to accomplish. Coaching allows the time and space to delve into the intellect, behaviors, practices, beliefs, values, and feelings of a teacher, and creates relationships where the teacher feels cared for and is therefore able to access and implement new knowledge. A coach can help create the conditions where reflection and learning can take place, allowing the teacher to take risks in the way they teach (Aguilar, 2013).

As Jim Knight (2009) shared in his book *Instructional coaching: A partnership approach to improving instruction*, traditional professional development delivered in one-shot conference sessions both in and outside of the school is not very effective. Furthermore, this kind of professional development fails to get no more than a 10% implementation rate of the strategy, knowledge or skill being provided to the teachers. According to Knight, teachers criticize the lack of follow-up training for this type of PD as well. As a result, instructional coaches are another resource for schools to use due to their potential to improve teacher practices and student achievement increases (Knight, 2009). According to Knight (2009), one of the primary purposes of instructional coaches is to develop a rapport, or a business friendship, and to establish a point of entry to teachers’ classrooms.

There are several models of coaching used in American schools: cognitive coaching, literacy coaching, reading coaching, and instructional coaching. According to the research and
writing found in *Cognitive Coaching: A Foundation for Renaissance Schools*, cognitive coaching is predicated on the assumption that human behaviors change after their beliefs change (Costa and Garmston, 2002). In other words, people’s behavior is shaped by their perceptions, and in order for change to happen, a change in perception and thought is necessary. This is because human beings construct their own meaning through reflection and discussion with others. For this reason, cognitive coaches work with teachers to improve their ability to reflect in collaboration with teachers (Costa & Garmston, 2002, p.7). Costa & Garmston (2002) suggested, “Cognitive Coaching is non-judgmental mediation of thinking” (p. 12). These coaches learn to ask questions in a way that helps teachers think about their actions. They listen attentively and employ a wide array of communication techniques to build and sustain the kind of relationships necessary to do this work with teachers (Knight, 2009).

Instructional coaches are on-site in schools working with teachers to help implement research-based best practices. Their goal is to assist teachers in innovating how they teach through modeling, co-teaching, or observation. Excellent communication skills are vital to their ability to assist teachers in changing how they teach (Knight, 2009). Modeling occurs when the coach models exemplary practice, such as effective student engagement and instructional practice, inside the teacher’s classroom within the context of their daily experience. Co-teaching occurs when the teacher and coach engage in a co-teaching experience that embodies the essential elements of modelling and planning (Hatt, et al., 2013).

Pennsylvania conducted a case study beginning in the school year of 2006-07 on coaching and the integration of technology. Participating schools in the CFF project were provided with funding to support a half-time instructional technology coach. The coaches acted as guides and supports for other teachers to help them effectively integrate technology into their
lessons and create activities that engage and inspire learners. Initially, the CFF project began as a high school reform program that has expanded to grades 5–12. Over the four-year span of these case studies, more than 90 percent of the state’s eligible high schools have participated in the program (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011).

The results from this case study revealed that students spent less time in lectures and more time working independently and in peer groups on reports, projects, or presentations. The study also showed significant increases in the use of activities requiring higher-order thinking, such as project- and problem-based learning, and authentic learning. Additionally, the study provided anecdotal stories about how teachers were engaged in more professional learning communities and were more collegial and collaborative (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011).

In 2006, the Wyoming Legislature passed HB 139, which created a program that provided funding within the education resource block grants for school-based instructional facilitators and instructional coaches. In the fall of 2006, Laramie County schools received Instructional Coaches working with approximately 2300 certified and classified employees. The K–12 Laramie County District reaches into 33 locations covering 1529 square miles in the southeast corner of Wyoming (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011).

Under HB 139, existing Technology Coaches directly support Instructional Coaches in the district in their use of technology in classroom lesson design. The district believed that increasing the technology comfort level of our coaches would have a direct impact on the use of technology within the classrooms. The Technology Coaches were required to work with the Instructional Coaches a minimum of one half of their work day and spend the additional half of
their time working directly with classroom teachers, non-tenured staff, support staff, and administrators. While the district collected no formal data on the growth of coaches and their impact on teaching practice, it did report that they observed dramatic improvement (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011).

Other examples of the impact of coaches on teaching practice can be found all around the country. In a state-wide action research project established by the North Carolina Governor and the North Carolina Department of Public Instruction (NCDPI), teachers who received coaching reported that it made them more reflective practitioners and helped them change how they teach. In fact, the largest impact from this project was the teacher’s ability to better analyze how they teach and consider, as part of their craft, how students learn to inform their instructional practices (Soni and Taylor).

A study in Houston of both public and private schools from the years 2010-2015 examined teachers in a variety of disciplines and grade levels, and revealed positive effects associated with coaching on teachers’ ability to integrate technology, which enabled them to hear and see new teaching strategies the technology offered. The study also showed that the coaching led to a self-imposed accountability for teachers who were coached to implement the technology in a positive and collegial way. Because the coaching was not only one-on-one but also on-demand, time spent planning for integration was implemented immediately (Wilson and Alaniz, 2015). In this study, coaches spent up to 15 hours with each teacher they coached throughout the semester. When they met, the coach and teacher brainstormed ideas for technology integration, created a plan for using the technology, and implemented the integration into their lesson (Wilson and Alaniz, 2015).
Coaches used a five-step process to help facilitate technology integration coaching with teachers. The study showed that this process was effective with teachers regardless of their experience using the technology. The five steps included the following: 1) establishing the need, 2) creating the partnership, 3) brainstorming and targeting integration projects, 4) assessing the outcomes, and 5) reflecting. The next time the coaches met with their teachers, they repeated steps three through five in order to increase teacher confidence and efficacy, while also developing lessons through the leveraging of technology that increased student motivation, engagement, and achievement (Wilson and Alaniz, 2015).

Strudler and Hearrington’s (2009) research confirms findings from the studies conducted in North Carolina and Houston. Strudler and Hearrington found that “educators are more likely to incorporate technology into their instruction when they have access to coaching and mentoring” (p.6). Tennessee’s EdTech Launch program (2005) also found that coaches who offered just-in-time, personalized support for integrating technology showed heightened student engagement in their lessons as well as “enhanced utilization of technology by students in meaningful and intensive ways” (TnETL, 2005).

Wilson and Alaniz study reveals that how the teacher perceives the coach is important. Coaching that is more of a “guide on the side” and not the “sage on the stage” or sole expert, creates more of an equal relationship that promotes collaboration and a sharing of ideas between the coach and the teacher (Wilson and Alaniz, 2015). Furthermore, teachers are less likely to be passive learners mimicking what they see and hear from their coaches, and more likely to actively implement what they have seen and heard from their coaches. This process promotes a relationship where the coach and the teacher increasingly become participants, collaborators, and partners in the creation of knowledge (Knight, 2009). Beglau and his fellow researcher’s (2011)
research reveals that when teachers are given the opportunity to receive professional
development through coaching, they grow and develop the knowledge and skills as well as
confidence necessary to design and support the integration of technology into instruction that
maximizes and innovates the way teachers teach and students learn (Beglau, Hare, Foltos, Gann,
James, Jobe, Knight, and Smith p. 3, 2011).

Researchers Dawn Wilson and Katie Alaniz both found in their work as coaches that the
teachers they coached reported positive changes in teachers’ efficacy when they collaborated
with teachers to plan and implement ideas for technology integration (Wilson, Brupbacher,
Simpson, & Alaniz; 2013, Wilson, Brupbacher, Merrin & Woolrich; 2013). They also found
when teachers were provided the opportunity to apply their own creativity and ideas for lesson
planning while collaborating with a coach—instead of following procedures dictated by a
school’s guidelines for a professional development session—they were more likely to integrate
the technology into their instructional practice (Wilson and Alaniz, 2015). Planning in the
coaching model entails choosing evidence-based teaching strategies to meet student and teacher
needs. Planning allows time for teacher and coach to identify the target standards and learning
goals of their instructional practice (Hatt, et al., 2013).

Wilson and Alaniz concluded:

Coaching allows each coachee to grow at a pace that he or she is comfortable with yet
challenges them in a fun, supportive and comfortable manner with elements of
accountability. Barriers are reduced and comfort levels rise allowing the teacher’s own
creativity to bloom. Every learner, no matter their age, benefits from instruction that is
personalized, supportive, and tailored to meet the learner’s specific needs. There must be
a shift in professional development beliefs before lasting changes in behavior occur, and
coaching provides scaffolded assistance as the new tool use and strategies become internalized and lasting (2015).

**Personal Characteristics and Professional Development**

This study uses the personal characteristics of teachers as mediating or intervening variables in questions 2. Personal characteristics for the purpose of this study are years of teaching experience, content area, and gender. The following paragraphs will look at research regarding these characteristics.

**Years Teaching Experience.**

One of the first studies that looked at the years teaching experience and its relationship to innovating instruction was conducted by Guskey (1988). He reported that teachers’ experience was “not significantly related to any of the determinants of their willingness to implement instructional innovation” (Guskey, 1988). It was rather teachers’ sense of self efficacy that influenced their attitudes toward innovating instruction. However, a study from Ghaith and Yaghi (1997) found that teachers with more experience tended to be less inclined to innovate instruction. Accumulated teacher experience seemed to erode teacher enthusiasm for adapting new instructional innovations in the classroom (Ghaith and Yaghi 1997).

**Content Area.**

Lawless and Pellegrino’s (2007) research on use of professional development to integrate technology into teaching and learning provided some current research on the role of content. Their study states that in order to be better informed about the role of content taught in regard to technology integration, student assessment must be a key component. However, there is a lack of information regarding how students are integrating technology across content areas, so it is
difficult to determine whether any improvement in technology leveraging occurs as a result of teacher professional development (Lawless and Pellegrino, 2007).

Their study emphasizes that beyond effective professional development, there is a need to have access to data related to the landscape of technology professional development. For example, while it is logical that the manner and type of technologies integrated in social studies would differ dramatically from those used in science, it is not clear whether these differences are made explicit to teachers during professional development. In reverse, we also do not know the extent to which teachers transfer specific training across content areas. These same arguments can be applied to professional development for teachers whose students vary in terms of developmental levels (i.e., elementary, middle, secondary). To the extent that technology leverages different outcomes across domains and levels of learners, the professional development must also vary. (Lawless and Pellegrino, 2007)

Yuksel’s (2015) research on Rogers’ Diffusion of Innovation Model looked at innovation profiles with teachers and found that content area accounted for statistically significant differences. In this study, teachers were issued a self-reporting survey called the “Innovativeness Scale” developed by Hurt, Joseph, and Cook (1977). This instrument was used to measure innovation levels of participants. The study revealed that the content area of participants accounted for statistically significant differences in their innovation scores. Yuksel’s study confirmed similar results from studies by Greenhalgh et al. (2008), Loogma et al. (2012), Soffer et al. (2010), and Hug and Reese (2006). Those studies, like Yuksel’s, showed that teachers in different content areas are open to technology integration, tend to accept changes, and are not afraid of taking risks leading to more innovative instruction. Yuksel’s finding contradicted the
findings of Zakaria (2001), whose study found no significant difference between content area and innovation with technology integration.

**Gender.**

Heafner’s (2014) study explored the gender divide in secondary teachers’ perceptions of effective technology integration. Her study was significant because it found that “teacher gender differences identified in their research findings can at least partially be explained by the gender inequity in exposure to technology in K-12 schooling” (Heafner, 2014) where participants’ personal beliefs and behaviors were shaped. Therefore, gender is a relevant factor influencing how teachers integrate technology in their content area. This confirms what is found in the literature regarding gender and technology integration.

Studies conducted by Huang, Hood, & Yoo (2013), Lau and Yuen (2010), and Saglam (2011) found that gender is associated with technology integration. The research of Crocco, Cramer, and Meier (2008) suggested that gender is an acknowledgement of a cultural difference. The difference being that men and women are drawn to different attributes of technology, and therefore, do not share the same interests or ideas for how technology should be integrated.

Yuksel’s (2015) research on Rogers’ Diffusion of Innovation Model looked at innovation profiles with teachers and found that, similar to content area, gender accounted for statistically significant differences in how men and women innovated instruction with technology. The findings in Yuksel’s study were consistent with other studies such as Kavak and Demirsoy (2009) and Kilicer and Odabasi (2010). While current research has gender influencing how teachers innovate with technology in the classroom, Guskey’s (1988) study of teacher implementation of innovative instructional practices showed no significant differences when accounting for gender.
Organizational Characteristics and Professional Development

This study uses the organizational characteristics of schools as independent variables in questions 3. Organizational characteristics include school size and grade level. The following paragraphs examine the research in the context these characteristics.

School Size.

The research of Forkosh-Baruch, Nachmias, Mioduser, & Tubin (2005) details a study where data was collected focusing on innovative instructional practices leveraging technology. Their research found that school size is significant in influencing innovative instructional practices when certain factors are in place, including innovative leadership and a small school that facilitates cohesion and mutual influence among teachers. Wu, Hsu, and Hwang (2005) investigated the effects of school size on integrating technology in the classroom. Their study echoes similar research findings that suggested school size has impact on teachers’ innovation instruction through technology integration. Their study found that in smaller schools, teachers tended to have more positive attitudes about technology integration, and for this reason were considered better environments for innovation (Wu, H.K., Hsu, Y.S. & Hwang, F.K., 2005).

Grade Level.

A qualitative study conducted by Raby et al. (2010) sought to identify factors that influence technology integration. The findings reported that integrating technology at lower grade levels was more of a challenge than with older students. However, the results of a study by Welsh and Harnes (2018) contradicted those of Raby et al. (2010). Welsh and Harnes found that elementary and middle school teachers were more likely to innovate their instruction using technology than high school teachers. Both studies report grade level as a factor influencing
innovating instruction. In contrast, an older study by Guskey (1988) revealed that grade level had no impact on innovating instructional practices.

**Conclusion**

Research confirms that with the increasing number of devices in students’ hands, we are still not seeing an increase in levels of teaching innovation (Moersch, 2015). School districts spend on average of $18,000 per teacher each year on professional development, yet the instructional practices of teachers are not improving despite this district-led professional development investment (Mader, 2015). The goal of the coach is to assist teachers in innovating with respect to how they teach through modeling, co-teaching, or observation (Knight, 2009). The support that coaching provides helps to build leadership and continuously improve teacher instructional capacity due to the embedded nature of the work and people engaged in it (Barr, Simmons, and Zarrow 2003). Personalizing professional development in this manner allows teachers to collaborate and solve problems they face daily in the classroom together (Davies, 2011). The research also tells us that when support is collaborative and designed to meet to the needs of teachers, teaching methods are more likely to improve (Darling-Hammond and McLaughlin 1995).

The overarching goal of this study was to determine the effect of coaching on teachers’ instructional technology use. This quantitative study will help to determine if having a technology coach can lead to more innovative teaching approaches for teachers who teach in a 1:1 environment. It will also support school leaders in making decisions regarding whether or not to hire a technology coach, or in cases where the school already has a coach, how to use this resource more effectively in order to facilitate innovative instructional practices in their 1:1 classroom environments.
Chapter 3: Methodology

Overview

While spending on technology in classrooms continues to rise (Schaffhauser, 2016), the way teachers leverage technology to innovate instruction and the learning environment fall short of meeting the educational needs of 21st century students (Ertmer & Ottenbreit-Leftwich, 2010). Research shows that teachers are struggling to integrate technology to innovate instruction and learning (Ertmer & Ottenbreit-Leftwich, 2010). For example, using technology to promote more student-centered learning environments, a method considered a highly effective use of technology (Ertmer & Ottenbreit-Leftwich, 2010) and shown to improve student learning (ISTE, 2008), is rarely used. Since the role of the teacher is instrumental in determining the extent to which students benefit from using technology in schools, knowing how teachers can more effectively leverage these tools in their classrooms is vitally important, as more and more money is being spent on technology (Shapley et al., 2010).

According to Moersch (2015), despite the increasing number of devices in students’ hands, we are still not seeing an increase in the levels of teaching innovation. The purpose of this quantitative study is to determine whether having a technology integration specialist or a technology coach can lead to more innovative teaching approaches for teachers who teach in a 1:1 environment, versus teachers in a 1:1 environment without the influence of coaching using the LoTi survey as a self-reporting tool.

The purpose of the study is to measure the impact of the coach on teachers’ ability to innovate their instruction. A quantitative research design was best suited to answer the research questions, as prior research conducted by Bruce Joyce and Beverly Showers (2002) and Knight (2007) has demonstrated the effect of coaching on teachers, but not as it relates to their ability to
innovate instruction in a 1:1 environment (Marzano, 2013, Knight, 2007, Joyce and Showers, 2002). This is a correlational study attempting to establish non-causal relationships among the variables, with the LoTi score serving as the dependent variable, and independent variables including the technology coach or technology integration specialist, amount and type of coaching; and the potential mediating effects of the teacher’s professional and personal characteristics; and the school’s characteristics.

The LoTi Framework of Moersch (2015) has been used to measure extent of technology integration in instruction. Knight (2007) has shown the impact of instructional coaching on teachers’ practice. However, literature on this subject has yet to reveal the impact of coaching on teachers’ ability to leverage technology to innovate their instruction when every student has a device.

**Research Questions**

A quantitative study was used to address the research problems. In seeking to examine the effect of the coach, this study posed the following questions:

**Question 1.** Controlling for all other factors, is coaching significantly related to technology integration?

**Question 2.** How do other factors, including teacher characteristics and school factors, relate to technology integration?

**Question 3.** Among those schools with coaches, does the type of coaching (modeling, co-teaching, observing, planning) and amount of time spent with the coach affect technology integration?
Research Design

This study surveyed teachers in schools that have implemented a 1:1 initiative (that has existed for more than one year) using the LoTi Framework survey, a proprietary instrument designed to assess the degree of technology integration and innovation in the classroom. Teachers who have technology coaches were compared with teachers without technology coaches in a one-shot cross-sectional design to determine whether pedagogy changed when there was a computing device in every student’s hand—with or without the assistance of a technology coach.

The LoTi Framework survey is a research tool developed by the LoTi Connection consulting services organization. Over a period of twenty years, research has established it as a statistically-valid tool for achieving (1) content, (2) construct, and (3) criterion validity. It has also been used as a survey tool for action research in hundreds of dissertations. Using the LoTi survey and the LoTi framework, Levels of Teaching Innovation, this action research published has contributed to literature exploring how leveraging technology more effectively has led to an increase in innovative approaches to teaching and learning in schools (Moersch, 2017).

The Atkinson County School District in Georgia used the LoTi survey to measure the level of teaching innovation with technology. In this example, 81 teachers in the Atkinson County School district in Georgia were assessed and 47% of the participants were rated at a Level 2 or lower for Level of Teaching Innovation. This data helped the school district better prioritize professional learning opportunities for staff (Moen, 2015).

Sampling

A purposive sampling strategy was used to identify the population for this study. A preliminary survey was administered on the Google Plus Community NJ School Technology
Coordinators whose members include IT Specialists, Directors of Technology, Supervisors of Technology and Technology Coordinators from 629 districts in the state of New Jersey. The same survey was shared with the NJECC community at the 2018 February monthly meeting where our community members come for professional development. Based on these surveys, we identified:

- A total population of 2892 teachers in middle and high school in New Jersey who reported having a 1:1 environment with a technology coach: 1102 middle and 1790 high school teachers.
- A total population of 939 teachers in middle and high school who reported having a 1:1 environment but not a technology coach: 415 middle and 524 high school teachers. The population for this study thus consisted of 3,831 teachers in middle schools and high schools in the state of New Jersey who report working in a 1:1 environment and the entire population served as the sample. Criteria for inclusion in the population included being a certified teacher in a middle school(s) and high school(s) of the districts that had adopted a 1:1 environment. Because the research study involved self-reporting from school employees, permission from the superintendent from each district was not needed.

This study distinguished between sample size and effective sample size. Effective sample size describes the number of teachers who received the survey instrument. The original sample size of 3831 teachers was reduced to an effective sample size of 2499 teachers after accounting for various factors such as web filters, incorrect emails on school websites, etc. Out of the 2499 teachers who received the instrument, 320 responded, yielding a response rate of 12.85%. This sample (n=320) was used for the descriptive statistical analysis described in Chapter 4.
Instrumentation

Primary data was obtained through the LoTi Framework self-reporting online survey, which includes 40 questions that measure the level of teaching innovation with technology. In addition, the survey included nine items that assessed the amount and type of coaching: professional and personal characteristics, including years teaching experience, content area teaching, and gender; and organizational characteristics of the school, including school size and type of school. The survey included Likert-type items that measure frequency of innovative instructional practices from Never to A few times a month to Daily. LoTi granted approval for the use of their survey instrument, and method was approved by Seton Hall University’s Institutional Review Board.

Data Collection

Individual email addresses for middle and high school teachers were obtained from public records for each school district. The teachers identified via email addresses were cross-referenced with the district’s school website and used to ensure that each survey respondent met the study criteria: a middle of high school teacher in a 1:1 environment. Teachers were invited via email to participate in the voluntary study by completing the survey on Survey Monkey. The Survey Monkey link was included in the email invitation and provided access to the 49 question survey. The survey took on average 15-20 minutes to complete. Also included in the email invite containing the Survey Monkey link to the survey was a brief explanation of the study. An informed consent form reiterated for the participants that the research will remain anonymous, voluntary, and confidential. Participants in the study were allowed to request a final copy of the research findings via email once the study is completed.
Data Analysis

The scaled scores on each teacher’s LoTi survey was calculated for each of the 8 levels by adding the points from items that correspond with each dimension, and calculating a mean for each dimension. While the LoTi survey provided scores in 8 different levels, this study converted (transformed) the scores on the LoTi into a dichotomous variable for the inferential statistical analysis that used a binary logistic regression to test for significance. Levels 0-3 (Nonuse, Awareness, Exploration, and Infusion) were labeled as “Emerging” and level 4-7 (Integration Mechanical, Integration Routine, Expansion, and Refinement) were labeled as “Innovative”.

Research question 1 focused on determining, when all other factors were controlled for, if there were differences in levels of technology integration among teachers with coaches and without coaches as indicated by the teacher’s score on the LoTi instrument. A binary logistic regression was used to test for any differences in the levels of technology integration as indicated by the teacher’s score on the LoTi survey between teachers in schools with coaches versus teachers in schools without coaches.

Research question 2 focused on determining how other factors, including professional and personal and organizational characteristics, affect levels of technology integration among teachers in schools with coaches and those without coaches. These levels are indicated by schools’ scores on the LoTi instrument, controlling for individual teacher professional and personal characteristics and organizational characteristics. The professional and personal characteristics were as follows: years teaching experience, content area teaching, and gender. Content area was divided into three categories: ELA/Social Studies; Math Science; and Other Content. The organizational characteristics were as follows: school size and type of school
(middle school or high school). School size was divided into three categories for the inferential statistical analysis: small schools – 0-499 students; medium schools – 500-999; and large schools – 1000 and above. A binary logistic regression was used to test for any differences in levels of technology integration as indicated by school LoTi survey scores between teachers with coaches and without coaches, controlling for individual teacher professional and personal characteristics and organizational characteristics.

The variables used for the logistic regression analyses for determining the effect of the coach in questions 1 and 2 are listed below.

Dependent variable:
- LoTi Score

Independent variables:
- Coach or No Coach
- Hours Spent with Coach
- Years Teaching Experience
- Gender
- Content Area
  - ELA/Social Studies
  - Math/Science
  - Other Content
- School Size
  - Small Schools – 0- 499
  - Medium Schools – 500-999
  - Large Schools – 1000 and above
- Grade Level

Teachers who reported hours coached had the following options to choose from on the LoTi survey question that asked how many hours of coaching they receive: Every day; A few
times a week; About once a week; A few times a month; Once a month; Less that once a month. According to the National Council on Teacher Quality, the average K-12 teacher receives around 45 minutes of prep time per day (Nittler, 2016). This would allow the middle and high school teacher in a 1:1 environment with a coach to have the potential to receive 45 minutes of coaching each day. Using the average prep time of 45 minutes, hours of coaching were coded in the following manner: Every day = 15 hours a month; A few times a week = 9 hours per month; About once a week = 3 hours per month; A few times a month = 2.25 hours per month; Once a month = .75 hours per month; Less than once a month = .50 hours per month.

The 8 levels of the LoTi Framework Level of Teaching Innovation are defined below.

“0 - Nonuse - Instructional focus ranges from a direct instruction approach to a collaborative, student-centered learning environment. The use of research-based best practices may or may not be evident, but those practices do not involve the use of digital tools and resources.

1 - Awareness - Instructional focus emphasizes information dissemination to students using lectures or teacher-created multimedia presentations. Teacher questioning and student learning typically focus on lower cognitive skill development. Digital tools and resources are used for curriculum management tasks, to enhance lectures, or as a reward for students who complete class work.

2 – Exploration - Instructional focus emphasizes content understanding and supports mastery learning and direct instruction. Teacher questioning and student learning focus on lower levels of student cognitive processing. Students use digital tools for extension activities, enrichment exercises, or information-gathering assignments that generally reinforce lower cognitive skill development. Students create multimedia products to
demonstrate content understanding in a digital format that may or may not reach beyond the classroom.

3 – Infusion - Instructional focus emphasizes higher-order thinking (application, analysis, synthesis, evaluation) and engaged learning. Teacher-centered strategies include the concept attainment, inductive thinking, and scientific inquiry models and guide the types of products the students generated. Students use digital tools and resources to carry out teacher-directed tasks that emphasize higher levels of student cognitive processing.

4a – Integration (mechanical) - Students are engaged in exploring real-world issues and solving authentic problems using digital tools and resources, but the teacher may experience classroom management or school climate issues, such as lack of support from colleagues, that restrict full-scale integration. Teachers rely on prepackaged materials, assistance from other colleagues, or professional development workshops. Emphasis is on applied learning and the constructivist, problem-based models of teaching that require higher levels of student cognitive processing and in-depth examination of the content. Students use digital tools and resources to investigate student-generated questions that dictate the content, process, and products embedded in the learning experience.

4b – Integration (routine) - Students are fully engaged in exploring real-world issues and solving authentic problems using digital tools and resources. Teachers are within their comfort levels promoting inquiry-based models of teaching that involve students applying their learning to the real world. Emphasis is on learner-centered strategies that promote personal goal setting and self-monitoring, student action, and issues resolution that require higher levels of student cognitive processing and in-depth examination of the
content. Students use digital tools and resources to investigate student-generated questions that dictate the content, process, and products embedded in the learning experience.

5 – Expansion - Students collaborate beyond the classroom to solve problems and resolve issues. Emphasis is on learner-centered strategies that promote personal goal setting and self-monitoring, student action, and collaborations with other diverse groups, such as people from another school, another culture, a business, or a governmental agency. Students use digital tools and resources to answer student-generated questions that dictate the content, process, and products embedded in the learning experience. The complexity and sophistication of the digital resources and collaboration tools used in the learning environment are now commensurate with the diversity, inventiveness, and spontaneity of the teacher’s experiential-based approach to teaching and learning and the students’ level of complex thinking (analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.

6 – Refinement - Students regularly collaborate beyond the classroom to solve problems and resolve issues. The instructional curriculum is entirely learner based. The content emerges based on the needs of the learners according to their interests, needs, and aspirations and is supported by unlimited access to the most current digital applications and infrastructure available. There is no longer a division between instruction and digital tools and resources. The pervasive use of, and access to, advanced digital tools and resources provides a seamless medium for information queries, creative problem solving, student reflection, and product development. Students have ready access to, and a
complete understanding of, an array of collaboration tools and related resources.”
(Moersch, 2010).

Research question 3 focused on determining, among those schools with coaches, whether the type of coaching (modeling; co-teaching; observing; planning) and amount of time with the coach affect technology integration as indicated by the teacher’s score on the LoTi survey. A binary logistic was used to measure any differences in the levels of technology integration as indicated by teacher score on the LoTi survey in schools with coaches, controlling for type of coaching, hours spent with coach, years teaching experience, content area teaching, gender, school size, and type of school (middle school or high school).

The variables used for the logistic regression analysis in research question 3 for determining the relationship of coaching to the extent of teacher technology integration varied by organizational characteristics are listed below.

Dependent variable:
- LoTi Score

Independent variables:
- Teachers with Coaching
- Hours Spent with Coach
- Type of Coaching
  - Modeling
  - Co-Teaching
  - Planning
  - Observation
- Years Teaching Experience
- Gender
- Content Area
  - ELA/Social Studies
  - Math/Science
  - Other Content
- School Size
  - Small Schools – 0- 499
  - Medium Schools – 500-999
- Large Schools – 1000 and above
  - Grade Level

Internal validity is an essential component that should be maintained when conducting a study with missing responses or questions unanswered. Therefore, it was necessary to determine whether there was missing data, and if so, to determine how this study should record it. To address the issue of missing data in this study, a listwise deletion was used. This statistical technique eliminated cases with missing responses. With the elimination of missing responses, this study was left with a sufficient remaining number responses (n = 275) for analysis. This sample (n=275) was used for the inferential statistical analysis, which can be viewed in Chapter 4.

**Summary**

This chapter described the research design, research questions, sample, instrumentation, data collection procedures, and data analysis that were used in this study. According to Moersch (2015), with the increasing numbers of devices in student hands, levels of teaching innovation have not increased as expected. It is essential to investigate the effects of coaching in 1:1 environments to determine whether it increase teachers innovation in their instruction. This study explored whether access to a technology integration specialist or technology coach affects the instructional practices of teachers in a 1:1 environment using the LoTi Framework as a measure of the dependent variable.

**Limitations**

It is important to note that limitations in sampling may exist when surveying teachers via their school email address obtained from District websites. Web filters, inaccurate email addresses, and SPAM are some of the challenges this study faced reaching out to teachers intended to take this survey and provide data for the study. For this reason, this study will
distinguish between the size of the sample population and the effective sample size. The effective sample size is the number of respondents who actually received the survey instrument.

Perhaps the most significant limitation in this study is that the instrument used, the LoTi survey, was a self-reporting questionnaire. Self-reporting questionnaires can be limiting because they rely on the assumption of honesty of participants. Since this self-reporting questionnaire was administered online via the Survey Monkey tool, there was limited ability to prevent participants from providing spurious responses and skipping questions they may not have liked or understood. No one was there to explain any questions the participant may have had about particular survey questions. This potential for misunderstanding could have skewed the survey results.

This survey was distributed during a major holiday period (November and December 2018) which may have presented another limitation. It is possible that the response rate of 12.85% may have been higher had it not been distributed this time of the year. Missing data was also a possible limitation in this study. While the effective sample size was (n=320), the listwise deletion reduced the sample to (n=275) for the inferential statistics used in Chapter 4. It is also worth noting that the effective sample size of (n=320) and listwise deletion reducing the sample size for the inferential statistical analysis rendered the study sample size too small, and may be part of the reason no statistical significance was found.

This study also did not examine teachers’ beliefs and attitudes regarding technology. Research has shown that teachers’ adoption of innovative teaching practices with technology is correlated with teacher’s beliefs and attitudes about technology (Czerniak, Haney, Lumpe, & Beck, 1999; Demetriadis et al., 2003; Dwyer, Ringstaff, & Sandholtz, 1991; Gallini & Barron, 2001; Windschitl & Sahl, 2002). Guskey’s study (1988) also found statistically significant
correlations between perceptions of teachers that are generally associated with instructional effectiveness and attitudes toward the implementation of instructional innovation. Teachers who express a high level of personal efficacy and are confident in their teaching abilities tend to be most receptive to the implementation of new instructional innovations.

Lastly, 90.3% of the teachers who had coaches spent less than three hours per month with their coach. Research by Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) reports on the importance of time allocated in professional learning in order to shift teacher practice. French (1997) found teachers may need as many as 50 hours of instruction, practice, and coaching before a new instructional innovation is learned and implemented in the classroom. Furthermore, Joyce and Showers’ (2002) research revealed that teacher mastery of new skills and instructional strategies depends upon teachers having about 20 separate instances of practice. If the vast majority of teachers who had access to coaches did not spend significant time with their coaches, it is possible this factor may have contributed to results showing that teachers with coaches LoTi score did not improve.
Chapter 4: Data Analysis

Introduction

The purpose of this quantitative study was to measure, using the LoTi survey, the impact of coaching on assisting teachers to integrate digital technologies into their instruction. This was a correlational study that attempted to establish relationships among the variables. The dependent variable was the degree or level of technology integration (as measured by the LoTi score), and the independent variables were the amount and type of coaching, while teachers’ professional and personal characteristics and the school characteristics serving as mediating or intervening variables.

This chapter reports the findings of data analysis conducted for this study. Following a description of the characteristics of the sample of respondents, this chapter reports descriptive results from the LoTi survey on the dependent variable, or level of technology integration, and independent variables, including the type and amount of coaching, teachers’ professional and personal characteristics; and the school characteristics. Lastly, the this section reports the results of a binary logistic regression that tested the statistical significance of differences in the levels of technology integration in schools with coaches and without coaches, controlling for the professional and personal characteristics of the teaching staff as well as the school characteristics. This analysis addresses all three research questions based on the results of the total sample surveyed as well as the variables examined.

Sample Characteristics

This section of the chapter presents the characteristics of the teachers and their schools. The sample characteristics include: the number of teachers in middle and high schools who reported being in a 1:1 environment, the number and percentage of middle and high school
teachers with and without technology coaches and their characteristics (school affiliation, the percentage and frequency of gender, years teaching experience, content area of teaching, and size of school), and the sample number versus the effective sample number.

During the months of November and December in the 2018-19 school year, the LoTi survey was emailed or sent to 3831 teachers in 28 middle schools and 30 high schools in the state of New Jersey who reported working in a 1:1 environment. While 3,831 teachers had originally reported working in a 1:1 setting, only 16 middle schools and 16 high schools across the state of New Jersey responded to the survey for an effective total of 2499 teachers. Due to surveys being blocked by district internet filters, inaccuracies in email addresses on school websites, and schools misreporting having a 1:1 environment, the original sample size of 3831 was reduced to the effective sample size of 2499 teachers. Table 1 provides the data for the original sample of teachers with and without coaches, and the effective sample of teachers who actually received the survey instrument.

Table 1
Number of High Schools and Middle School Teachers with and without Coaches in a 1:1 in Population and Sample

<table>
<thead>
<tr>
<th></th>
<th>Total Number of Middle and High School Teachers</th>
<th>Number of Middle School Teachers with coach</th>
<th>Number of Middle School Teachers without coach</th>
<th>Number of High School Teachers with coach</th>
<th>Number of High School Teachers without coach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>3831</td>
<td>1102</td>
<td>415</td>
<td>1790</td>
<td>524</td>
</tr>
<tr>
<td>Effective Sample</td>
<td>2499</td>
<td>704</td>
<td>302</td>
<td>820</td>
<td>673</td>
</tr>
</tbody>
</table>
2499 teachers at 16 middle schools and 16 high schools actually received the survey. Out of the 16 middle schools, 9 had a technology coach or technology integration specialist, and 7 did not. Out of the 16 high schools, 9 had a technology coach or technology integration specialist, and 7 did not.

Tables 2-6 describe the characteristics of schools and teachers who responded to the survey. The 9 middle schools who reported having a technology coach or technology integration specialist had a population of 704 teachers, while the 7 middle schools who reported not having a technology coach or technology integration specialist had a total population of 302 teachers. The 9 high schools who reported having a technology coach or technology integration specialist had a population of 820 teachers, while the 7 high schools who reported not having a technology coach or technology integration specialist had a total population of 673 teachers. Although the survey was emailed to 2499 teachers, only 320 teachers (N=320) responded, yielding a 12.8% survey completion rate. Out of the 320 teachers who took the survey, 287 teachers answered the question concerning type of school. Out of the 287, 174 (60.6%) were teachers who reported working at middle schools and 113 (39.4%) were teachers who reported working at high schools. Middle schools included in this study offered grades 5 through 8, 6 through 8, and/or 7 through 8. These three grade configurations account for approximately 89% of all separately organized public middle schools in the country (McEwin & Greene, 2011).

Table 2
Characteristics of Teachers Who Received and Who Responded to LoTi Survey

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Coach Effective Sample</th>
<th>Coach Respondents</th>
<th>No Coach Effective Sample</th>
<th>No Coach Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle School</td>
<td>704</td>
<td>132</td>
<td>302</td>
<td>42</td>
</tr>
<tr>
<td>High School</td>
<td>820</td>
<td>57</td>
<td>673</td>
<td>56</td>
</tr>
<tr>
<td>Not Reporting</td>
<td>24</td>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
Out of the 320 teachers who took the survey, 286 teachers (N=286) answered the question on gender. Of this group of 286, 79 (27.6%) were men and 207 (72.4%) teachers were women. In both the Coach and No Coach categories, the majority of survey respondents were women. Table 3 provides data on gender of respondents.

Table 3

*Gender of Teachers who Responded to LoTi Survey in Percent (N=286)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>All N=286</th>
<th>Coach N=188</th>
<th>No Coach N=98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>27.6%</td>
<td>24.5%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Female</td>
<td>72.4%</td>
<td>75.5%</td>
<td>66.3%</td>
</tr>
</tbody>
</table>

Out of the total sample of 320 reporting teachers, 320 teachers (N=320) answered the question on years of teaching experience. Out of the 320 responses, the average amount of years teaching experience was 15 years. In Table 4, teachers were grouped into categories according to years of service.

Table 4

*Distribution of Years of Teaching Experience by Coaching Status in Percent (N=320)*

<table>
<thead>
<tr>
<th>Years Teaching Experience</th>
<th>All N=320</th>
<th>Coach N=213</th>
<th>No Coach N=107</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>10%</td>
<td>9.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>23.4%</td>
<td>18.8%</td>
<td>32.7%</td>
</tr>
<tr>
<td>11-15 years</td>
<td>24.1%</td>
<td>23%</td>
<td>26.2%</td>
</tr>
<tr>
<td>16-20 years</td>
<td>19.7%</td>
<td>22.5%</td>
<td>14%</td>
</tr>
<tr>
<td>21-25 years</td>
<td>12.8%</td>
<td>14.5%</td>
<td>9.3%</td>
</tr>
<tr>
<td>25 plus years</td>
<td>10%</td>
<td>11.3%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>
Out of the 320 teachers who took the survey, 288 (90%) of teachers answered the question asking content area of teaching. The majority of this population, 72 (25%) of the 288, were ELA teachers. 50 (17.4%) were Math teachers and 44 (15.3%) chose “Other” as their content area of teaching. Table 5 provides the numbers middle and high school teachers with and without coaches according to their content area of teaching.

Table 5  
_Distribution of Sample by Content Area Teaching and Coaching Status in Percent (N=288)_

<table>
<thead>
<tr>
<th>Content Area of Teaching</th>
<th>All N=288</th>
<th>Coach N=190</th>
<th>No Coach N=98</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>ELA</td>
<td>25</td>
<td>26.8</td>
<td>21.4</td>
</tr>
<tr>
<td>Math</td>
<td>17.4</td>
<td>20</td>
<td>12.3</td>
</tr>
<tr>
<td>Other</td>
<td>15.3</td>
<td>13.2</td>
<td>19.4</td>
</tr>
<tr>
<td>Social Studies</td>
<td>13.5</td>
<td>13.2</td>
<td>14.3</td>
</tr>
<tr>
<td>Science</td>
<td>10.4</td>
<td>10</td>
<td>11.3</td>
</tr>
<tr>
<td>World Language</td>
<td>9.4</td>
<td>6.8</td>
<td>14.3</td>
</tr>
<tr>
<td>Art</td>
<td>3.8</td>
<td>5.3</td>
<td>1</td>
</tr>
<tr>
<td>PE</td>
<td>1.7</td>
<td>2.1</td>
<td>1</td>
</tr>
<tr>
<td>Business</td>
<td>1.7</td>
<td>0.5</td>
<td>4.1</td>
</tr>
<tr>
<td>FCS</td>
<td>1.4</td>
<td>1.6</td>
<td>1</td>
</tr>
<tr>
<td>IA</td>
<td>0.4</td>
<td>0.5</td>
<td>0</td>
</tr>
</tbody>
</table>

The question related to school population asked teachers to provide the population of students in the building(s) where they work. 284 out of 320 teachers responded to this question. The school populations ranged from 13 students, or 0.4% of the population, to 3000 students, or 1.8% of the population. The average school size was 821 students, and the median was 750 students. The table below provides the distribution of schools sizes for all 284 teachers respondents, which are organized into 7 categories according to the number of students in reporting schools.
Table 6
Distribution of Sample by School Size and Coaching Status in Percent (N=284)

<table>
<thead>
<tr>
<th>School Size</th>
<th>All N=284</th>
<th>Coach N=188</th>
<th>No Coach N=96</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>0-499</td>
<td>24.7</td>
<td>18.1</td>
<td>37.4</td>
</tr>
<tr>
<td>500-999</td>
<td>46.1</td>
<td>61.2</td>
<td>16.7</td>
</tr>
<tr>
<td>1000 and above</td>
<td>29.2</td>
<td>20.7</td>
<td>45.9</td>
</tr>
</tbody>
</table>

Descriptive Statistics

This section of the chapter presents the distribution of the outcome variable: the LoTi scores. The LoTi survey was used as a measure of the dependent variable, the level or extent of technology integration. It provided a score for each teacher of the 320 teachers who took the survey. Teachers score on eight different levels. Table 7 provides the distribution of LOTI scores for teachers with and without coaches.

Table 7
LoTi Scores for Teachers with and without Coaches (N=320)

<table>
<thead>
<tr>
<th>LoTi Scores</th>
<th>All N=320</th>
<th>Coach N=213</th>
<th>No Coach N=107</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Nonuse</td>
<td>Emerging</td>
<td>39.1</td>
<td>37.1</td>
</tr>
<tr>
<td>Awareness</td>
<td>Emerging</td>
<td>10.6</td>
<td>10.8</td>
</tr>
<tr>
<td>Exploration</td>
<td>Emerging</td>
<td>18.4</td>
<td>20.2</td>
</tr>
<tr>
<td>Infusion</td>
<td>Emerging</td>
<td>10.6</td>
<td>12.2</td>
</tr>
<tr>
<td>Integration Mechanical</td>
<td>Innovative</td>
<td>5</td>
<td>4.7</td>
</tr>
<tr>
<td>Integration Routine</td>
<td>Innovative</td>
<td>11</td>
<td>10.3</td>
</tr>
<tr>
<td>Expansion</td>
<td>Innovative</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Refinement</td>
<td>Innovative</td>
<td>3.1</td>
<td>2.8</td>
</tr>
</tbody>
</table>

At the low end of the distribution of LoTi scores, Nonuse through Infusion, or in the Emerging category described in the Data Analysis section of Chapter 3, teachers who had
coaches received higher LoTi scores. Only 37.1% of teachers with coaches scored Nonuse, versus 43% of teachers who did not have coaches. While the percent of teachers who scored in the Awareness category were almost similar, 10.8% for teachers with coaches and 10.3% for teachers without coaches, teachers with coaches scored higher in the Exploration and Infusion categories. 20.2% of teachers with coaches scored in the Exploration category, while only 15% of teachers without a coach did. 12.2% of teachers with coaches scored in the Infusion category, the highest end of Emerging, versus 7.5% of teachers without coaches.

At the high end of scores, Integration Mechanical through Refinement, or in the Innovative category as described in the Data Analysis section of Chapter 3, the difference in LoTi scores between teachers with coaches and without coaches is small. In fact, teachers without coaches scored slightly higher than teachers with coaches.

Table 8 and 9 report the average number of hours spent per month engaged in coaching for the 195 teachers who reported receiving coaching and who responded to this question. Out of the 195 who provided an answer for the amount of time per month they received coaching, the majority of this population, 122 teachers (62.6%), reported receiving an average of one half hour of coaching monthly. Only 1 teacher (.5%) received the maximum amount of coaching which was 15 hours a month. Table 8 shows the mean for hours per month with coach, which is 1.1667. Table 9 shows the percentages and frequencies for hours of month spent with a coach.

Table 8

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>195</td>
<td>1.1667</td>
<td>.5000</td>
<td>.50</td>
<td>1.71329</td>
</tr>
</tbody>
</table>
Table 9

*Percentages for Hours per Month of Coaching Received (N=195)*

<table>
<thead>
<tr>
<th>Hours per Month with Coach</th>
<th>All N=195</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>.50</td>
<td></td>
</tr>
<tr>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>9.00</td>
<td></td>
</tr>
<tr>
<td>15.00</td>
<td>.5</td>
</tr>
</tbody>
</table>

Table 10 provides the distribution on the types of coaching received for the 182 teachers who responded to that item. Fifty teachers (27.5%) who have a technology integration specialist or coach reported Modeling as the type of coaching they receive. Two teachers (1.1%) reported Co-Teaching as the type of coaching they receive. Six teachers (3.3%) reported Observation as the type of coaching they receive. Forty-three teachers (23.6%) reported Planning as the type of coaching they receive. When you add Modeling to other types of coaching, it is clear that most coaching teachers receive includes Modeling as a practice. Overall, 119 teachers (65.3%) receive Modeling as part of their coaching experience.
Table 10  
*Distribution of Types of Coaching Received by Teachers (N=182)*

<table>
<thead>
<tr>
<th>Type of Coaching</th>
<th>All N=182 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
<td>27.5</td>
</tr>
<tr>
<td>Co-Teaching</td>
<td>1.1</td>
</tr>
<tr>
<td>Observation</td>
<td>3.3</td>
</tr>
<tr>
<td>Planning</td>
<td>23.6</td>
</tr>
<tr>
<td>Modeling/Co-Teaching</td>
<td>4.4</td>
</tr>
<tr>
<td>Modeling/Observation</td>
<td>2.2</td>
</tr>
<tr>
<td>Modeling/Planning</td>
<td>9.9</td>
</tr>
<tr>
<td>Co-Teaching/Planning</td>
<td>3.3</td>
</tr>
<tr>
<td>Observation/Planning</td>
<td>3.3</td>
</tr>
<tr>
<td>Modeling/Co-Teaching/Planning</td>
<td>7.1</td>
</tr>
<tr>
<td>Modeling/Observation/Planning</td>
<td>1.6</td>
</tr>
<tr>
<td>Modeling/Co-Teaching/Observation/Planning</td>
<td>12.6</td>
</tr>
</tbody>
</table>

A significant additional result did emerge from analysis of the descriptive statistics. It was clear from the descriptive statistics that teachers who had a coach were more likely to innovate their instruction on the lower levels of the LoTi scale. The lower levels of the LoTi scale were Nonuse, Awareness, Exploration, and Infusion. Teachers who had coaches recorded higher LoTi scores than teachers without coaches in these four categories. It is also significant that over 90% of reporting teachers who had coaches met with them a few times a month or less. Teachers who had the opportunity to meet with a coach did not either take much time to do so, or were not required to meet with the coach.
Results

Findings for Research Question 1

The following sections reexamine the three research questions that guided this study. To address the issue of missing data in this study, a listwise deletion was used. This statistical technique eliminated the cases with missing responses. With the elimination of missing responses, this study was left with sufficient responses (n = 275) to be analyzed. This sample (n=275) was used for the inferential statistical analysis related to questions 1 and 2. Question 3 was analyzed with those respondents who reported coaches only (n=181)

Research Question 1

**Question 1.** Controlling for all other factors, is coaching significantly related to technology integration?

To address Research Question 1, a binary logistic regression was conducted to determine, when controlling for all other factors, whether there were differences in levels of technology integration among teachers in schools with coaches and those without coaches as indicated by score on the LoTi instrument. In Research Question 1, I removed the content area ELA/Social Studies and school size Small from the logistic regression and reclassified them as the reference group. Table 11 reports the results of the binary logistic regression. As shown in Table 11, in terms of determining the presence of differences in the level of technology integration in schools with coaches and without coaches, the binary logistic regression did not yield any significant predictors with the exception of Medium-sized schools.
Findings for Research Question 2

Research Question 2

**Question 2.** How do other factors, including teacher characteristics and school factors, relate to technology integration?

In Research Question 2, a logistic regression was conducted to determine how other factors, including teacher characteristics (content area taught, years teaching experience, and gender) and school factors (grade level and school size) related to technology integration. In Research Question 2, I removed the content area ELA/Social Studies and school size Small from the logistic regression and reclassified them as the reference group. Table 12 reports the results of the binary logistic regression in determining how other factors, including teacher characteristics (content area taught, years teaching experience, and gender) and school factors (grade level and school size) related to technology integration. The binary logistic regression yielded one significant predictor. Medium-sized schools (500-999 students) were found to be a significant predictor \( p < .05 \). In addition, Medium-sized schools were associated with 62.1% decrease in the odds of having a technology coach affect innovative instructional practices through technology integration. There was no effect with Large schools.
Table 11

*Predictors for LoTi score for Determining Any Differences in Levels of Technology Integration in Schools with Coaches and without Coaches Including Teaching and School Characteristics (N=275)*

<table>
<thead>
<tr>
<th>Binary Logistic Regression</th>
<th>Ex(B)</th>
<th>S.E.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coach or No Coach</td>
<td>1.186</td>
<td>0.36</td>
<td>0.635</td>
</tr>
<tr>
<td>Hours per Month Spent</td>
<td>1.011</td>
<td>0.12</td>
<td>0.924</td>
</tr>
<tr>
<td>Content Area - Math/Science</td>
<td>0.47</td>
<td>0.407</td>
<td>0.063</td>
</tr>
<tr>
<td>Content Area - Other</td>
<td>1.115</td>
<td>0.335</td>
<td>0.509</td>
</tr>
<tr>
<td>Years Teaching Experience</td>
<td>1.003</td>
<td>0.019</td>
<td>0.869</td>
</tr>
<tr>
<td>Gender</td>
<td>0.665</td>
<td>0.321</td>
<td>0.204</td>
</tr>
<tr>
<td>Grade Level</td>
<td>0.751</td>
<td>0.364</td>
<td>0.432</td>
</tr>
<tr>
<td>School Size - Medium</td>
<td>0.379</td>
<td>6.195</td>
<td>.013*</td>
</tr>
<tr>
<td>School Size - Large</td>
<td>0.926</td>
<td>0.407</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Findings for Research Question 3**

**Research Question 3**

**Question 3.** Among those schools with coaches, does the type of coaching (modeling; co-teaching; observing; planning) and amount of time with the coach affect technology integration?

To address Research Question 3, a logistic regression was conducted to determine whether, among those schools with coaches, the type of coaching (modeling; co-teaching; observing; planning) and amount of time spent with the coach affected technology integration as indicated by the school’s score on the LoTi instrument. In Research Question 3, I removed the content area ELA/Social Studies and school size Small from the logistic regression and classified them as the reference group.
As shown in Table 13, in terms of determining whether, among schools with coaches, the type of coaching (modeling; co-teaching; observing; planning) and amount of time spent with the coach affected technology integration as indicated by the school’s score on the LoTi instrument, the binary logistic regression did not yield any significant predictors.

Table 12
Predictors of the Analysis for Determining the Relationship of Coaching to the Extent of Teacher Technology Integration Varied Organizational Characteristics (N=181)

<table>
<thead>
<tr>
<th>Binary Logistic Regression</th>
<th>Ex(B)</th>
<th>S.E.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-Teaching</td>
<td>0.422</td>
<td>0.554</td>
<td>0.119</td>
</tr>
<tr>
<td>Observing</td>
<td>0.565</td>
<td>0.53</td>
<td>0.281</td>
</tr>
<tr>
<td>Planning</td>
<td>0.946</td>
<td>0.395</td>
<td>0.889</td>
</tr>
<tr>
<td>Hours per Month Spent</td>
<td>1.121</td>
<td>0.116</td>
<td>0.326</td>
</tr>
<tr>
<td>Content Area - Math/Science</td>
<td>0.609</td>
<td>0.488</td>
<td>0.309</td>
</tr>
<tr>
<td>Content Area - Other</td>
<td>1.136</td>
<td>0.449</td>
<td>0.776</td>
</tr>
<tr>
<td>Years Teaching Experience</td>
<td>0.984</td>
<td>0.024</td>
<td>0.492</td>
</tr>
<tr>
<td>Gender</td>
<td>0.792</td>
<td>0.446</td>
<td>0.602</td>
</tr>
<tr>
<td>Grade Level</td>
<td>0.589</td>
<td>0.533</td>
<td>0.32</td>
</tr>
<tr>
<td>School Size - Medium</td>
<td>0.402</td>
<td>0.499</td>
<td>0.068</td>
</tr>
<tr>
<td>School Size - Large</td>
<td>1.304</td>
<td>0.605</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Summary

Chapter 4 presented an analysis of the quantitative data for this correlational study designed to establish non-causal relationships among the variables, with dependent variable being the LoTi score and the independent variables being the presence or absence of a technology coach or technology integration specialist, amount and type of coaching, the teacher’s professional and personal characteristics; and the school characteristics. The
descriptive data were presented, and the results of the study revealed no statistically significant difference in level of self-reported technology integration as measured by LoTi between the teachers who had technology coaches and those who did not have technology coaches. Among the other control variables, personal characteristics and organizational characteristics, only medium school size was found to be statistically significant (p < .05). A relevant additional result did emerge from this study that was not part of the three guiding research questions. While there was no statistical significance revealed through the binary logistic regression conducted to address Research Question 1, it was clear from the descriptive statistics that teachers who had a coach were more likely to innovate their instruction on the lower levels of the LoTi scale. The lower levels of the LoTi scale included Nonuse, Awareness, Exploration, and Infusion. These four levels were organized and assigned the label “Emerging” in order to run the inferential statistical analysis in Chapter 4. Emerging teachers who had coaches recorded higher LoTi scores than emerging teachers without coaches. Chapter 5 will discuss the implications of this study and recommendations for further research in coaching and innovating instruction through technology integration as a result of the study findings.
Chapter 5: Conclusions and Recommendations

Introduction

Chapter 5 is divided into five sections. Section one reintroduces the purpose of the study. Section two presents a summary of the study findings. Section three discusses the findings and conclusions of the study as they relate to the literature and previous research. Section four discusses the implications of this study for policy and practice. The final section discusses recommendations for further research.

Currently, school districts spend more than $3 billion per year on technology-related resources (Herold, 2015). Despite the increased spending on devices, the evidence shows that teachers have been slow to transform the way they teach (Cuban, 2006). The National Center for Education Statistics 2009 report on Teachers’ Use of Educational Technology in U.S. Public Schools revealed statistics that illuminate this reality. Students are using technology for preparing written text, conducting Internet research, and learning/practicing basic skills, rather than for creating, designing, producing, conducting experiments, or writing blogs (NCES, 2009). When transformation does take place it is usually limited, incremental, and variable, perhaps having more to do with general teaching practice than technology use (Weston & Bain, 2010). A significant redefining of what student learning can be, as well as the creation of new ideas and tasks in ways that would not be possible in the absence of technology are the kinds of transformation technology integration can bring to classroom instruction and learning (Jacobs-Israel, M., & Moorefield-Lang, H. 2013).

While teachers report that greater use of technology leads to greater benefits to student learning, they also acknowledge the vital need for training when it comes to the effective technology integration (Grunwald, 2010). The use of technology coaches in classrooms is
currently on the rise. The role of coaches encompasses everything from observing to co-teaching, as well as passing on their technological knowledge so teachers can be more productive and effective at integrating technology to transform the way they teach (Flanigan, 2017). Research tells us that technology is not really transforming the way teachers teach despite the influx of technology in the classroom in recent years. While coaching can be impactful, current research does not tell us the impact coaching may have on teachers innovating by integrating technology in a 1:1 environment.

The purpose of this quantitative study was to determine whether access to a technology coach or technology integration specialist affects the instructional practices of teachers in a 1:1 environment using the LoTi Framework as a measure of the dependent variable. The researcher used the LoTi Framework to survey teachers in schools that have implemented a 1:1 initiative for more than one year. Survey responses of teachers who meet with technology coaches (technology integration specialists or TIS) were compared with those of “uncoached” teachers in a 1:1 environment. As schools across New Jersey continue to place more devices in student hands, this study may inform an understanding of how schools can assist teachers to better leverage this technology to innovate instruction and transform the student learning experience.

Summary of the Study

This study explored the effect of the coach on innovating instruction in a 1:1 environment. While there is an abundance of research on the impact of coaching in various content areas, according to Truesdale (2003) and Knight and Cornett (2009), the research has yet examine the role of coaching in a 1:1 environment. Specifically, the question this research addressed is: How does the role of the coach impact teachers’ instructional practice when considering the professional and personal characteristics of the teacher being coached, as well as
the organizational characteristics of the school?. Using the LoTi (Levels of Teaching Innovation) Framework, this study examined the effect of coaching on the instructional practices of teachers in a 1:1 environment, and was guided by the following three research questions:

**Question 1.** Controlling for all other factors, is coaching significantly related to technology integration?

**Question 2.** How do other factors, including teacher characteristics and school factors, relate to technology integration?

**Question 3.** Among those schools with coaches, does the type of coaching (modeling; co-teaching; observing; planning) and amount of time with the coach affect technology integration?

During the months of November and December in the 2018-19 school year, a link to an online survey including 40 items related to LoTi framework was emailed to 3831 teachers in 28 middle schools and 30 high schools in the state of New Jersey who reported working in a 1:1 environment. While 3,831 teachers had originally reported working in a 1:1 environment, only teachers in 16 middle schools and 16 high schools across the state of New Jersey responded to the survey, for an effective total of 2499 teachers. Due to surveys being blocked by district internet filters, inaccuracies in email addresses on school websites, and schools misreporting having 1:1 environments, the original sample size of 3831 was reduced to an effective sample of 2499 teachers. Out of the 2499 teachers in the effective sample, 320 of them responded to the survey. Out of the 320 who took the survey, 181 teachers with coaches and 94 teachers without coaches answered all the questions on the LoTi survey accessible through a Survey Monkey link.
Findings and Conclusions

The descriptive statistics provided interesting data on teachers who were coached versus non-coached teachers. While no statistical significance was revealed through the binary logistic regression on Research Question 1, it was clear that teachers who had a coach were more likely to innovate their instruction on the lower levels of the LoTi scale. That is, they were less likely to attain the lowest level, non-use, and more likely than teachers without coaches to self-report Awareness, Exploration, and Infusion. These four levels were organized and assigned the label “Emerging” in order to run the inferential statistical analysis in Chapter 4. Emerging teachers who had coaches recorded higher LoTi scores than emerging teachers without coaches. Only 37.1% of teachers with coaches scored Nonuse versus 43% of teachers who did not have coaches. While the percent of teachers who scored in the Awareness category were almost similar, 10.8% for teachers with coaches and 10.3% for teachers without coaches, teachers with coaches were more likely to score in the Exploration and Infusion categories. There were 20.2% of teachers with coaches who scored in the Exploration category, while only 15% of teachers without a coach did. There were 12.2% of teachers with coaches who scored in the Infusion category, the highest end of Emerging, versus 7.5% of teachers without coaches.

Research question 1. Research Question 1 focused on differences in the levels of technology integration as indicated by the school scores on the LoTi instrument effect in schools with coaches and schools without coaches. The results of the logistic regression indicated that there was no statistically significant difference between teachers with and without coaches. Therefore, there was no statistically significant change in the level of teaching innovation among teachers in schools with and without coaches.
While there is no peer reviewed literature that supports this specific finding, there is research published on the positive influence of coaching on innovating instruction. The 21st Century Teaching and Learning/Classrooms for the Future (CFF) project run in the State of Pennsylvania in (2011) revealed that students spent less time in lectures and more time working independently and in peer groups on reports, projects, or presentations with significant increases in the use of activities requiring higher-order thinking, such as project- and problem-based learning, and authentic learning. The study also provided anecdotal stories about how teachers were engaged in more professional learning communities and were more collegial and collaborative (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011). In 2006, the Wyoming Legislature passed HB 139, which created a program that provided funding within the education resource block grants for school-based instructional facilitators and instructional coaches. While the district collected no formal data on the growth of coaches and their impact on teaching, the study did report significant increases in teachers using technology to innovate lesson design and (Beglau, Hare, Foltos, Gann, James, Jobe, Knight, and Smith, 2011). In a 2013 state-wide action research project, established by the North Carolina Governor and the North Carolina Department of Public Instruction (NCDPI), teachers who received coaching reported that it made them more reflective practitioners and helped them change how they teach (Soni and Taylor, 2016).

A study conducted in Houston from 2010-2015 investigated teachers in a variety of disciplines and grade levels in both public and private schools, and revealed the positive effects of coaching on their ability to integrate technology by enabling them to hear and see new ways to harness technology in their teaching. This study concluded that a shift in professional development beliefs are needed before lasting changes in behavior can occur, and coaching
provides scaffolded assistance as new tool use and strategies become internalized and lasting (Wilson, Alaniz, 2015). While there was no statistically significant relationship in findings of Research Question 1 with the exception of Medium-sized schools, the descriptive statistics for this study confirmed that emerging innovative instructional practices did occur more frequently among teachers who had technology coaches than with teachers who did not have a technology coach.

According to Rogers (2003), once an individual experiences innovation, the adoption process begins, information is gathered, and the innovation is tested to see if yields results that are worth the time and effort. Therefore, how the innovation is perceived by the adopters is significant. Everett Rogers theory suggests that some teachers are pioneers based on their attitudes and perceptions on change. In addition to this, several diffusion of innovation studies have found that 2.5% of teachers are classified as innovators, 13.5% are classified as early adopters, 34% are classified as early majority adopters, 34% are classified as late majority adopters, and laggards or late adopters comprise of the final 16%. Rogers's (2003) findings stipulate that in order to diffuse the innovation, staff development needs should focus on the teachers that fall into the classification of laggards and late majority. It is quite possible that this study yields similar results to Roger’s Diffusion of Innovation theory in that only a small percentage, 3.1% of teachers with and without coaches, scored in the highest “Innovation” category, Refinement. According to Roger’s theory, only 2.5% of teachers are classified as innovators.

Furthermore, current research suggests that an effective human infrastructure in a school would have a staff member that could help with understanding and using the technology effectively in instruction. It is also essential that this staff member help translate how integrating
the technology fits into teachers’ pedagogical practice (Zhao et al, 2002). Ultimately, schools that are able to innovate will need to establish ideal conditions for implementing change. Among other factors, professional development, the system in place to support teacher learning, is essential to helping technology integration innovate instruction (Zhao et al, 2002). This study suggests that while coaches are present in schools, limited time spent with coaches might be why this research, similar to Zhao’s, did not yield statistically significant results.

**Research question 2.** Research Question 2 focused on determining how other factors, including teacher characteristics (content area taught, years teaching experience, and gender) and school factors (grade level and school size) relate to technology integration in a 1:1 environment as reflected in LoTi survey scores. The results of the logistic regression indicated that there was no statistically significant difference in levels of technology integration between teachers regardless of years teaching experience, content area, and gender. However, the variable of school size did yield one significant outcome. Medium size schools were found to be a significant factor (p < 0.05). In addition, Medium-sized schools were associated with a 62.1% decrease in the odds of having a technology coach affect innovative instructional practices through technology integration. No such effect was visible with Large schools.

While no peer reviewed literature supports this specific research finding regarding teacher characteristic factors, there is some literature published on the influence of teaching experience, content area, and gender. Chong (2012) found that positive attitudes about technology increased with age. Chong’s finding contradicted Handler’s (1993) study, in which age was not reported as a factor influencing teachers’ intention to innovate instruction with technology. Chong’s more recent data suggests that older participants viewed technology favorably despite a lower comfort level with technology compared to younger teachers.
Teachers with more years of teaching experience perceive technology as a norm in today’s classroom and recognize the need to keep up with their students and fellow teachers (Chong, 2012). Guskey (1988) reported that teachers’ experience was not significantly related to any of the determinants of teacher willingness to implement instructional innovation. However, Ghaith and Yaghi (1997) found that teachers with more experience tended to be less inclined to innovate instruction. Accumulated teacher experience seemed to erode teacher enthusiasm for adapting new instructional innovations in the classroom.

Lawless and Pellegrino (2007) found that since innovative technology integration is leveraged differently across different content areas and levels of learners, professional development must also vary between content areas. Yuksel’s (2015) research on Rogers’ Diffusion of Innovation Model looked at innovation profiles with teachers and found that content area accounted for statistically significant differences. Yuksel’s study confirmed similar results from studies by Greenhalgh et al. (2008), Loogma et al. (2012), Soffer et al. (2010), and Hug and Reese (2006). Those studies, like Yuksel’s, showed that teachers in different content areas are open to technology integration, tend to accept changes, and are not afraid of taking risks leading to more innovative instruction. Yuksel’s finding contradicted the findings of Guskey (1988) and Zakaria (2001), whose studies found no significant difference between content area and innovative instructional practices. This study’s findings support prior research conducted by Guskey (1988) and Zakaria (2001).

Studies by Huang, Hood, & Yoo (2013), Lau and Yuen (2010), and Saglam (2011) offer findings suggesting gender is associated with technology integration. The research of Crocco, Cramer, and Meier (2008) suggests that gender is an acknowledgement of cultural difference, in that men and women are drawn to different attributes of technology, and therefore do not share
the same interests or ideas regarding how technology should be integrated. Yuksel’s (2015) research on Rogers’ Diffusion of Innovation Model looked at innovation profiles with teachers and found that, similar to content area, gender accounted for statistically significant differences in how men and women innovated instruction with technology. The findings in Yuksel’s study were also consistent with other studies such as Kavak and Demirsoy (2009) and Kilicer and Odabasi (2010). While current research has gender influencing how teachers innovate with technology in the classroom, Guskey’s (1988) study of teacher implementation of innovative instructional practices showed no significant differences when accounting for gender, and reported similar findings to this study.

The research of Forkosh-Baruch, Nachmias, Mioduser, & Tubin (2005) found that school size is significant in influencing innovative instructional practices when certain factors are in place, including innovative leadership, a small school size that facilitates cohesion, and mutual influence among teachers. Wu, Hsu, and Hwang (2005) echoed these findings, illustrating that school size does have impact on teachers’ instruction innovation through technology integration. Their study found that teachers in smaller schools tended to have a more positive attitude about technology integration and thus offered a better environment for innovation (Wu, H.K., Hsu, Y.S. & Hwang, F.K., 2005). While current research lists school size as a factor influencing how teachers innovate with technology in the classroom, Guskey’s (1988) study of teacher implementation of innovative instructional practices showed no significant differences when accounting for school size, and reported findings similar to this study.

A qualitative study conducted by Raby et al. (2010) reported that integrating technology at lower grade levels was more of a challenge than with older students. The results of Welsh and Harnes (2018) contradicted those of Raby et al. (2010). Welsh and Harnes (2018) found that
elementary and middle school teachers were more likely to innovate their instruction with technology than high school teachers. While both of these studies reported grade level as being a factor influencing teacher instruction innovation, Guskey’s study (1988), similar to this study, revealed that grade level had no impact on innovating instructional practices.

**Research question 3.** Research Question 3 focused on determining whether, among schools with coaches, the type of coaching (modeling; co-teaching; observing; planning) and amount of time with the coach affected technology integration as indicated by the school scores on the LoTi instrument. The results of the logistic regression indicated that there was no statistical significance in level of technology integration among “coached” teachers regardless of hours spent and type of coaching. Therefore, there was no statistically significant change in the level of teaching innovation when these factors were run through the regression analysis.

While there is no peer reviewed literature supporting this particular research finding on types of coaching and hours spent per month, some research has been published on the influence of coaching and hours spent in job-embedded professional development. French (1997) found that mastery of instructional innovations in the classroom is a time-consuming process. Her study concluded that teachers may need as many as 50 hours of instruction, practice and coaching before a new instructional innovation is learned and implemented in the classroom. Joyce and Showers (2002) revealed that teacher mastery of a new skills and instructional strategies depends upon teachers having about 20 separate instances of practice. That number may increase if the skill being learned is difficult. The research of Darling-Hammond, Wei, Andree, Richardson, & Orphanos (2009) also supported the practice of greater time being spent in job-embedded professional learning to support innovation in teacher instructional practice. Their research found that this added time allows for the teacher to practice their instructional
strategies. Corcoran, McVay, and Riordan (2003) found that science teachers with 80 hours or more of professional development were significantly more likely to innovate their instructional practices than teachers with less than 80 hours. However, research also show that time is not the only significant factor. Truesdale’s study (2003) found that the way professional development time is spent was significant. Coaching and the various types of coaching support teachers in the implementation stage once they have learned a new strategy, and are more likely to lead to transfer of their instructional practice than teachers without a coach. In a similar study, Knight and Cornett (2009) found that teachers who had coaching following a workshop were more inclined to implement the instructional innovation in their classrooms.

**Implications for Policy and Practice**

This study focused on the effect of coaches on innovating instruction in a 1:1 environment. Across the country, governments and schools continue to recognize the need for students to develop a diverse set of technology skills to enhance communication, and to create, collaborate, and share information in the 21st century. Teachers and schools have the greatest responsibility in preparing students for this new digital world (Yuksel, 2015). While teachers are proficient at using technology such as word processing, spreadsheets, slide presentations, etc. in the classroom, they rarely use the technology to innovate instruction and their learning environment. Policy makers, K-12 schools, and schools that prepare teachers face great challenges helping teachers to innovate with technology in the classroom in order to increase student preparedness for an increasingly digital world (Davis et al., 2010).

The results of this study did not demonstrate a statistically significant relationship between teachers in a 1:1 environment who had technology coaches versus teachers who did not have technology coaches. It did not reveal any statistical significance with the other independent
variables, personal and organizational characteristics, with the exception of Medium-sized schools. While no statistical significance was found in this study, there was significant data suggesting that teachers who had coaches were likely to score at the higher levels of the emerging categories of the LoTi score (awareness, exploration, and infusion). Teachers who had coaches were more likely to engage students with digital tools and resources for extension and enrichment activities, multimedia creations to demonstrate content understanding, and in some cases to carry out teacher-directed tasks that focus on higher levels of student cognition (Moersch, 2010). Furthermore, 62.6% of teachers who had coaches reported meeting with their coaches less than once a month. According to Linda Darling Hammond, studies show that anything under fourteen hours of any kind of professional development appears to have no effect on teacher effectiveness. Not only is the kind of professional development teachers receive important, but length of time allocated is equally vital in shifting teacher practice (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

If teachers are not meeting with their technology coaches for a significant length of time, examining the structures and practices that can be adjusted to increase time would be beneficial. While there were more teachers who scored higher on the LoTi score in the Emerging category than those without coaches, this study also demonstrated a higher number of teachers who scored in the Innovation category of the LoTi score (Integration Mechanical, Integration Routine, Expansion, Refinement) and did not depend on them having a technology coach. Some other factor was instrumental in the innovative instructional practices they exhibit in their classrooms.

This study also found that most teachers, 76%, both with and without coaches, fell into the Emerging category based off the LoTi score. In order to help our students prepare for the digital world with a diverse set of technology skills to enhance communication, and to create,
collaborate, and share information in the 21st century, innovative instructional practices need to become the norm in classrooms. Research-based practices should be implemented to help move more teachers from Emerging to Innovative.

This study also found that Medium-sized schools were less likely to innovate instruction through the integration of technology than Small-sized schools. The research of Forkosh-Baruch, Nachmias, Mioduser, and Tubin (2005) found that school size is significant in influencing innovative instructional practices when certain factors are in place; innovative leadership and a small school that facilitates cohesion and mutual influence among teachers. Wu, H.K., Hsu, Y.S. and Hwang, F.K. (2005) study also investigated the effects of school size on integrating technology in the classroom and found that teachers in smaller schools tended to have a more positive attitude about technology integration and were thus a better environment for innovation (Wu, H.K., Hsu, Y.S. & Hwang, F.K., 2005). These studies point to the importance of an environment where innovative leadership exists that encourages risk taking and teachers know and work with one another to grow and learn in their professions. Not every school district is small but how can medium and larger sized schools help to grow and foster those qualities that lead towards innovation would be practice worth exploring for school leadership.

Schools must make an important decision regarding technology coaches. If they are to be included in the schools, coaches must be utilized in such a way that facilitates innovative instructional practices in the classroom. Schools must recognize that technology integration cannot be a separate entity delivered in isolation from the pedagogical practice and content mastery that often informs professional development and learning. The technology coach must work in unison with teacher leaders, supervisors, and others responsible for providing
professional learning for teachers. Technology coaches who find themselves working in isolation from other educators deliver professional development without having the opportunity to work and coach teachers will produce islands of innovation in the school. This study and the current literature supports the strategy of having a technology coach if that technology coach is used in the manner that is supported by research that has affirmed the benefits of coaching and job-embedded professional development.

**Recommendations for Further Research**

Although there is significant research and literature on the topics of coaching, innovating instruction, and technology integration, studies that examine the correlational relationship between these variables are limited. With the increase of 1:1 environments in schools, studies that examine how to best innovate instruction with and without technology coaches are a promising area for further research. The recommendations for future research from this study are listed below.

1. This study revealed that while effective technology integration can lead to transformative instruction in the classroom, it was not being used to its fullest potential with or without the coach by the majority of teachers from the sample population. If we want to see innovative instructional practices become a larger part of the student learning experience, teachers may need significantly more additional professional development time emphasizing technology integration. This study would benefit from including a case study school with a more substantial amount of technology coaching in order to measure the impact of coaches who spent more time with teachers. There is a correlation between improved teacher practice and time spent in professional development and/or coaching dedicated to those improvements.
2. This study used a self-reporting questionnaire. The nature of self-reporting questionnaires is associated with some limitations. Replicating this study with additional qualitative data, such as measuring for self-efficacy, could help to eliminate possible limitations that come with self-reporting and provide greater reliability and validity to the research.

3. While professional development measures such as having a technology coach are one way to assist teachers in a 1:1 environment, this study revealed an additional factor that led to teachers’ high scores on the LoTi survey. The diffusion of innovation literature of Everett Rogers suggests that some teachers are just pioneers with respect to their attitudes and perceptions on change. Additional research into what better leads to improved teacher attitudes and perceptions when it comes to innovating instruction with technology integration would further assist policy makers, K-12 schools, and teachers in fostering learning environments where students can develop a diverse set of technology skills to enhance communication, and to create, collaborate, and share information in the 21st century.

4. Replicating this study through a mixed-methods approach involving teachers interviews exploring possible barriers to innovation would yield additional data that would lead to an enhanced interpretation and understanding of the role of coaching in a 1:1 environment.

5. Future studies could distribute the survey instrument at the end of the year to provide teachers more time to meet with coaches. Since this survey was distributed in November and December, it is possible that some teachers had not had enough time to meet with coaches to learn how to innovate their instruction with technology.
6. This study found that Medium-sized schools were significant. Why is it that Medium-sized schools were less likely to innovate instruction through the integration of technology than Small-sized schools? A study that examines this question in greater depth may contribute to the research on the effect of school size.

7. This effective sample size for the inferential statistical analysis was (N=275), with 181 teachers having access to coaches and 94 without. A greater sample size may yield different results.

Conclusion

While it may be easy to discount the importance of role of technology coaches because this study did not show a statistically significant relationship between teachers in a 1:1 environment who had access technology coaches and teachers who did not have technology coaches, it is necessary to understand that technology integration is a complex, dynamic process that continues to pose challenges for teachers (Mishra and Koehler, 2006). In addition, research by Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) reports on the importance of time allocated in professional learning in order to shift teacher practice. The research of French (1997) also found teachers may need as many as 50 hours of instruction, practice, and coaching before a new instructional innovation is learned and can be implemented in the classroom. Furthermore, Joyce and Showers (2002) revealed that teacher mastery of new skills and instructional strategies depends upon teachers having about 20 separate instances of practice. If the vast majority of teachers who had coaches did not have the opportunity to work with them—over 90% according to this study—it is possible this factor may have led to the results showing that LoTi scores of teachers with coaches were not significantly higher than teachers without coaches. Schools need to examine funding issues and other reasons for not
using the coaches. Furthermore, roughly one third of schools reported having a coach available to assist teachers. With little professional development time for teachers as the current practice in the United States, schools may want to explore what impedes their hiring of coaches to assist their staff. It may be the case that the 2% budget cap limits smaller schools from hiring the staff needed to innovate instruction.

OECD data shows us that teachers in European and Asian countries engage in professional learning far more than teachers in the United States. Time is provided for professional development during the work day. This is possible because in most European and Asian countries, instruction takes up less than half of a teacher’s working time, providing far more time for the kind of professional learning necessary to enable teacher practice to grow. In the United States, the majority of teacher work time is spent teaching. Teachers have little time to interact with colleagues and they are not expected to disseminate what they know or learn (Little, 1987). Teachers on average have three to five hours a week for lesson planning which is usually done independently (NCTAF, 1996). United States teachers also spend far more time over the course of an academic year in instructional hours (1080 hours) with students than any other OECD nation, which holds an average of 803 hours in primary schools and 664 hours in secondary schools (OECD, 2007). The net result is that United States teachers have far less time to plan, learn together, and develop high-quality curriculum and instruction than other OECD countries around the world (Darling-Hammond, Wei, Andree, Richardson, Orphanos, 2009).

There is a shortage of research exploring how teachers learn and innovate instruction through technology integration in a 1:1 environment. The conceptual model of this study is a step towards contributing to the larger body of research investigating how to innovate instruction through technology integration. It has revealed some important factors worth considering for
practice in schools or in additional research studies, including school size, the role and value of the coach, and providing more learning time for teachers as is done in European and Asian countries. In the end, whether or not schools have a coach or do not, investing in a technology coach requires leadership to do more than just hire this position for the benefit of innovating instructional practices in a 1:1 environment. Leadership must ensure that technology coaches are part of an interdisciplinary and cross curricular team of professional development providers and allow time for teachers to work with them. Doing so may increase the probability that teachers who have technology coaches can acquire a better understanding of the interrelatedness of technology, pedagogy, and content knowledge, allowing them to integrate technology in more relevant and meaningful ways that promote essential 21st century skills, such as enhanced communication, creativity, collaboration, and information sharing.
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Appendix A
Letter Of Solicitation

Dear Teacher,

The Impact of Coaching on Learning in a 1:1 Environment

My name is Michael Mitchell and I am a doctoral student in the Department of Education Leadership, Management, and Policy at Seton Hall University, South Orange, New Jersey. I am conducting a survey to examine the ways in which teachers integrate technologies into their instruction and the role that technology coaches may play in facilitating that process. The survey will take 10 to 15 minutes to complete.

You are invited to participate in this survey because you are a certified middle and/or high school teacher employed in a school with a 1:1 mobile device program. Your participation in this survey is completely voluntary and you have the option to opt out and receive no further contact.

All your responses will be kept confidential. Responses from the survey will be kept on an encrypted USB flash memory drive and stored in a locked room in my home. The information this survey yields, will be stored securely for a minimum of 3 years. The principal investigator and his research supervisor will be the only ones who have access to the surveys. No personally identifiable information will be associated with your responses in any reports of these data. However, as with all online surveys emailed to potential subjects, there is always the possibility of hacking with online materials.

To participate in this survey, please click the link below. It will take you to a Seton Hall University (SHU) sponsored website which includes documentation of “official” Seton Hall Institutional Review Board (IRB) approval of the study as well as the link to the survey. By clicking on the link to the survey from this SHU sponsored site, you will be offering your voluntary and informed consent to participate in this study.

Any questions you have about this study, can be directed to me or my research supervisor:

Dr. Martin Finkelstein
Department of Education Leadership, Management, and Policy
Seton Hall University
South Orange, New Jersey, 07079
Phone: 973-275-2056
Email: Martin.Finkelstein@shu.edu

This project has been reviewed and approved by the Seton Hall University Institutional Review Board (IRB). Any questions you have regarding your rights as a participant in this research study can be addressed to:

Dr. Mary Ruzicka
Director of Internal Review Board (IRB)
Seton Hall University
South Orange, New Jersey, 07079
Phone: (973) 275-2723
Email: mary.ruzicka@shu.edu

Thank you for your assistance with this important research study,

Michael Mitchell
michael.mitchell@student.shu.edu

MichaelSensei@gmail.com
Appendix B
Demographic Questions

The Role of Coaching on Learning in a One to One
Middle Schools and High Schools with 1:1

The following survey is based off the LoTi Framework Levels of Teaching Innovation. It is a survey to be taken by Middle or High School teachers in a 1:1 environment. The first several questions are demographic questions required to help the "The Role of Coaching on Learning in a One to One" study. Questions 10 -49 are from the LoTi Digital Age Survey. Please answer all questions to the best of your ability. Thank you for your participation.

* 1. How many years of teaching experience do you have in education? (Please provide just a number. i.e., 10, 20, 30, etc.)

* 2. Do you have a designated staff member whose job responsibility is to assist you with integrating technology to enhance and innovate instruction? This staff member can or may be known as the instructional coach, technology coach, and/or technology integration specialist.

☐ Yes
☐ No

The Role of Coaching on Learning in a One to One
1:1 Middle & High Schools with Technology Integration Specialists, Instructional/Tech Coaches

Please answer the following questions about the type of coaching and time spent with your Technology Integration Specialist, Instructional/Tech Coach.

3. What type of coaching do you receive from your instructional coach, technology coach, technology integration specialist, etc.? (choose any that apply)

☐ Modeling (showing you what integrating technology would look like by teaching the lesson)
☐ Co-Teaching
☐ Observing
☐ Planning

4. How much time do you spend with your instructional coach, technology coach, technology integration specialist, etc.?
The Role of Coaching on Learning in a One to One

Middle and High Schools with 1:1 Demographics Part 2

Please continue providing demographic information for this survey.

* 5. What is your content area of teaching?
   - English Language Arts (ELA)
   - Math
   - Social Studies/Humanities
   - Science
   - World Language
   - Physical Education
   - Business
   - Family and Consumer Science (cooking, child care, etc.)
   - Industrial Arts (wood, metal, sewing, etc.)
   - Art
   - Other

* 6. What is your grade level of teaching? Please choose more than one if applicable.
   - 8th grade
   - 9th grade
   - 6th grade
   - 10th grade
   - 7th grade
   - 11th grade
   - 8th grade
   - 12th grade

* 7. To which gender do you most identify with?
   - Female
   - Transgender Male
   - Male
   - Gender Variant/Non-Conforming
   - Transgender Female
   - Other

* 8. What is the population of students in the building(s) where you work? (Please provide just a number. i.e., 10, 20, 30, etc.)

* 9. What school do you work in?
   - Middle School
   - High School
   - Both
## The Role of Coaching on Learning in a One to One

### LoTi Digital Age Survey: Use of Resources

Select the response for each question below that best represents how often digital resources are being used during instruction.

**10.** How often are your students using digital resources during the instructional day?

- Never
- At least once a year
- At least once a month
- At least once a day
- Multiple times a day

**11.** How often are you (the teacher) using digital resources during the instructional day?

- Never
- At least once a year
- At least once a month
- At least once a day
- Multiple times a day

## The Role of Coaching on Learning in a One to One

### LoTi Digital Age Survey: Standards Based Learning

Select the response that best represents how often standards drive student learning experiences.

**12.** How often are your students involved in standards-based learning experiences during the instructional day?

- Never
- At least once a year
- At least once a month
- At least once a day
- Multiple times each day
The Role of Coaching on Learning in a One to One

LoTi Digital Age Survey: Classroom Practices

Respond to each statement with the frequency that best represents the instructional practices in your learning environment

* 13. I plan learning activities that have students use digital resources to perform experiments and analyze information with a known outcome.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 14. I plan learning activities that have students use digital resources to complete online tasks that emphasize complex thinking skills.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 15. I plan learning activities that have students use digital resources to interact with the content standards based on their personal interests and readiness levels.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
* 16. I plan learning activities that have students use **digital resources** to work **collaboratively** toward applying their learning to their own lives.

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* 17. I plan learning activities that have students use **digital resources** to pursue **student-centered activities** based on their **learning styles**.

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* 18. I model safe and legal uses of **digital resources** to deliver content and/or assess student understanding.

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* 19. I model safe and legal uses of **digital resources** to support **digital citizenship** and responsibility among students.

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* 20. I model safe and legal uses of digital resources to implement teaching and learning best practices using current and emerging technologies.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 21. I model safe and legal uses of digital resources to facilitate global awareness and student collaboration beyond the classroom walls.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 22. I model safe and legal uses of digital resources to share ideas among colleagues within my professional community.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 23. I use digital resources during the school day to cover all of the required content using presentation tools.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
24. I use digital resources during the school day to support my students' mastery of the content through reteaching and enrichment.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

25. I use digital resources during the school day to reinforce specific content standards and confirm student learning.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

26. I use digital resources during the school day to differentiate the content, process, and/or product of learning experiences.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

27. I use digital resources during the school day to expand communication opportunities with students, parents, and peers.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
* 28. My students collaborate using digital resources to make inferences and ask questions based on a teacher-provided prompt.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 29. My students collaborate using digital resources to create solutions to real-world problems that affect their community.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 30. My students collaborate using digital resources to use social media to pursue inquiry-based learning opportunities.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 31. My students collaborate using digital resources to resolve an issue of personal or social importance.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 32. My students collaborate using digital resources to set self-directed goals with me (individual goals) or with peers (group goals).

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
* 33. My students use a variety of digital resources to participate in activities that require them to transfer their learning to a new situation.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 34. My students use a variety of digital resources to direct their own learning aligned to the grade level content.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 35. My students use a variety of digital resources to collaborate with classmates to tackle real-world problems within their community.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 36. My students use a variety of digital resources to define and solve real life challenges that are grade level appropriate.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 37. My students use a variety of digital resources to participate in problem-solving activities with peers and professionals beyond the classroom.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
* 38. My students use digital resources to improve their basic math and literacy skills.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 39. My students use digital resources to explore deeper content connections that require them to draw conclusions.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 40. My students use digital resources to complete student-centered performance assessments.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 41. My students use digital resources to engage in relevant and challenging self-directed learning experiences.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 42. My students use digital resources to apply their learning to real world situations within the local or global community.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily
* 43. My students use digital resources alone or in groups to create digital presentations that demonstrate their content understanding.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 44. My students use digital resources alone or in groups to engage in projects that apply their learning to authentic situations.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 45. My students use digital resources alone or in groups to design solutions for project-based learning (PBL) experiences.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 46. My students use digital resources alone or in groups to demonstrate their content understanding using formative or summative assessments.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily

* 47. My students use digital resources alone or in groups to complete tasks using self-selected tools.
   - Never
   - At least once a year
   - At least once a semester
   - At least once a month
   - A few times a month
   - At least once a week
   - A few times a week
   - Daily
* 48. I ensure digital resources are being used responsibly in my classroom by collaborating with peers to explore creative applications of digital tools.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily

* 49. I ensure digital resources are being used responsibly in my classroom by monitoring digital etiquette and discussing the consequences of digital interactions.

- Never
- At least once a year
- At least once a semester
- At least once a month
- A few times a month
- At least once a week
- A few times a week
- Daily
Appendix D
Permission to use LoTi Survey - Developed by LoTi Connection

Jul 30th, 2018
Permission for Use of the LoTi Framework

To: Seton Hall University
   Dissertation Review Boards

Please accept this letter as notification that Michael Mitchell is hereby granted permission to utilize the LoTi Framework and corresponding Digital-Age Survey to collect data for his doctoral dissertation study. Michael is permitted to use the Digital-Age Survey and the LoTi Framework for purposes of the study only. In addition, Michael has permission to review all available LoTi Digital-Age results on the individuals taking place in his study.

The guidelines for using LoTi Connection copyrighted material as part of this dissertation study are as follows:

1. Permission to reprint the LoTi Framework is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
2. Permission to reprint selected results including graphs and tables in the Appendices of the study is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
3. Permission to reprint selected questions from the Digital-Age Survey in the Appendices of the study is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
4. LoTi Connection holds the right to restrict usage of any intellectual property if LoTi Connection finds that the content is being used in an inappropriate manner.

Sincerely,

Dennee Saunders
Assistant Executive Director

Date 07/30/2018
Appendix E
LoTi Scoring Guide - Developed by LoTi Connection

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**Dissertation Candidate Reference**

**LoTi Level Scoring Guide**

Use this tool to produce a LoTi Level score from participant responses to the LoTi Digital Age Survey.

**STEP 1:**
Collect the frequency answers for each corresponding question field from the Classroom Practices, Use of Resources, & Standards-Based Learning sections.

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<th>Level 5/6</th>
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<th>PCU</th>
<th>CIP</th>
<th>SCU</th>
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</table>

**STEP 2:**
Add scores for category totals

**STEP 3:**
Apply the category totals to the if/then scoring statements below. If a scoring statement reads **false**, using the category totals, go on to the next statement. If a scoring statement reads **true**, the resulting LoTi Level is received.

If (SBL $\leq$ 2); then the final LoTi score is LoTi Level 0.

If (Level 5/6 $\geq$ 21) and (Level 4a/4b $\geq$ 27) and (Level 3 $\geq$ 24) and (PCU $\geq$ 24) and (CIP $\geq$ 31) and (SCU $\geq$ 4) and (TCU $\geq$ 4); then the final LoTi score is LoTi Level 6.

If (Level 5/6 $\geq$ 16) and (Level 4a/4b $\geq$ 22) and (Level 3 $\geq$ 24) and (PCU $\geq$ 20) and (CIP $\geq$ 28) and (SCU $\geq$ 3) and (TCU $\geq$ 3); then the final LoTi score is LoTi Level 5.

If (Level 4a/4b $\geq$ 16) and (Level 3 $\geq$ 17) and (CIP $\geq$ 25) and (SCU $\geq$ 3) and (TCU $\geq$ 3); then the final LoTi score is LoTi Level 4b.

If (Level 4a/4b $\geq$ 12) and (Level 3 $\geq$ 22) and (PCU $\geq$ 25) and (CIP $\geq$ 22) and (SCU $\geq$ 3) and (TCU $\geq$ 3); then the final LoTi score is LoTi Level 4a.

If (Level 3 $\geq$ 20) and (PCU $\geq$ 12) and (CIP $\geq$ 17) and (SCU $\geq$ 2) and (TCU $\geq$ 2); then the final LoTi score is LoTi Level 3.

If (Level 1/2 $\geq$ 19) and (PCU $\geq$ 8) and (CIP $\geq$ 13) and (SCU $\geq$ 2) and (TCU $\geq$ 2); then the final LoTi score is LoTi Level 2.

If (Level 5/6 $\geq$ 7) or (Level 4a/4b $\geq$ 7) or (Level 3 $\geq$ 7) or (Level 1/2 $\geq$ 7) or (PCU $\geq$ 7) or (CIP $\geq$ 7) or (SCU $\geq$ 1) and (TCU $\geq$ 1); then the final LoTi score is LoTi Level 1.

Else, the final LoTi score is LoTi Level 0.

*Questions in this category generate other survey metrics but don’t affect the LoTi Level score unless unanswered. See Question Reference for more information.*
Appendix G
Letter of IRB Approval

October 8, 2018

Dear Mr. Mitchell,

The Seton Hall University Institutional Review Board has reviewed the information you have submitted addressing the concerns for your proposal entitled “The Role of Coaching on Learning in a 1:1 Environment.” Your research protocol is hereby accepted as completed and is categorized as exempt.

Please note that, where applicable, subjects must sign and must be given a copy of the Seton Hall University current stamped Letter of Solicitation or Consent Form before the subjects’ participation. All data, as well as the investigator’s copies of the signed Consent Forms, must be retained by the principal investigator for a period of at least three years following the termination of the project.

Should you wish to make changes to the IRB approved procedures, the following materials must be submitted for IRB review and be approved by the IRB prior to being instituted:

- Description of proposed revisions;
- If applicable, any new or revised materials, such as recruitment fliers, letters to subjects, or consent documents; and
- If applicable, updated letters of approval from cooperating institutions and IRBs.

At the present time, there is no need for further action on your part with the IRB.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Martin Finkelstein