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Implementation of Technology in the Primary Grades: Transformational Leadership and Teacher Motivation

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ACCEPTANCE

This dissertation, THE IMPLEMENTATION OF TECHNOLOGY IN THE PRIMARY GRADES: TRANSFORMATIONAL LEADERSHIP AND TEACHER MOTIVATION, by KRISTI M. RYCZEK, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education and Human Development, Georgia State University.

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THE IMPLEMENTATION OF TECHNOLOGY IN THE PRIMARY GRADES: TRANSFORMATIONAL LEADERSHIP AND TEACHER MOTIVATION

by

KRISTI RYCZEK

Under the Direction of Dr. Yinying Wang

ABSTRACT

Purpose: When a school leader communicates a shared school vision, a sense of purpose is created among staff members that may lead to increased motivation. Creating a shared school identity is the main task of a transformational leader. Addressing the needs and interests of teachers is the foundation for transformational leadership that in turn may affect student performance. **Research Methods:** This dissertation focuses on three constructs: (a) transformational leadership, (b) teacher motivation (in technology integration in instruction), and (c) student achievement. This study utilized a survey to investigate teachers' perceptions of the principal's leadership style and their own motivations for integrating technology into their classrooms. The data for four different regression models came from several sources: (a) a survey administered to second grade classroom teachers from the five schools participating in the study (transformational leadership and teacher motivation data), (b) second grade students' end of year assessment scores, (c) data on time spent on technology, (d) socioeconomic status (students who qualify for free and reduced lunch), and (e) race and gender information. The sample in the study was comprised of 330 second grade students from five different elementary schools in the school district and included eighteen second grade teachers from five different

schools. This research study provides insight into transformational leadership and teacher motivation, as well as detailed demographic information concerning the use of technology in the primary grades. **Findings:** The results showed that a principal's transformational leadership style and a teacher's motivation to implement technology were significantly positively related to principal's transformational leadership, accounting for 28% of teacher motivation. The findings of the multiple regression models indicated that at the second grade level, only ethnicity (specifically Whites to the comparison Black group) had an influence on student end of year scores. The conclusion indicates that White students scored on average 7.688 points higher than the Black students controlling for all other variables. **Implications for Research and Practice:** This study supports the need for states and school districts to train and support principals to build their capacity and to motivate teachers in order to build the teacher's capacity, which supports effective instructional practices to increase student achievement.

Keywords: *mathematics assessment, primary grades, teacher motivation, transformational leadership*

THE IMPLEMENTATION OF TECHNOLOGY IN THE PRIMARY GRADES: TRANSFORMATIONAL LEADERSHIP AND TEACHER MOTIVATION

by

KRISTI RYCZEK

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DEDICATION

This dissertation is dedicated to several important people in my life. First, to my parents, Bill and Helen Marable, thank you for your love and support during my life. I have been able to complete this journey because you have instilled strong core values that have guided my life. The best is yet to come, and I know that you are proud of me.

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CHAPTER 1

TECHNOLOGY IN THE CLASSROOM: A ROLE FOR TRANSFORMATIONAL LEADERS

More than ever before, students have access to current technology. According to the US Census Bureau in 2013, 83.8% of households in the United States reported computer ownership. The same report indicates that 78.5% of all households own a desktop or laptop computer, and 63.6% own a handheld computer (File & Ryan, 2014). More than three out of four 12-17 year-olds own cell phones with no variances among race, socioeconomic status, or ethnicity (National Association of State Boards of Education, 2012). Students attending school are digital natives, and technology is part of their daily lives.

In one of the first publications on educational technology, DeCecco (1964) stated that our schools exist in a technological culture, and it is difficult to see how schools will be able to resist the invasion of machines. The field of educational technology seeks to improve teaching and learning by studying the effective use of technology in education. Currently, educational technology is best described as the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources (Januszewski & Molenda, 2008).

Many research findings demonstrate that the use of educational technology in teaching has a strong, positive effect on student achievement (Hopson, 2002; Savage & Brown, 2014). Although technology has the potential to transform education, barriers remain that limit technology integration into everyday instruction (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2005). Being an effective teacher is a difficult task in itself, even without the addition of technology to classroom practice (Henriksen, Mishra & Fisser, 2016). Implementing

instructional change is a process, not an event; therefore, one barrier hindering this process is a lack of training and experience. Ertmer (2012) indicated that teachers need both in-service trainings in the use of technology applications and on-going curriculum support to be able to incorporate technology into the curriculum in meaningful ways. The teachers' comfort level with technology is another barrier that affects teachers' attitudes. Only 57% of teachers feel adequately trained to integrate technology into instruction (Ertmer, 2012). Teachers are faced with the new technology of tomorrow as they are still struggling with the effective use of technology today (Lisenbee, 2016; Morehead & LaBeau, 2005). Tech savvy and computer literate students are now entering school, and twenty-first-century skills are not being implemented with fidelity across classrooms because teachers are not always using available technologies in the school setting (Rotherham & Willingham, 2009). Presently, teachers and schools are scrambling to catch up to these children and the needs of the digital era (Wright & Lesisko, 2007).

Technology is no fad: it is the future staring us right in the eye and challenging us to adapt to both the challenges and opportunities presented (German, 2013; Rotherham & Willingham, 2009). According to Chou, Condrom, and Belland (2005), students are becoming negatively magnetized to technology because of the increased popularity and availability. The increased access exposes children to inappropriate content which can have an effect on childrens' psychological and physical development. The ability to incorporate educational opportunities that technology promises will help level the playing field throughout K-12 education and particularly across racial, gender, and geographic divides (Ritzhaupt, Feng, Dawson & Barron, 2013).

Since technology is not a fad, Gordon (2014) believes that if schools do not begin adopting and imbedding career and technical skills into education, people will encounter a world with many people without jobs and increasing numbers of jobs without people. To maximize student learning, everyone in the school community, including the students, needs timely and effective access to justify the right information and learning resources (Miller & Simkins, 2002). The frequency of educational technology in teaching and learning should be characterized by a strong, consistent integration of 21st century skills across all subject areas to better prepare students for the future (Lapek, 2017; Wallis, Steptoe, & Miranda, 2006). Technology is a tool that allows teachers to address equity and access issues, to provide opportunities to accelerate students' linguistic and conceptual development, providing support for students who learn in different ways by creating authentic and meaningful learning experiences (Hollenbeck & Hollenbeck, 2009; Warschauer, Knobel, & Stone, 2004). The development of a student's academic knowledge and career skills are no longer mutually independent silos (Gordon, 2014).

The strategy for this dissertation is to review the research literature as it applies to technology implementation through three constructs: (a) transformational leadership; (b) teacher motivation in technology integration in instruction; and (c) student achievement. The literature on the theory of transformational leadership is examined along with articles concerning the broader concept of organizational change. The review also includes information on teacher motivation and the principal’s role in setting teacher comfort level, particularly with technology implementation. Barriers to the implementation of educational technology are investigated including resource needs, institutional and administrative support, sufficient time, training and experience, and attitude or personality factors associated with major change. The focus shifts to student achievement by explaining the history of technology and teaching in schools. A

connection is then made between 21st century skills and student achievement. And finally, technology integration is addressed explaining the digital divide and exploring how that divide can be bridged.

This dissertation investigates a teacher's perception of the principal's leadership style and his or her own level of motivation to use technology in their classrooms to enhance student learning. The theory of transformational leadership provides a framework for assessing the principal's strategy for implementing a new role for technology. For educational leaders guiding change is one of their main responsibilities and lever of influence. It is through principal/teacher relationships that the change needed can take shape and have an effect on students and their achievement (Leithwood, Seashore Louis, Anderson, & Wahlstrom, 2004). My dissertation utilizes a case study approach to examine the relationships among principals and teachers in their efforts to integrate technology into the curriculum for primary students.

Guiding Questions

What is the relationship between a principal's transformational leadership and a teacher's motivation to integrate technology in the primary grades?

What is the relationship between technology integration in instruction and student achievement in mathematics for 2nd grade students in one urban Georgia school district?

This dissertation investigated the relationships among school principals' transformational leadership, teachers' motivation to integrate technology into instruction, and student achievement. Once this relationship is quantified, school leaders can use this information to make decisions with regard to technology integration. School leaders may find this study useful since many schools are beginning to facilitate practices to excel in the current Information Age. Understanding the impact of how their leadership affects change, may help leaders make optimal school-based decisions to improve practices (Barrett & Breyer, 2014). Being aware of the impact

of instructional practices that affect student achievement is critical to determine the course of action to successfully integrate technology into schools. Strong leadership is an essential component for successful technology-based school reform (Wright & Lesisko, 2007). Hughes, Boklage, and Min Wook (2016) emphasized the importance of school leaders setting goals and vision for technology, supporting teachers' professional learning, and practicing shared leadership when introducing technological innovations. According to Kurland, Peretz, and Hertz-Lazarowitz (2010), transformational leadership is related to implementing school reform while focusing on creating a school improvement vision through positive emotions in others and believing in their abilities. Richardson, McLeod, and Sauers (2015) explained the importance of leaders creating a collaborative vision with staff to increase technology-supported pedagogy. This study will either support or refute the Kurlan et al., (2010) and the Leithwood and Sun (2012) statement that transformational leaders possess attributes for motivating their staff in positive ways.

Merely adding technology in the classroom does not translate into better teachers or better educational outcomes (Harris, 2016; Moeller & Reitzes, 2011). However, when teachers are inspired to use technology effectively, outcomes tend to improve (Sharma & Singh, 2017). Yet, teachers can utilize technology applications as a simulation of the real-world, creating the opportunity for students to explore authentic tasks, such as interacting with people in different cultures, exploring various locations around the world, and gathering information to solve meaningful problems (Dunleavy, Dede, & Mitchell, 2009). Examining the role that educational technology plays in student achievement, may provide a picture of the impact of educational technology as a way to enhance teaching and learning. This dissertation uses quantitative methods to examine the influence that technology has on student achievement for 2nd grade

students in an urban Georgia district by measuring the amount of time students spend on technology.

In 2015, Congress passed the Every Student Succeeds Act, which is President Obama's version of the Elementary and Secondary Schools Act. One feature of this Act requires school leaders to support professional development related to instruction in science, technology, engineering, and mathematics, including computer science. Investment in human capital is as important as the investment in technology (Akbaba-Altun, 2006). The study may help district leaders make better decisions in regards to professional development that aids teachers in integrating technology with state standards. When process performance is analyzed and compared with the desired outcomes, facts can be generated and used to assess management and used to make changes for continuous improvement (Hamilton, Orr, & Raboin, 2008).

Using the study's data, districts' leaders will be able to evaluate components of technology access, including the ratios between the number of students at a school and the number of devices owned by the school and the frequency of use of a school technology device. These measures may provide insight on the most efficient way to spend money on technology. Districts leaders have used funds to add technology in schools; the data from this study will provide base line information on the instructional knowledge needed, the number of computers, and the optimal amount of study time needed. For effective implementation, teachers must understand how to connect technology with pedagogy and curriculum standards. Focusing on how teachers integrate technology into their teaching is more important than focusing on what tool teachers integrate into their practice (Koehler, Mishra, Akcaoglu, & Rosenberg, 2013). There are a myriad of factors for the integration of technology into student learning. It can be measured in multiple ways, such as by student access and student achievement. With high stakes

testing and pressure to use technology, it is beneficial to look at the connection between technology integration, teaching and learning, and student performance data.

Review

The premise of the 21st century skill movement is that the world has been transformed in the last few decades. Lapek (2017) suggests that students have developed and mastered 21st century skills, students will be able to use these skills to positively respond to changes in the world and solve problems that result from the changes. The role of learning and the structure of education both need to evolve in order to meet the demand of the global economy (Jacobson, 2016; Trilling & Fadel, 2009). Schools as organizations have been challenged to adjust to new technology, or they may face negative consequences (Rotherham & Willingham, 2009; Salmela, Muotka, Alho, Hakkarainen & Lonka, 2016). This challenge has created a need to examine school leadership to meet the needs of this evolving world (Brown & Bryant, 2015; Yuen, Law, & Wong, 2003). Leithwood and Riehl (2003) explained that there is only about three to five percent variation in student learning. However, the effect of that variation is amplified to nearly 25% when all of the school's factors are taken into consideration.

A shift has occurred in the language in defining the field in the 21st century, with an emphasis on management to leadership (Bush, 2017). According to Ling and Ling (2012), school leadership is a priority in education because it plays a significant role in the outcomes of the school by the leader's influence on the motivations and abilities of teachers, in addition to the school climate and environment. This dissertation investigates, by following other case studies, the principals' efficacy in leading major change within a school. It is known that educational leaders influence teachers by promoting the organization's vision and goals and by providing resources that support teachers in their effort to teach students (Ling & Ling, 2016; Sun & Leithwood, 2015). Though indirect, the effect of leadership on school personnel is important;

specific attitudes and endeavors may be identified as studies examine how new practices have evolved into established programs. Many researchers have claimed that *leadership is one of the main factors in motivating others to implement change effectively* (Kurland, Peretz, & Hertz-Lazarowitz, 2010; Leithwood & Sun, 2012). Researchers have stated that personality traits are connected to leadership style (Solaja, Idowu, & James, 2016). Currently, there is limited research on how a specific leadership style motivates teachers to implement technology into the curriculum. Given the current state and pace of change in organizational behavior, this lack of attention to the effect of leadership style can leave organizations struggling to meet their organizational goals.

Schools have invested substantial funds to provide educational technology resources for the improvement of student learning (Halverson & Smith, 2010). The technology initiative has not been entirely successful because of its exponential growth. Many aspects have not been implemented effectively to meet student needs. Even though technology can transform teachers' teaching and thinking, and impact student learning (Moeller & Reitzes, 2011) a guidebook for best practices is missing. For example, according to Hardman (2005), there is a lack of synchronization between the use of computers for mastering mathematic concepts taught by the teacher and the use of computers to develop "student's understanding of mathematics" (p.11).

Technology can address equity issues by the delivery of instruction that focuses on each student's pace of learning and their need for immediate feedback (Hollenbeck, 2009). However, there is a gap in the knowledge of the extent to which technology hinders or enhances teachers' instructional practices and student learning. In addition, limited research is available about the amount of time students spend on technology and resulting student achievement levels. Very

little research and data have been published on using socioeconomic status (SES) as a prediction for mathematics assessment scores among primary students: kindergarten to grade six.

There is a significant gap in the literature between the knowledge and skills a majority of students attain in school and the necessary knowledge and skills needed for the 21st century community and workplace. To see the potential of technology to enhance instruction and increase student achievement, it is imperative that school leaders be able to guide the reform for teachers to make that paradigm shift (Ackerman & Krupp, 2012; Kagan, 2004). Schools that have not added 21st century skills to their instruction are facing external pressures to prepare students for the real world (Wallis, Steptoe, & Carolina, 2006). Principals must be skillful at guiding the needed transformation within their school (Arokiasamy, Abdullah, Shaari, & Ismail, 2016; Solaja et al., 2016).

Background

The evolution of technology created a need to incorporate technology management (Moeller & Reitzes, 2011). Empirical research studies on technology implementation within organizations began to appear in literature in the 1950s, which led to a similar investigation of technology in educational settings (Yuen et al., 2003). The findings from this research project have created a set of perspectives or models of how organizational change occurs (Ellsworth, 2000). Rogers (2003) explained that in the process of adopting an innovation there are four key elements: (a) communication channels, (b) time, (c) innovation, and (d) social systems. Rogers' theory of innovation diffusion can be applied to the study of educational reform; particularly the agent's framework of informal and formal communication. It is possible that in this environment of change, resistance can disrupt or distort the perception of the innovation to the proposed

adoptor (Hallinger, 1992, 2003). The leader's channels of communication used to diffuse an innovation may impact the rate of adoption (Ely 1990; Rogers, 2003).

Hall and her research team (1974), completed a three and one-half year study of innovation adoption in an educational organization and developed the Concerns-Based Adoption Model (CBAM) as a developmental process that stakeholders and organizations sift through when designing and implementing an innovation, such as a program, practice, or strategy. The results indicated that people go through stages of concern with seven possible categories associated with an innovation. In the earliest stage of the change process, individuals focus on their personal concerns and the impact on their performance. When educators become more knowledgeable and skilled in the innovation, their focus shifts to the concern of the impact of the change and how it will affect students and relationships with colleagues. Leaders can use these models to understand the concerns of teachers in the change process and provide support as needed.

Ely (1990) described eight conditions of change that facilitate the adoption, implementation, and institutionalization of educational technology: (a) dissatisfaction with the status quo, (b) adequate knowledge and skills, (c) accessible resources; (d) available time, (e) rewards or incentives for participants, (f) participation that is expected and encouraged, (g) commitment by those who are involved, and (h) evident leadership. Implications for leaders include the need for the communication of a clear vision and professional development for teachers and staff to support the new process (Hallinger 1992, 2003). Fullan (1993) introduced a framework that includes the complexity of the process of change in schools, implying that the construction of a shared vision is imperative in the implementation process.

Fullan's (1993) framework along with Roger's (1995) diffusion of innovations theory, Hall's (1974) CBAM model, and Ely's (1990) conditions of change emphasize the complexity of the process of change to successfully implement technology in schools. Mooij and Smeets (2001) recommend a five-phased model to increase levels of technology transformation within a school setting, with a hierarchy of levels representing each level more profound than the last. Their information and communication technology (ICT) model includes five phases: (a) incidental and isolated use of ICT by one or more teachers, (b) increasing awareness within the school or the relevance that ICT has for all levels, (c) emphasis on coordinating the implementation and integration of ICT and hardware within the school, (d) emphasis on didactic innovation and ICT support, and (e) use of ICT-integrated teaching and learning that is independent of time and place. All of the phases, except the last one, were generalized from Mooij and Smeets (2001) case study analysis of ICT implementation development in ten secondary schools in the Netherlands. The researchers described the fifth phase as a theoretical construct because this phase was not yet observed in action in the schools. Mooij and Smeets' (2001) model, along with Ely's (1990) model, both focus on implementation. Yuen et al., (2003) argue that it is imperative to examine the history of school development to recognize the challenges in the implementation of ICT.

Researchers have also connected the value of leader-teacher collaboration to successful school leadership practices (Birky, Shelton, & Headley, 2006). Almarshad (2017) found that principals that directly interact with the teaching and learning process have a larger effect on a students' academic performance. An effective principal's leadership includes building positive collaborative relationships and encouraging innovation as teachers implement new strategies into their classroom (Barrett & Breyer, 2014; Heystek, 2015). A principal's leadership, as a

transformational leader, is contingent on the collective identity within the work environment, such as a teacher's perception of values and goals being aligned with the principal's initiatives (Feinberg, Ostroff & Burke, 2005). Prior research studies have indicated that school leaders play a significant role in educational innovations (Barrett & Breyer 2014; Yuen, Law, & Won 2003). The successful implementation of technology is about influencing and empowering teachers by supporting their continuous development in their learning, not about the technology equipment (Yuen et al., 2003). However, there is a gap in the literature on how a principal's leadership style impacts teachers' motivation. The lack of attention to leadership style can lead to organizations not being able to meet their organization's goals.

Transformational leadership. In the mid-1980s, more demands were made on school systems to raise academic standards and student achievement (Darling-Hammond, 2000). This excellence in education movement was based on the premise that raising expectations would raise student achievement. The reform effort or movement spotlighted school leadership and the connection between school leadership and teacher effectiveness. The movement also provided economic, human, and material resources to economically disadvantaged schools in an effort to achieve parity **(**Fritzberg, 2001). However, limited attention has been given to implementation and what techniques should be used to support students to live up to these new higher standards (Tosh, 1984). Honig (1985) explained that the excellence movement was designed to increase educational accountability and create a movement to obtain better student performance. The new school reform and accountability pressures principals to improve student achievement on high-stakes standardized testing, which is an ineffective way to measure quality instruction (Honig, 1985). This new leadership focus demanded veteran principals to embrace a new way to lead their schools (Darling-Hammond, 2000).

The transformational leadership theory emerged in the literature in the 1980s by responding to the link between school effectiveness and leadership due to too much emphasis on instructional leaders being powerful authorities (Kurland et al., 2010). Transformational leadership theory focuses on members of an organization being engaged and motivated to reach goals, shared by both the individuals and the whole organization (Leithwood & Sun, 2012). James McGregor Burns (1978) pioneered the concept of transformational theory focusing on ways that leaders emerge from a focus on transactions to becoming an agent of change. Burns believes that it is important to look at the power of leadership through the lens of relationships with leaders exerting mutual persuasion by enticing employees to work toward the organization's goals that are aligned with the wants and needs along with the desires and shared expectations of both the leader and the follower. Burns developed this model for political leadership without empirical research; yet this model influenced researchers such as Bass and Avolio (1994) and Leithwood (1994) to expand the transformational leadership model for school leaders.

Bass's (1998) research was an extension of Burns' earlier studies. Bass found that transformational leaders displayed certain behaviors that increased the level of commitment and expectations. Bass and Avolio (1993) stated the behaviors that transformational leaders exhibit includes four components: (a) inspirational motivation, (b) idealized influence, (c) individualized consideration, and (d) intellectual stimulation. Inspirational motivation includes clearly communicating a shared vision with enthusiasm to challenge employees. Leaders who have idealized influences demonstrate a sense of purpose and will take risks. They are trusted because they display high standards and are respected and admired by their employees. Transformational leaders with individualized consideration pay attention to the employees' needs and encourage and develop others. Intellectual stimulation increases awareness by creating ways to view

problems with a new perspective. Results from many research studies have indicated that these transformational behaviors are linked to leadership effectiveness (Kark & Shamir, 2002; Masood, Dani, Burns, & Backhouse, 2006).

Leithwood connected Burns and Bass' research by creating a conceptual model that has contributed to the educational leadership community by increasing knowledge of how leadership affects the school's environment. Leithwood, Begley and Cousins (1994), presented seven dimensions to describe transformational leadership: (a) building school vision and establishing school goals, (b) providing intellectual stimulation, (c) offering individualized support, (d) modeling best practices and important organizational values, (e) demonstrating high-performance expectations, (f) creating a productive school culture, and (g) developing structures to foster participation in school decisions. Leithwood et al. (1994) also added management dimensions of staffing, instructional support, monitoring school activities, and community focus. Leithwood's model focuses on providing support for changes in the form or operation of a phenomenon with intellectual stimulation and personal vision (Leithwood et al., 1994).

In the last two decades, many studies have indicated the behaviors exhibited through transformational leadership are an influential form of leadership, which is linked to high levels of individual and group performance (Kark & Shamir, 2002; Masood et al., 2006). Yet, specific research on exploring the underlying processes in which transformational leaders apply their influence on employees which leads to higher performance is limited (Kark & Shamir, 2002). Masood et al. (2006) conducted a study involving 339 participants from five manufacturing companies in Pakistan. The researchers determined how the behavior of the transformational leader can influence, to a great degree, the employees' motivation. By granting workers the freedom to make decisions in their work the moral and confidence of the workers increased.

Transformational leadership in schools. Transformational leadership often includes the creation of a school improvement vision. By generating positive emotions in others and supporting a belief in their abilities, educational leaders can affect change (Kurland et al., 2010). These two strategies, generating positive emotions in others and supporting a belief in their abilities, creates a pathway to which change can take place in an optimistic and goal focused direction, transforming the school through a shared school improvement vision. Transformational leadership increases the effort and commitment of teachers, and others, towards achieving a school improvement vision (Leithwood & Sun, 2012). Leithwood and Sun argue that teachers and administrators become motivated by inspiration and goals associated with the values and beliefs of the school's vision. Much like Kurland et al. (2010), Leithwood and Sun identify with transformational leaders who possess attributes for motivating their staff in positive ways to create a transformational school improvement vision.

In a study examining the correlation between leadership, vision, and learning in schools, Kurland, Peretz, and Hertz-Lazarowitz's (2010) revealed that articulating a vision is an aspect of the principal's leadership style, and vision creation can be used as a predictor of the learning that takes place within the school. When school leaders communicate a shared school vision, a sense of purpose is created among staff members that create motivation. Another conclusion from the study discovered that teachers see value in principals who give them individual attention and inspire them to look for solutions in new ways.

Strong transformational leadership from the principal is crucial in supporting the commitment and assurance of teachers (Hallinger, 2003; Tengi, Mansor & Hashim, 2017). Sometimes teachers themselves can be barriers to the development of teacher leadership, and transformational principals are needed to encourage teachers to share leadership functions

(Hallinger, 2003). When teachers perceive principals' instructional leadership actions to be appropriate and in the best interest of the school, their level of commitment, professional involvement, and willingness to innovate grows (Sheppard, 1996). The more transformational the leadership, the more teachers become task oriented and engaged (Kurland et al., 2010). Instructional leadership can itself be transformational. The two can go hand in hand.

Teacher motivation: the principal's role. Several researchers have studied the problem of lack of motivation among teachers and their high turnover rate (Ingersoll, 2001). Several studies (Alatawi, 2017; Griffith, 2004; Sun & Wang, 2016; Walumbwa & Lawler, 2003) have examined the relationship between transformational leadership and turnover intention. Yet, there is not sufficient data to determine the amount of impact of transformational leadership on turnover rate. Griffith (2004) study found that a school's principal transformational leadership indirectly negatively affected school turnover, as measured through job satisfaction. In addition to schools, Walunbwa and Lawler (2003) studied transformational leadership style in work settings and determined that the style had a negative impact on employee turnover intentions. Unlike Walunbwa and Lawler (2003), Alatawi (2017) found that employers that portrayed a transformational leadership style led to a reduction in employee turnover intention. Sun and Wang (2016) state that leaders with a transformational style build connections with their employees, which leads to a decrease in turnover intention. Results of studies are inconsistent in regards to the correlation between transformational leadership style and turnover intention.

According to Ingersoll (2001), district and local school leaders have been provided with research-based suggestions as solutions to the problem of high teacher turnover or transfer rate. However, there is limited research investigating teacher motivation alone (Heystek, 2015). Several factors determine the kind of motivation required to help teachers perform in the way

expected by leaders (Heystek, 2015). The principals' leadership style has a direct effect on the creation of a school climate that is focused on achieving the school's vision (Leithwood & Jantzi, 2006).

Transformational leadership influences teachers' performance, raising their perceived effectiveness (Alatawi, 2017; Arokiasamy et al., 2016; Solaja et al., 2016). Researchers have found that transformational leaders, compared to other leadership styles, are more likely to motivate their employees (Masood et al., 2006; Singh, 2013). However, in the educational sector, there are many factors that establish a teacher's work ethic. Based on Maslow's needs theory satisfying one's needs is an effective strategy to use for motivation, and transformational leaders activate these higher-order needs in their employees (Maslow, 1943).

If teachers have their needs met by creating a feeling of satisfaction, they perceive the school to meet their needs (Shields, 2010). Principals benefit from the teachers' perception and can use their satisfaction as a motivational tool (Schiller, 2003; Shields, 2010). According to Leithwood and Jantzi (2006), (a) work conditions and climate, (b) high performance standards, and (c) parental involvement are factors of teacher motivation; but the principal's leadership style is one of the most significant factors in creating an encouraging school climate. According to Singh (2013), leaders who deal with and understand emotions in the organization ensure job satisfaction since the members feel that their feelings and emotions are being acknowledged.

Researchers agree with Rogers' (2003) diffusion of innovation theory, stating that incorporating a clear communication process is one of the key components of teacher innovation and motivation. Davis (2006) emphasizes that transformative learning involves the acquisition of knowledge, which consequently reshapes prior knowledge, attitudes, and motivation. Effective school leaders support teachers in their development of new skills while creating a safe working

environment for teachers to feel comfortable about sharing their ideas and working through issues (Leithwood & Jantzi, 2006).

Another important factor in educational leadership motivation is the type of relationship between the principal and the teachers. Zainal (2008) explains that a principals' positive relationship with teachers is a source of motivation that has a direct correlation to teachers' morale and performance. Literature has verified that there is a correlation between transformational leadership and job satisfaction. Singh's (2013) findings indicated members who are satisfied and happy want to be inspired by optimistic, confident leaders who maintain self-control while communicating a clear message.

Teacher comfort level. Educators of the 21st century think and act differently from 20th century educators because of the profound amount of technological tools that are available (Ertmer & Ottenbriet-Leftwich, 2009). Many educators believe that students need to develop critical thinking and problem-solving skills to be effective 21st century students and technology has the potential to transform the learning environment (Moeller & Reitzes, 2011). However, many teachers are still not comfortable with student-centered teaching strategies that utilize technology (Ertmer & Ottenbreit-Leftwich, 2010). According to Palak and Walls (2009), teachers often use technology for preparation, administration, and management purposes even when they are not comfortable using technology for teaching in a technology-rich environment.

Teachers are essential in the effective implementation of educational technology into the curriculum (Trilling & Fadel, 2009; Wright & Lesisko, 2007). One factor that affects teachers' attitudes is the teacher's comfort level with technology (Ertmer, 2012). Putting technology into classrooms without teacher readiness and curriculum considerations have produced anxiety among teachers because using technology as a teaching and learning tool creates changes in

classroom procedures (Morehead & LaBeau, 2005). The use of often-unfamiliar technology leaves teachers unsure of how to adjust their practices; teachers are trained in how to deliver curriculum and handle classroom management, but not trained in providing their own technical support (Ertmer, Ottenbreit-Leftwich, Sadik, & Sendurur, 2005).

Barriers to Implementation

School administrators, parents, students, and even the federal government have begun advocating for the meaningful use of digital tools in the classroom (McLeod & Richardson, 2013). However, meaningful technology utilized in the K-12 classroom presents an ongoing challenge in education (Celik & Yesilyurt, 2013; Morehead & LaBeau, 2005). Bingimulas (2009) stated that teachers had a strong desire to integrate technology into education, but they encountered many barriers. The predominant barriers were (a) lack of confidence, (b) lack of competence, and (c) lack of resources. Since confidence, skill, and accessibility have been found to be the critical components for the integration of technology in schools, then professional development for software and hardware along with administrative and technical support all need to be provided for technology to be beneficial (Bingimulas, 2009).

Level of administrative support. A school's vision, staff, and resources create the school's environment. In addition, a school's environment is inclusive of the attitudes of the school leaders and the teachers (Machado & Chung, 2015). Macado and Chung (2015) suggest there is a relationship between a principals' influence and a teacher's practice. Forward-thinking principals who focus on technology integration have more influence on teacher practice while those principals with less focus have less influence on teacher practice. Dawson and Rakes (2003) research revealed that technology integration is related to the principals' belief that technology

improves achievement. Researchers have shown that those principals with technology integration training achieve more integration success than those without such training.

According to Machado and Chung (2015) results from multiple studies have shown that school principals have a direct influence on teachers and the school's environment. The principals' desire to implement technology integration was found to affect teachers' desires to integrate it. Generally, (Peeler, Kali, & Dori 2011) found that principals' attitudes are positively correlated with teachers' attitude. Moreover, improving teachers' attitudes toward technology helps improve implementation of computer-supported education (Celik & Yesilyurt, 2013).

In order to effectively implement technology into instruction, teachers must be provided the resource of time (Machado & Chung, 2015). Teachers report that one way they feel supported in implementing technology is by being given the time to use the technology (Lu & Overbaugh, 2009). Other factors affecting technology implementation include (a) mentoring, (b) providing extended workshops, and (c) providing continuing learner-centered professional development (Duran Brunvand, Ellsworth, & Sendag, 2011; Polly & Hannafin, 2010). The most successful principals were those who implemented a school vision, which included technology integration that supported teachers with comprehensive and on-going professional development (Machado & Chung, 2015).

Professional development. Technology and equity have revealed a new social divide (Warschauer, Knobel, & Stone, 2004; Yau, 2000). Providing access does not mean that technology will be used effectively to enhance teaching and learning (Noeth &Volkov, 2004). According to Schrimpt and Tower (2011), teachers are not always using available technologies to the fullest power because there is a need for more professional development to increase proficiency and comfort in using technology. According to Darling-Hammond, Chung Wei,

Andree, Richardson, and Orphanos, (2009), traditional professional development, or the one-time workshop model, operates under a faulty theory of teacher learning. Assumptions are made that the only challenge facing teachers is a lack of knowledge of effective teaching practices and that teachers will be able to change when the knowledge gap is corrected.

Cornett and Knight (2008) found that when teachers were only given a description of new instructional skills, as traditional workshops do, only 10% of the teachers applied the new knowledge in their classrooms; however, when modeling, practice, and feedback were added to staff development, approximately 95% of the teachers implemented the new skills in their classrooms. Thus, aligning professional development with teachers' beliefs and curriculum taught may increase technology usage. Successful integration requires collaboration and commitment from teachers. Patter (2009) suggested that when teacher support is increased, the likelihood that teachers will successfully integrate technology also increases. According to Gil-Flores, Rodriguez-Santero, and Torres-Gordillo (2017), professional development in technology is the most significant variable in the explanation of classroom use of technology.

Continuous professional development for teachers is necessary to increase frequency and intensity of technology implementation in the ever-changing field of education (Berry, 2011). Gorder's (2008) study examined teachers, K-12 from South Dakota, who had been trained to use and integrate technology into their classroom. The results indicated that the teacher is the critical factor for success when using and integrating technology. Other research showed that teachers were able to use technology for their own professional productivity, yet they struggled with integrating technology into their classrooms for teaching and learning. Teachers who taught high school tended to integrate and use technology more than teachers who taught elementary and middle school. Gorder suggests that professional development opportunities are important to

bring teachers together to discuss and share ideas for integrating technology into their classroom and that it is best if teachers integrate technology into their daily instructional practice.

Scheduling sufficient time. Busy teachers find that time is a barrier to achieving classroom technology integration. In addition to their normal responsibilities, they must master and achieve confidence in new technology in order to utilize the technology in instruction (Machado & Chung, 2015). Teachers need time to learn the new technology; then they must adjust lessons in order to accommodate the new technology. Berry (2011) conducted a case study that found that 62% of participants said their greatest obstacle to the continuous development of the use of technology was time to learn, practice, and plan. Berry's findings suggest that teacher classroom practices can be changed if teachers are given a chance to plan how to integrate technology into instruction. The study shows the importance of providing sufficient time for teacher training in order to promote the successful integration of technology for learning and instruction.

One way to build instructional capacity is to provide teachers the time to plan and practice learning activities for future lessons, so they are comfortable using them (Lisenbee, 2016). It is also beneficial for the teacher to share technology resources with other teachers including research, lesson planning, resources, and activities, which enable teachers to build proficiency level and create awareness of students learning to use technology (Darling-Hammond, 2000; Wang, Wang, Li, & Li, 2016). According to Noeth and Volkov, the most critical element in technology use is the preparedness and skill level of those who employ it (2004).

Technical support. Today an increasing proportion of school system budgets is being spent for the support of technology. Despite this growth, only a minority of state education

departments have created licensing or certification credentials for instructional technology leaders (Wright & Lesisko, 2007). Adequate technical support can be critical for the success of implementation of technology. Teachers are not always using available technologies to their fullest power to promote 21st century skills (Lisenbee, 2016). There is a widespread assumption that teachers are trained in how to deliver curriculum and handle classroom management and that they can employ technology in those efforts "out of the box" without any assistance beyond that involved in wiring the classroom (Wright & Lesisko, 2007). The truth is that educators are not trained in providing their own technical support, and are not prepared to support a school-based infrastructure that houses data, voice, and video components (Noeth & Volkov, 2004). Teachers will not effectively use technology if they are not confident and have easy access to technical and instructional support. The key for effective integration of technology is adequate teacher training in handling and managing the devices in their classroom (Oliver & Townsend, 2013). To develop an engaging school climate, leaders need to tap the wealth of knowledge and skill sets of everyone in the school (Hughes & Pickeral, 2013).

The Role of Technology in the Culture and in the Schools

Bates (2014) explains that the role of technology dates back at least 2,500 years, with technologies being developed to make complex work more manageable to the ordinary person. One of the earliest documented examples of technology tools, the bow and arrow, dates back to the Stone Age, where cave paintings depicted how the bow was used in hunting (Buchanan, 2015). Around the third century BC, the Greek philosopher, Archimedes, had an idea to make a tool to make work easier by the use of simple machines, like the lever, pulley, and screw (Roth, 2013). Tools support innovative processes. Markman and Wood (2009) explained that

innovations happen in the context of a practical problem that leads to a solution that could be implemented.

The Industrial Revolution introduced many innovations that made work easier, such as the invention of the steam engine (1698) and the cotton gin (1794), which opened up a window of opportunity to increase production, efficiency, profits and commerce, not only domestically but also internationally (Montagna, 2015). Technology was defined as a way a human alters the environment, and the people were focused on learning how to use these new tools during the Industrial Revolution (Chichilnisky, 1997). Caudill (2012) describes technology as a tool, and he believed that technology had always been a tool and will never be more than just a tool.

Danelek (2010) described the 20th century as a memorable time in history based on the rapid pace of inventions and innovations. Changes included the introduction of Ford's Model-T (1908), the radio (1916), photocopier (1937), color television (1940), calculator (1967), the personal computer (1974) and world-wide-web (1990), which were inventions that transformed our nation.

Molnar (1997) explained that the technological revolution started because “necessity is the mother of invention," yet paradoxically this tent has been inverted so that now "an invention is the mother of necessity" (para.1). Bellis (n.d.) described the people of the 20th century as being in awe and amazed at the capabilities of these new technological devices. Turkle (2011) indicates the excitement of technology has now faded over the years and now people take this technology for granted. The entire population uses technology in some capacity as it has become a standard part of lives. Barani (2014) suggests that memories of life before the Device Age are diminishing and will be extinct soon.

Chichilnisky (1997) stated: "We are not seeing, as, previously thought, a transformation from industrial production to services but rather from a resource-intensive to a knowledge-intensive economy" (p. 107). Our world has shifted from one focused on using tools to make work easier to a world where people use technology to process information and communicate with others in ways that were rarely possible until recently. In our global society, we are dependent on the use of human knowledge (Wallis, Steptoe, & Miranda, 2006). Smith (1999) added that humans are now in a time that expects technical understanding in order to engage thought and action.

Many changes have been made in the world because of innovations and technology; however, Stager (2015) suggests that education reform has not made any dramatic changes over the years. Mendez-Morse's (1993) research indicates that schools will improve if innovations are implemented with fidelity. Kagan (2004) adds that educators have the ability to access more information than in the past and it is unfortunate that a paradigm shift has not occurred.

Within the context of educational reform, innovation and technology are related. Schilling (2013) defines innovation as "the practical implementation of an idea into a new device or process" (p. 18). Regarding education, an innovation can include a modification within an instructional practice that is currently being implemented or enhancing lessons using products or services that are accessible to schools (Nworie, 2014). Innovation can come through instructional design alone or in conjunction with a device. Both are under the umbrella of innovation, as defined by Merriam-Webster (2015) as "the practical application of knowledge, especially in a particular area" (1a). It is useful to note that educational technology is defined as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (Januszewski & Molenda, 2008, p.

1). Kuboni et al. (n.d.) explains that technology can be used as a driving factor in implementing change in schools' educational design and delivery.

Instructional innovation and technology have evolved over the past 100 years (West & Bleiberg, 2013). At the beginning of the 20th century, Hein (2004) explained that both schools and libraries were required to adapt to mirror educational museums during the Progressive Movement. These school museums housed supplemental teaching materials for teachers to use to support teaching and learning in their classrooms such as stereographs, slides, films, charts, and other instructional materials (Hein, 2004; Reiser, 2001). The audiovisual instructional movements peak was in the 1920s and 1930s, and at this time radio broadcasting along with sound motion pictures were added as instructional resources for teachers (Bates, 2014; Reiser, 2001). King (2008) suggested that the United States' involvement in World War II created a critical need for immediate attention to the military, creating a decline in audiovisual instruction advancements.

After World War II, the focus shifted back to creating new technological advancements, and during the 1950s, the television was announced as a new tool to support teaching and learning in the classroom (King, 2008). King suggested that teachers were excited about the use of television, and this innovation quickly became popular in schools, thus the Ford Foundation Project launched a closed circuit television system that provided instructional content to students in both schools and colleges. By 1955, Reiser confirmed that 17 educational television stations were in the United States. A large quantity of television stations were present, but in the mid-1960s, the quality of the programming was declining, and some programs only contained a teacher presenting a lecture (2001).

Years later, an accidental revolution occurred. A thinking machine, also known as a computer, was introduced into the educational setting (Molnar, 1997). This revolution of personal computers began to emerge in the early 1980s, and by 1984 there was approximately one computer per 92 students attending public schools in the U.S. (Dunn, 2011). As a result, schools created a centralized room to house the desktop computers and called the rooms computer laboratories (Wright & Lesisko, 2007). Becker (2000) shared that during this time, teachers used the desktop computers in these computer labs as a tool to teach computer skills, such as word processing and typing, and not as a tool to gain knowledge. Finnis (2004) stated that the public's shift to the Information Age would likely impact education and the learning process. Internet accessibility expanded worldwide by the late 90s, and Reiser (2001) reported that access to the Internet increased from 50% in 1995 to 90% in 1998 in schools. Finnis' (2004) statement was confirmed, and instead of a keyboard being limited to just typing information, it became a way to type as a means to communicate (Mbuva, 2012).

Computer capabilities grew rapidly, and various platforms of media were being introduced to transport information using the computer, such as text, video, audio, and graphics (Swenson, Rozema, Young, McGrail & Whitin, 2005). Tablets, iPads, and smartphones along with other technological devices are in practically every school, and students are bringing their own device (BYOD) into their classroom for learning (Mbuva, 2012). Collins and Halverson (2009) indicated that this digital revolution has changed education and will continue to renovate the world of education with every innovation. Collins and Halverson (2009) stated that education has evolved to meet the needs of the workforce. Initially, American education focused on the skills necessary to survive in a pre-industrial society. Focus shifted after the Industrial Revolution to create well-rounded citizens with basic knowledge. Collins and Halverson (2009)

added that the Digital Revolution has caused education to emphasize more “generic skills such as problem solving and communication in different media, and on finding different resources and learning from them” (p. 6).

21st Century competence. In the 21st century work and social demands have remarkably changed from the previous century (Dede, 2010). Societal problems are becoming more global and complex creating the need for creative thinking (Henriksen, Mishra, & Fisser, 2016). Trilling and Fadel (2009) state that critical thinking and problem solving are more important now than in past centuries and adds that new skills that were not even invented 50 years ago are now needed, such as digital media literacy. Buckingham (2015) explains that technology in the world has enhanced communication and increased the ability to interact with other cultures in the world. Educators need to incorporate digital literacy by affording students opportunities to gain knowledge on how to use media to engage with others (Buckingham, 2015).

According to the *Glossary of Educational Reform* (2016), the term 21st century skills refers to "a broad set of knowledge, skills, work habits, and character traits that are believed—by educators, school reformers, college professors, employers, and others—to be critically important to success in today's world, particularly in collegiate programs and contemporary careers and workplaces" (para. 1).

In 2002, the US Department of Education, alongside businesses, such as Apple and Microsoft, founded the Partnership for 21st Century Learning. The Partnership for 21st Century Learning’s (2016) mission statement is:

> to serve as a catalyst for 21st century learning to build collaborative partnerships among education, business, community and government leaders so that all learners acquire the

> knowledge and skills they need to thrive in a world where change is constant and learning never stops. (para. 1)

Trilling and Fadel (2009) recognized that a society's success depends on its educational system to produce workers that fulfill the needs of the economy. Collins and Halverson (2009) shared that it is impossible for students to acquire all of the knowledge that they may need in their future, but students can be taught how to retrieve the information they need as they become life long learners. Moroney, Czaplinski, Burrage and Yang (2016) expand on this idea by indicating that students need to become proficient in the standards being taught and in the learning process to gain additional knowledge.

The Partnership for 21st Century Learning developed a shared vision for learning and named the document as the Framework for the 21st Century Learning (2011). This framework contains a description of the subject knowledge, skills, expertise, and literacies that are critical for students to master to thrive in the workforce and life.

1. Mastery of core subjects (English, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government, and civics) while weaving in interdisciplinary themes (global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, and environmental literacy) into core subjects.
2. Learning and innovation skills, which include creativity and innovation, critical thinking and problem solving, and communication and collaboration
3. Information literacy, media literacy, and ICT (Information, Communications and Technology) literacy

4. Life and career skills such as flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility (Partnership for 21st Century Learning Skills, 2011, pp. 1-2)

The Partnership for 21st Century Learning believes that building a foundation based on this framework with support, such as curriculum standards, assessment, instructional practices, and professional development, students will be authentically engaged in their learning and be equipped with tools to succeed in the global economy (2011).

The 21st century has clearly shown that information technology has changed the way in which people live, and technological innovations have profoundly altered and redefined the way information is viewed and displayed (Panigrahi, 2011). When most of today's educators were in school, technological tools to support and enhance instruction were not used in everyday life (Dunn, 2011). Today, technology is woven throughout children's lives, and it is simply the way it is done, as they have never known life without the Internet (Oblinger & Oblinger, 2005). Consequently, students' technological proficiency level can present a challenge for many teachers, while at the same time the teacher's job description about classroom expectations has been modified to include being tech savvy to meet the demands of the digital society (Schrum, Shelley & Miller, 2008). Levin and Wadmany (2008) stated that teachers are essential to change because they have the greatest impact on the implementation of quality technology use within a school. James (2009) explains that with technological advances, increased funds spent on technology, along with awareness of the advantages of technology, has created an expectation of teachers to use technology resources that are available to them. Teachers are required to change their instructional practices when adopting educational technology resources to support and supplement teaching and student learning (Ertmer, 2012). Groff and Mouza (2008) state

incorporating technology into their instructional practices require teachers to confront their pedagogical beliefs.

By the late 1800s, the Committee of Ten standardized education, and 200 years later schools have remained stagnant, cemented in the same structure (Jacobs, 2010). Trilling and Fadel (2009) criticized our antiquated educational model noting that it no longer needed to track language, math, and the arts. Muttappallymyalil, Mendis, John, Shanthakumari, Sreedharans and Shaikh (2016) share with the incorporation of advanced technology in schools, schools need to be mindful of lessons learned in the past and create a balance between new methods of teaching and the timeless principles of education. Bellack (1969) shared that curriculum reform efforts should be made to solve a problem, not based on an innovation or model, and to solve the problem, one must examine the past. Past experience is invaluable, and failure could result if one fails to learn from it.

Dede (2010) explained that skills have evolved since the 20th century due to the addition of advanced communication technology. Computers are now able to complete some human tasks, which in turn is eliminating the need for some manual jobs (Dede, 2010). Technology is changing what is important to learn in a variety of ways (Collins & Halverson, 2009). Due to innovative technological advancements, it is imperative that schools make immediate changes to the design and teaching method to meet each student's need (Ackerman & Krupp, 2012). The world is rapidly changing, and society is evolving making the future unclear. Lapek (2017) explains that if we want students to thrive in this ever-changing world, they need to be equipped with both academic content and 21st century skills to be able to tackle any situation with success.

21st Century students. The Industrial Revolution is over, and education must adapt to meet the new needs of the 21st century (Ackerman & Krupp, 2012; Lisenbee, 2016). Barani

(2014) described the phase the world is living in as the Digital Age, where technology has become a vital part of our lives. Turkle (2011) supports the idea of technology being a vital part of our lives by describing technology as a phantom limb that has become part of our body.

Students are already primed to accept these needed changes. Students currently enrolled in schools in the United States have always been part of a world with high-speed Internet, social media, and immediate access to information at any time (Daugherty, 2015). Therefore, technology plays a critical role in building 21st-century skills for students, because today's students arrive at schools familiar with technology and possess a natural acceptance for new technology (Erdem & Kibar, 2014). Collins and Halverson (2009) explain that students who are attending schools should have the opportunity to learn through different mediums, such as playing complex video games, being involved in online learning, and participating in real-life simulations. Turkle (2011) describes current students as digital natives who feel comfortable being networked with lots of people, with limited personal contact with them. Daugherty (2015) describes that current students are digital natives, and the rest of the population are immigrants in this new world.

According to the authors of *Identify the Need for Technology Integration* (2014), 80% of jobs in the future will call for technological knowledge, creating a need for students to be familiar with the use of technology. Daugherty (2015) recognized the bygone era of rote memorization. This educational relic is no longer necessary when students may access the formerly memorized data with a few clicks on the Internet. Rather than exercising students' memories, accessible technology (and the information therein) provides students with the ability to challenge themselves in ways that transcend mere regurgitation of facts and data.

Students are now part of a global society and need to have knowledge about the entire world (Wallis, Stepstone & Carolina, 2006). Politicians, business leaders, and the education community are in agreement that we need to transform teaching practices into the 21st century, which is referred to as 21st-century skills (Wallis et al., 2006). Daniel Pink (2005) agrees by explaining that in the past development of "left-brained" skills was essential, but now "right brain" qualities, such as inventiveness and empathy are key. According to Wallis et al. (2006), one way to promote the integration of skills across subjects in the classroom is by allowing students to work as a team to merge ideas, which creates critical thinking and problem solving, in order to derive original concepts. Students need to be able to manage quickly and validate their source to analyze the information to determine if it is a reliable source. Twenty-first-century skills are about students acquiring the knowledge and skills to be successful in today's world (Black, 2010).

Computers have been used as learning tools in American schools for over 30 years (Hardman, 2005). Computer-assisted instruction in schools was mainly used for practice through individualized drilled programs to reinforce skills in the 1980s, along with the creation of spreadsheets and word processing (Shields & Behrman, 2000). The 1990s introduced more applications, such as the Internet and educational software that could be used to enhance the curriculum. In 1994, Congress enacted the Goals 2000: Educate America Act and the Improving America's Schools Act (Shields & Behrman, 2000). Title III of this act focused on technology for education. This $250 million initiative was used to provide students access to computers by distributing state-of-the-art technology to upgrade education.

How computers should be used to teach children continues to be a hot topic in education reform (Attewell, 2001). A debate on educational reform includes one side of the scale believing

that a focus should be placed on core competencies, such as reading, writing, and mathematics for students to be able to compete in the workforce (Shields & Behrman, 2000). The other side believes that it is necessary for students to learn higher-order thinking skills in order to problem solve, analyze information and discover solutions to remain competitive in the workforce (Shields & Behrman, 2000).

In the last ten years, computer technology has affected every aspect of our lives. Technology places new demands on our workforce as workers must adjust their education and skills to accommodate changes in economic engines (Bell, 2016; Uhalde, & Strohl, 2006). The workforce must adjust to computer and technological advance through training and education. Our economy has required more computer skills as computer-based careers increase (Carnevale & Smith, 2010). The computer-focused economy has transformed the educational and economic landscape on a scale not seen since the Industrial Revolution (Jacobs, 2010). The need for children to achieve computer literacy and competence is objectively recognized and supported (Howell, 2011). Accordingly, there is strong public support for providing access to technology to help students achieve computer literacy and competence (Buckingham, 2015; Howell, 2011). However, there is uncertainty regarding how educators will respond to technological advances, and it does not necessarily follow that learning outcomes will improve (Collins & Halverson, 2009). Improved technology does not guarantee improved learning (Facer & Sandford, 2009; John & Sutherland, 2005). Researchers generally agree that certain educational technology tools might be useful for some educational purposes while the same tools may not be useful in others (Papanastasiou & Ferdig, 2006; Peeraer & Van Petegem, 2015). The goal of integrating information and communication technology (ICT) into teaching practices and learning is to improve student's academic performance; therefore, numerous studies have been conducted to

determine the relationship between ICT for educational purposes. Findings have been inconsistent: some researchers have supported positive influences of ICT on student achievement (Boster, Meyer, Roberto, & Inge, 2002; Khalid, Sutoyo, Mungad, Sari, & Herawan, 2014), on the other hand, some have found negative influences (Biagi & Loi, 2013; Papanastasiou & Ferdig, 2006; Wenglinsky, 1998), and others have found no significant relationship (Aypay, 2010; Zhang & Liu, 2016).

Wenglinsky (1998) explored the relationship between mathematical literacy and technology use. He examined whether using computers resulted in higher math scores. The fourth and eighth graders in the study who used computers achieved lower math scores than the control group. Wenglinsky's study revealed a negative correlation between math scores and time on the computer. Wenglinsky explained this inverse relationship by concluding that either students do not put forth effort or that underperforming students are given more time on the computer. Wenglinsky maintained that computers could support an increase in student learning when used appropriately. Wenglinsky's (1998) conclusion aligns with Boster, Meyer, Roberto, and Inge (2002) and Khalid, Sutoyo, Mungad, Sari, and Herawan's (2014) statement that decades of research have proven that drill and practice programs are an effective means to reinforce basic skills to raise student achievement. Khalid et al.'s (2014) quasi-experimental study determined that students who practiced mathematics skills on the computer had an average of six points increase in pre to post-test; compared to students who did not use the computer with an average two points gain. However, Khalid et al. (2014) and Wenglinsky (1998) did not examine higher order thinking skills or problem solving.

Papanastasiou and Ferdig (2006) expanded on Wenglinsky's study by explicitly examining the particular uses of technology and compared those uses to performance on higher

or lower level mathematical literacy. Their study initiated a random sampling of 2,135 fifteen-year-old United States students who were administered the Program for International Student Assessment (PISA) to examine the correlation of information and communication technology (ICT) and academic achievement. Results showed that the frequency of educational software use was associated with lower levels of mathematics achievement. Thus, Papanastasiou and Ferdig's results indicated that the increase of computer use leads to increased computer comfort, but did not yield higher student achievement.

Aypay (2010) also used PISA data, but his sample consisted of 4,942 fifteen-year-old Turkish students. Aypay's results indicated that there was no significant relationship between math achievement and students' use of multiple variables of ICT, which included students' computer competency and use of computers. Zhang and Liu (2016) carried out a longitudinal study by using PISA data to examine how ICT use influenced achievement in mathematics over a twelve year period. According to the results, Zhang and Liu conclude that students' frequency of ICT does not necessarily relate to higher student achievement scores. Zhang and Liu (2016) concluded that for this generation of students, having the knowledge of ICT skills might not be as significant as how the students use ICT.

Due to the perception that students need to be proficient in using the computer, Borghansa and ter Weel (2004) completed a quantitative study to determine if it is beneficial for people to have sufficient computer skills before entering the workforce. The skill survey results indicate that the ability to use a computer did not have an impact on wages. Borghansa and ter Weel conclude that educational programs to teach students how to use computers is not an effective way to spend funds. However, Wallis et al. (2006), Black (2010), and Trilling and

Fadel, (2009) findings suggest that educators should use technology as a tool to meet the educational needs of all students.

Bridging the achievement gap. Along with Noeth and Volkov (2004), Wilson (2013) believed that technology should be used to enrich teaching and learning in every school. Wilson's vision was that technology should offer limitless possibilities for students to enrich their experiences and opportunities while developing higher order thinking skills (2013). Incorporating technology into teaching and learning practices will help level the playing field in education and narrow the division gap, especially across racial, gender, and geographic lines (Ritzhaupt et al., 2013). Warren-Sams (2009) discovered disparities among mainstream and disadvantaged racial/ethnic groups, in relation to technology embedded into teaching practices. Du, Havard, Sansing and Yu (2004) suggest that teachers and students in poor schools are more likely to use computers for drill practice and less likely to use them for research work when being compared with their counterparts in affluent schools.

Educators unconsciously stereotype students according to their socio-economic status, gender, and ethnicity, which prevents them from holding students to high standards and challenging them (Diem & Carpenter, 2012; Lowenstein, 2013). On the other hand, technology is not human and does not have any prejudice against race, gender, age, or ethnicity while being patient and allowing students time to think and respond. Specific programs provide more questions to determine the student's mastery of concepts, or their misconceptions, in order to assess the student's knowledge. Yau (2000) indicates that teachers should use technology to meet the needs and pique the interest of all students while deliberately making sure that instruction includes: (a) boys and girls from a variety of ethnic backgrounds in diverse roles, (b) availability in more than one language, (c) incorporation of multiple learning styles, and (d) different ability

levels. Yau explains that to ensure that students of all races and backgrounds have access to appropriate technology to benefit their education, technology leaders and educators need to implement effective policy and practices. Student learning can be maximized when students have access to information to support their learning in a timely fashion (Miller & Simkins, 2002).

To increase student mastery of skills and address equity issues, students need access to technology on their instructional level (Hollenbeck & Hollenbeck, 2009). Students can achieve their optimal best if they have a positive experience in school with a focus on accomplishment (Phan, Ngu, &Williams, 2016). Technology can be comforting to students because the information on their screen is for them to see and respond to privately. When students are interacting with a device, they do not have to fear the opinion of other students. According to Roe (2011), students will excel faster academically with increased motivation when technology allows students to work at their pace while receiving immediate feedback. Roe also states that using technology as an assessment tool allows educators to take immediate action by identifying student's content mastery instantaneously, allowing the educator to provide differentiated instruction to address students' needs.

Addressing equity and student mastery through the lens of an optimization theorist, Phan (2015) describes optimized functioning as a multifaceted structure with an "emphasis on the internal process of contemplation, sustaining, and action" so that students "maximize specific learning outcomes" (p. 442). To determine the impact of optimized functioning on a student's well-being and academic achievement, Phan (2015) initiated a quantitative study. Two hundred fifty-nine high school students in Australia participated in Phan's (2015) study by completing an Optimized Functioning Questionnaire. Phan's results indicate optimized functioning had a positive impact on academic engagement and interest in learning tasks. Phan suggests that

educators need to have students participate in authentic learning tasks that promote intellectual curiosity and application of real-world situations.

Educators have the ability to incorporate interactive technology that allows students to demonstrate their learning in a comfortable way (Edwards, 2009). Alammary's (2012) research findings, from multiple studies, indicated that there is a strong, positive effect on student achievement when technology is used to support teaching and learning. However, Clark (1983) did not believe that technology created a positive effect on student outcomes, and he wrote a meta-analyses about technology stating that media does "not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition" (p. 445). A few years later, Kozma (1991) debated Clark to create a shift in perspective, as Kozma believed that Clark did not take into consideration the possible relationship between technology and learning, by focusing on the improvements in technology capabilities in regards to education. Kozma states that both technology and teaching method need to be part of the instructional design in order to optimize the technology capabilities (Kozma 1991, 1994). An educator's charge is to create a learning environment that supports academic excellence along with personal growth (Phan, 2015). Using technology can create an interactive way of learning to gain deeper knowledge in a content area.

Summary

In the 19th century, schools had to transition their organization and vision to meet the needs of the Industrial Revolution. Now in the 21st century, the Digital Revolution is causing schools to transform to meet the needs of the world (Collins & Halverson, 2009). Jacobs (2010) explains that the American education system has not been updated in 100 years, and educational

technology does not fit within the current school structure. Currently, there are no federal or state laws mandating technology use for teaching and learning; there are just guidelines and standards.

In an education setting, a process or procedure can only be optimized if the members have a clear understanding of how multiple systems work together to make up the whole. Results from this study will inform school leaders how best to deploy technology resources in light of the principals' leadership style (Schoderbek, Cosier & Aplin, 1988).

Technology has altered the way humans think, operate, and is starting to affect schools. Changing instruction in the classroom to implement the use technology devices to enhance instruction is creating an effect on student achievement. The device is not the answer, but how teachers utilize the tools for teaching and learning is valuable to students. Benefits of technology are motivation to learn, ownership of learning, and individualized instruction based on the students' needs. Educational technology is not only a useful tool to support teaching and learning, but can be incorporated to build a comprehensive system to encourage life-long education (Muttappallymyalil, Mendis, John, Shanthakumari, Sreedharans & Shaikh, 2016). Students having access and using technology will be better prepared for the workforce and life. Technology allows for new teaching practices and student learning while providing new means for all stakeholders to be accountable to students, parents, and the community (Ellmore, Olson, & Smith, 1995). When a school leader communicates a shared school vision, a sense of purpose is created among staff members that creates motivation. Teachers see value in principals who give them individual attention and inspire them to look for solutions in new ways. Strong transformational leadership from the principal is crucial in supporting the commitment and assurance of teachers (Hallinger, 2003).

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CHAPTER 2

THE EFFECTS OF LEADERSHIP STYLE ON TEACHER MOTIVATION AND STUDENT PERFORMANCE

The design of the study along with the results are presented in this chapter. The description of the sample, instrumentation, data collection procedure, data analysis, and internal and external validity are also presented, along with the conclusions from the researcher's hypotheses are reported.

The review of the literature in Chapter One focused on technology implementation through three constructs: (a) transformational leadership; (b) teacher motivation for technological integration in instruction; and (c) student achievement. Literature on the transformational leadership framework was examined along with organizational change. The review explored the principal's role in engaging teacher motivation, teacher comfort levels and beliefs, along with data on technology in the classroom. Barriers to implementing educational technology for student learning included lack of (a) resources, (b) institutional and administrative support (professional development), (c) experience, and (d) optimistic attitude or personality factors (Bingimulas, 2009; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2005). The review transitioned into student achievement by explaining the history of technology and teaching in schools. A connection was made between 21st century skills, students, and student achievement. The literature review confirmed the need to answer questions and determine the relationships among (a) school principals' transformational leadership, (b) teacher motivation for technology integration in instruction, and (c) student achievement.

Appropriateness of the Research Design

President Obama signed the reauthorization of the Elementary and Secondary Education Act of 1965 on December 10, 2015, which replaced President Bush's No Child Left Behind

(NCLB). Every Student Succeeds Act (ESSA) with President Obama has shifted educational reform with a majority of the weight focused on academic indicators, such as test scores and school accountability. Georgia's accountability platform is the College and Career Ready Performance (CCRPI), which incorporates a variety of indicators to appoint a score, from 0-100, to every school in the state to represent school performance. Yet, this new reform has added pressure among school administrators and teachers to raise student achievement in all subpopulations (Darrow, 2016). With an added focus on closing the achievement gaps between a variety of subgroups, school leaders are seeking to identify factors that affect student achievement that are within the scope of the leaders' control (Almarshad, 2017; Allen, Grisby, & Peters, 2015; Marks & Printy, 2003).

According to Finnigan (2010), school accountability policies are based on two assumptions. The first assumption is that individual educators will be encouraged to raise student achievement by a desire to avoid the stigma of public scrutiny and other negative reinforcement methods. The second assumption is that these goals will be supported at the program level. In other words, school accountability policies also assume that the school hierarchy will provide the necessary climate, leadership, organizational structure, and resources to achieve achievement goals. Both individual educator motivation and leadership support must be present for accountability policies to be successful (Finnigan, 2010).

Principals' leadership efficacy affects their relationship with teachers with possible consequences for student performance (Marks & Printy, 2003; Zainal, 2008). There is research on the effect that a principals' behavior has on school achievement (Rose, 2007). Transformational leadership is a leadership style that has been proved to be one of the most effective factors in school improvement and leadership reform (Allen et al., 2015). Alatawi

(2017) explains that any leader that desires to lead using a transformational leadership style can come through education and practice.

According to Burns (1978), transformational leaders are those who inspire the organization. This tenet suggests the necessity to focus on the principal's leadership style, because student and teacher performance is affected by the leadership style (Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011). Additionally, innovative leaders directly affect school performance at every level. Innovative, transformational leaders motivate teachers to innovate as well (Leithwood & Jantzi, 2005). Policy makers generally utilize leadership styles in school reform, while avoiding the direct vs. indirect influence debate (Leithwood & Jantzi, 2006; Osborn & Marion, 2009). Leithwood and Jantzi (2006) and Nguyen, Winata, and Chong (2016) note that transformational leaders are more willing to make changes to the organization. Finnigan and Stewart (2009) recognized transformational leadership as the most effective leadership style after noting that transformational leadership qualities are highly represented in high performing schools. Principals have also recognized transformational leadership as the most effective style (Masood et al., 2006; Singh, 2013).

School leaders must draw upon transformational leadership behaviors in order to motivate teachers to execute change (Leech & Fulton, 2008). Drawing on these more effective leadership behaviors allows school leaders to meet increased demands to achieve improved educational outcome. Teacher motivation is usually determined by studying job satisfaction with respect to compensation, or support from the administration, the parents, and the community. However, this dissertation focuses on the teachers' perception of the principal's transformational leadership and the relationship to how those perceptions influence teachers' behavior to integrate

technology in their instruction to enhance teaching and learning. The relationship between transformational leadership, motivation, and technology use is examined.

Leithwood's (1994) research indicated that principals can enhance students' engagement in the learning process, but studies showing direct effects on student achievement are limited. Measuring student learning can often be difficult, as learning does not always fit neatly into measurable and identifiable characteristics. Accurately measuring student learning in a quantifiable and comparable way is a highly challenging task. Learning is a complex phenomenon, not easily reduced to simple and accurate measures **(**Marks & Printy, 2003; Sun & Leithwood, 2012). For the purpose of this study, student achievement on standardized tests aggregated to the school district is the primary measure of student learning outcomes. It is hoped that this study will provide school leaders with information and a method for analyzing their current programs and approaches.

Methodology

This study was an independent investigation; the researcher will not be included in the study. The researcher has determined that collecting numerical data using a quantitative research design would best capture the phenomenon, that is, the relationships among the three constructs: (a) school principals' transformational leadership, (b) teacher motivation in technology integration in instruction, and (c) student achievement. Second grade classroom teachers and second grade students were selected to participate in this study because of the limited research on primary grades. Using second grade teachers and students in the study with contextual data will promote a Post-Positivist paradigm that allows solutions to pressing problems (Kitchin, 2014).

For this study, the researcher applied a deductive research approach. After reviewing the literature on educational technology, transformational leadership, and teacher motivation, the

researcher knew it would benefit the research community to complete a study on teachers' motivation to implement technology in instruction and the extent of duration of technology use by students to predict student achievement. The study's findings may help educational leaders make optimal decisions and/or make changes to successfully implement technology and increase student performance.

Multiple regression was used to assess the effect of duration of technology use, student socioeconomic status, teacher motivation, and transformational leadership on student performance (mathematics assessments). Pair correlations indicated the directional relationship (positive/negative/none) among the variables. After the data were analyzed, conclusions were drawn, and generalizations were made about the entire population. This research study will aid school leaders by addressing the gap in professional knowledge concerning technology use in the primary grades. The results will be able to guide educators in the improvement of their professional practice.

Research Questions

Two research questions were developed based on the current literature on transformational leadership-teacher motivation concerning the implementation of educational technology and student achievement. The questions were designed to be answered by testing the related hypotheses and by gathering teacher survey data, second grade sample populations with end-of-the-year mathematics scores, students' socio-economic status, and time spent on technology.

What is the relationship between a principal's transformational leadership and teachers' motivation to integrate technology in primary grades?

What is the relationship between technology integration in instruction and student achievement in mathematics for 2nd grade students in one urban Georgia school district?

Hypotheses. Two hypotheses were developed to address the research questions in the study.

H_1 There is a positive correlation between a principal's transformational leadership and teachers' motivation to integrate technology in primary grades.

H_2 There is a positive correlation between the duration of student time on technology among 2nd-grade students and their end of year district developed mathematics assessment scores in one urban Georgia school district.

Instrumentation. The data that was used for this study came from four sources: (a) a survey administered to second grade classroom teachers from twelve schools that assess teacher motivation and principal leadership style, (b) second grade students' end of year Student Performance Gains (SPG) district-developed mathematics assessment scores that were administered in May 2017, (c) archived data from each district's's technology department to track students' technology time, and (d) a report from each school which indicated students who qualify for free and reduced lunch to determine the students' socio-economic status. For the purpose of this study, the survey included twenty four items that will assess teachers' perceptions of his/her school principal's transformational leadership and their own motivation to integrate technology. The researcher chose to base the study's survey items upon Herold, Fedor, Caldwell and Lui's (2008) leadership scale survey items and Lam, Cheng, and Choy (2010) motivation survey items due to the high reliability and validity of their items and their accuracy to measure transformational leadership and teachers' motivation.

The survey instrument created by Herold et al. (2010) was the most appropriate to implement in this study because of its focus on transformational leadership. The survey instrument examined the degree to which leaders exhibited transformational behaviors and the

extent of the employee's support for a specific change effort. It is important to note that in the corporate world profit is the driving force or agency; whereas in the educational field student performance is a goal, driving force, or agency. In Herold et al.'s (2010) study, the sample population consisted of employees from a variety of sectors, such as telecom, information technology, and engineering consulting.

Herold et al. (2008) used scaled items to determine the extent to which employees generally viewed their leader's behaviors as transformational in nature. The instrument reported a high alpha coefficient for the items ($\alpha = .94$); that is, over the multiple administrations of the instrument the responses to the individual questions were consistently low, consistently mid, or consistently high. Their studies' instrument was taken from the work of Rubin, Munz, and Boomer (2005) where they examined the influence of emotional intelligence and personality traits on transformational leadership behavior. Rubin, Munz, and Boomer, in turn, based their study upon a meta-analysis by Podsakoff, MacKensie, and Boomer (1996) examining the strength of relationships between leadership behaviors and subordinates attitudes by examining the role of perceptions and performance. Transformational leaders are engaged with their employees and motivate them to perform beyond their necessary duties and responsibilities.

The motivation survey questions come from a study by Lam et al. (2010) who examined teachers' motivation in relation to the implementation of an educational innovation – Project-Based Learning. Lam et al.'s (2010) teacher motivation survey was based up on the work of Deci and Ryan's (2000) self-determination theory, which contained motivational processes. The internal consistency of Lam et al.'s (2010) survey was measured with Cronbach's alpha ($\alpha = .91$); that is, over multiple administrations of the instrument the responses to the individual questions were consistently low, consistently mid, or consistently high.

The researcher was granted permission via email (See Appendix B) to use and adapt both Herold et al.'s leadership scale survey items (2008) and Lam et al.'s (2010) motivation survey items. The first twelve statements of the survey were adapted from Herold et al. and designed to capture the extent to which teachers view their principal's behavior as transformational leadership with the lead in for the items being, "I believe my leader. . ." (See Appendix A for the complete set of items). The second twelve statements of the survey were adapted from Lam et al. and investigated the factors that contribute to teachers' motivation in the implementation of technology into teaching practices with the lead in for the items being, "I implement technology into my instructional practices because…" (See Appendix A for the complete set of items). Respondents were asked to rate each statement based upon a semantic differential scale that is anchored at each end by opposites (Rovai, Baker, & Ponton, 2013). Teachers were asked to indicate their agreement to each statement on a 7-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

For the Mathematics assessment, the SPG test is specifically designed to measure student achievement relative to the state-mandated content curriculum standards. The results from the SPG test identifies students' mastery of content, provides teachers with information to guide instruction, and assists teachers and leaders in making optimal decisions using the school's strengths and weaknesses to determine needs for improvement. The end of year multiple-choice test questions and answers will be read-aloud to all second grade students by a teacher, certified by the Georgia Professional Standards Commission.

Population. The second grade teachers and students who participated in this research study were from a large urban school system in the southeast region of the United States. This school district is one of the top fifteen largest school districts in the nation with over 150,000

students (America School and University, 2014). The district has earned multiple national awards for high student achievement. The convenience sample in the study was comprised of 330 second grade students from five different elementary schools in the school district and 18 second grade teachers from five different schools. The teachers' survey results and the students' scores that are used in the study are from the 2016-2017 school year.

To monitor the district's achievement and instructional goals in grades and subjects not assessed by a state-assessment, the district has developed SPG tests. The SPG tests were created by the school district and encompass questions assessing the mastery of curriculum standards. This approach examines the extent to which students are meeting achievement targets in non-state assessed grades and subjects. The district ensures that necessary resources are being provided to support initiatives for improvements. Professional development classes are continually offered to teachers to support their efforts in the integration of technology to support teaching and student learning in their classroom. The district has provided a technology coordinator at every school to provide leadership and support in the use of technology in teaching and learning, along with overseeing the planning of technology initiatives. For each school, the district has funded sixty laptops for computer labs, one mobile cart on wheels with thirty laptops, two computer workstations in every classroom, and one laptop per teacher. Students are also allowed to bring their own technological devices, such as a cell phone or tablet, and can use the device with teacher discretion. Teachers in the district have reported that students in kindergarten through 2nd grade rarely or never bring their own devices to use for instructional purposes in the classroom. Students' time on personal devices will not be included in the study. The amount of time students use technology, and teachers' motivation to integrate technology will be a focus in this study.

Sample. The researcher conducted a priori power analyses as a means to provide an efficient method of controlling statistical power before data was collected (Faul, Erdfelder, Lang & Buchner, 2007). This G Power test is based on assumptions regarding the output of the study and gives a researcher an estimate sample size needed to achieve a certain effect size (Faul et al., 2007). For a moderate effect size of 0.15, and using a conventional power of 0.80 and significance level of .05, with three independent predictor variables, G Power 3.1.9.2 calculated a sample size of n = 66. According to Baruch's (1999) meta-analyses response rate for top managers of an organization was 35.5% and employees 61.4%. Baruch and Holtom (2008), recommended that published research suggest a benchmark of 35-40 percent rate of return. The researcher used this average response rate to determine how many schools needed to be contacted for an adequate sample size. To follow the university's internal review board procedures, the researcher had to get each school's principal to sign a school agreement to participate in the study before contacting teacher participants.

For the purpose of this study, elementary schools contained grades K-5. The Georgia College and Career Readiness Performance Index (CCRPI) is an accountability system that replaced No Child Left Behind (NCLB) and Adequate Yearly Progress (AYP). CCRPI measures schools on a 100-point scale reporting performance in a more comprehensive manner than the pass/fail system under AYP (Woods, 2015). To collect a sample of elementary schools, the researcher completed a univariate analysis to examine the ranking, with the CCRPI score as the variable, to determine the distribution with the central tendency. Using the distribution of CCRPI scores by mean, twelve elementary schools were purposefully selected that fall within a one-point range of the mean of the entire district on the CCRPI 2016 annual report (that is, twelve average elementary schools) to give adequate room for a return response. The researcher emailed

the principals of the twelve schools selected for the study with a description of the study and a consent agreement for participation in the study, with a two week window to respond (see Appendix C). An additional email was sent after the first week, and a final encouraging email for participation two days before the end of the window. Five principals signed and returned the school agreement to the researcher. The researcher used a purposeful sampling method in which all second grade teachers were identified and selected from the five elementary participating in the study.

Likewise, the second grade purposeful student sample came from the same five schools selected that fall within a one-point range of the mean of the entire district on the CCRPI 2016 annual report. A second criteria was used to determine which second grade students enrolled in these four schools attended the school at least 75% of the year, which means they have met the full academic year (FAY) status. All second grade students meeting this criterion were included in the study.

Data collection. Multiple sets of data were collected for this study. The school district procedure for conducting research was followed by submitting the district's internal review board application outlining the study to the Research and Evaluation office. The researcher provided the district with the assurance that their policies and procedures would be followed. The Georgia State University's Institutional Review Board (IRB) procedures for permission to conduct the study in the four schools as part of a dissertation were followed prior to and during the implementation of the study. For the survey, each potential respondent was contacted by the researcher via email with an embedded link to the online survey. In this communication, the nature of the research study along with the study's guidelines was explained, such as voluntary participation. The online survey included a description of the study and consent information was

provided. Additionally, the email included attached documentation to inform the teachers that their school district and the university had granted permission to conduct the study. Participants were given a participant consent form and directions for accessing the survey, and a three week window in which to respond (see Appendix D). Each teacher received the email invitation, and a reminder email after two weeks. At the end of the three weeks, a final encouraging email for participation was sent to increase the participation rate.

To address ethical considerations, the researcher followed the IRB guidelines of Georgia State University and the school district to protect the confidentiality of the study participants. "Subjects have the right to expect that any personally identifying information will be limited to the authorized researcher and not be revealed externally (unless the subjects themselves authorize such exposure)" (Rovai et al., 2013, p. 13). To address confidentiality, the information participants provided was stored on a firewall-protected computer in the office of the researcher. The researcher used a key code (number) to identify participants that is stored separately from their data to protect privacy. All study data, including key code, will be destroyed three years after the study's closure. Teacher's name and other facts that might point to a specific teacher, or specific school district do not appear when the researcher presents this study or publish its results. The findings are summarized and reported in group form. Teachers are not be identified personally.

To retrieve student participants, the researcher retrieved a report of the 2nd-grade students who attended the school and met the full academic year (FAY) requirements for the 2016-17 school year. The researcher collected from each school in the study the second grade May 2017 SPG end of year mathematics district-developed assessment results by individual classroom and student. The researcher gathered archived data from the district's technology department that

tracks minutes on technology via student usage report from August-May during the 2016-17 school year.

While not all threats can be fully controlled, the researcher put practices into place to help decrease the threats to internal and external validity. The researcher decided not to collect SPG beginning year of the mathematics' pretest scores due to the difference in scores that may not measure the actual growth because of external factors. Shadish, Cook and Campbell (2002), explain that when nonequivalent experiment groups are formed at the beginning of the treatment, students may mature at different rates over time creating the selection-maturation effect. The researcher addressed selection by matching schools that reflect the mean of the CCRPI scores for elementary schools in the county. To minimize maturation, the researcher examined second grade teachers and students during a defined time that was consistent for all participants.

To improve external validity, SES, race, and gender were incorporated as independent variables. Experimental morality is an internal validity threat (Rovai et al., 2013). Shadish et al. (2002), refer to experimental morality as attrition, referring to outcomes of test scores may be different that is not attributed to the treatment. Not all students attend the same school the entire school year. To attend to the attrition issue and avoid selection bias, the researcher only included students who had attended school 75% of the school year to attain FAY status. In order for the sample population to be valid and generalizations of the results to be representative of the larger population, five schools that have a similar range in school rating, according to CCRPI, were included in the study. History is an internal threat; there is always a possibility that factors other than the treatment that is being investigated influence the dependent variable at the same time at which the treatment was introduced (Shadish et al., 2002).

Variables. The dependent variable measures any change as resulted by the influence of the independent variables. The variables in the study are second grade mathematics assessment scores, transformational leadership and motivation from the teacher survey, minutes each student spent on technology, students' socio-economic status, and race and gender. For the purpose of this study, the multiple regression analysis included all independent variables to assess the extent to which they predict students mathematics scores performance. Also, the relationship between transformational leadership and teacher motivation was investigated.

Research Design

The goal of quantitative research is to determine the relationship between an independent variable and a dependent variable or outcome variable of a population (Hopkins, 2007). "Tests of association and regression are used to estimate strength and direction of relationships between variables or to predict outcomes" (Rovai, Baker, & Ponton, 2013, p. 331). The researcher created three empirical models to assess the relationship among leadership, teacher motivation, technology use, and student math performance. The researcher created a spreadsheet in Microsoft Office Excel 2016 and downloaded students' mathematics scores from their end of the year district developed test along with the students' demographic information, teacher name, and time on technology (in minutes). The teacher survey data, which measured principal's transformational leadership and their motivation to integrate technology, was compiled and reported by Google Forms and downloaded into a Microsoft Office Excel spreadsheet with the student information. The data were imported into Statistical Package for the Social Sciences (SPSS) analysis software version 24 for disaggregation and analysis. To analyze the data, descriptive statistics were used as the method needed to tabulate, depict, and describe the set of data (Bowen, 2016). Descriptive statistics were used to analyze the variables and were presented

in tabular form. The descriptive statistics for quantitative variables included a measure of central tendency (mean) and measure of variability (standard deviations). Frequencies and relative frequencies were calculated for the categorical variables in the study.

To test research question one, a simple regression model was used to determine the significance of transformational leadership as a predictor of teacher motivation. The simple regression model that was used is as follows:

$$Y = \beta_0 + \beta_1 x + \epsilon$$

In Model 2, "*Y"* represented teacher motivation, β_0 represents the constant or intercept, and *x* represented transformational leadership. The coefficient "β_1*"* represented the relationship (positive or negative) between transformational leadership and teacher motivation; that is, for each unit change in transformational leadership there will be a corresponding *"*β_1*"* change in motivation.

Research question number two sought to understand the relationship between technology integration in instruction and student achievement in mathematics for 2nd grade students. Regression models included the influence of the independent variables on the dependent variable (Bowen, 2016). To adequately answer this question a multiple regression analysis was conducted to examine the amount of variance of student achievement that can be accounted for by the principal's leadership style, teacher motivation, and student time on technology. Model 3 includes the dependent variable math score with the three variables of interest: Leadership X_1, Teacher Motivation X_2, and Student's time on technology X_3

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon$$

Model 4 used synced student and survey data to predict student achievement, from the three variables of interests along with categorical variables that can give differentiated

information such as gender, socioeconomic status (SES), and racial/ethnicity. The multiple regression model with nine independent variables is indicated by the following equation:

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \varepsilon$$

Using a multiple regression model with categorical variables (dummy), the intercept is the mean for the "buried category" when all of the other categorical variables take on the value 0 (Hardy, 1993). In model 4 the dependent variable is math score affected by the independent variables: Leadership X_1, Teacher Motivation X_2, and Student's time on Technology X_3, Gender X_4, SES X_5, Race-White X_6, Race-Hispanic X_7, Race-Asian X_8, and Race-Other X_9.

For both research questions, the researcher tested the hypotheses. An *F* test was conducted to assess the significance of each model. The confidence level will be set at 95% or $p = .05$ to confirm that a type 1 error will occur no more than five percent of the time. Prior to analysis, data gathered for the study was checked for accuracy. Standard procedures were followed to check for data that were out-of-range, missing, or received in an incorrect form (Keith, 2014).

Results

The conceptual framework for this study suggests that characteristics of principal leadership may be associated with teacher motivation based on the transformational leadership theory. The findings in this section are the results of a statistical analysis from data of second grade students at four schools and second grade teachers at four schools in one urban Georgia school district. The first subsection, Sample Size of the Study, contains Tables 1-3 showing a breakdown of the study's participants by the school. The second subsection, Testing of the Hypotheses, presents the simple and multiple regression models that addressed the research questions in the study. The simple regression model was used to predict to what extent

transformational leadership predicts teacher motivation. The multiple regression model was used to predict to what extent the nine independent variables such as students' time on technology and student's socio-economic status predicts the score on an end of year district-developed mathematics assessment among second grade students. An explanation of the theoretical framework and connection to the research from the literature review section is included in the discussion and conclusion section.

Sample size of the study.

Table 1.

Schools, Teachers, and Student Participants

Groups	Number of teachers	Number of students
School 1	*3*	*52*
School 2	*5*	*86*
School 3	*2*	*42*
School 4	*5*	*81*
School 5	*3*	*69*
Total	***18***	***330***

Testing of the hypotheses. The section presents the findings of the statistical analysis to answer the study's two research questions and to address the two alternative hypotheses.

Two null-hypotheses were developed to address the research questions in the study.

H_{01} There is no correlation between a principal's transformational leadership and teachers' motivation to integrate technology in primary grades.

H_{a1} There is a significant correlation between a principal's transformational leadership and teachers' motivation to integrate technology in primary grades.

H_{02} There is no correlation between the duration of student time on technology among 2^{nd}-grade students and their end of year district developed mathematics assessment scores in one urban Georgia school district.

Ha_2 There is a significant correlation between the duration of student time on technology among 2nd-grade students and their end of year district developed mathematics assessment scores in one urban Georgia school district.

Table 2.

Comparison of Sample with School Population Based on Ethnicity

	School 1		School 2		School 3		School 4		School 5	
Ethnicity	Sample	School	Sample	School	Sample	School	Sample	School	Sample	School
Black	16%	20%	42%	37%	26%	27%	22%	24%	58%	60%
White	29%	20%	17%	19%	31%	37%	42%	44%	4%	6%
Hispanic	39%	40%	32%	32%	19%	13%	12%	15%	33%	28%
Asian	14%	15%	6%	8%	14%	15%	19%	12%	0%	2%
Other	2%	5%	3%	4%	10%	8%	5%	5%	5%	4%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3.

Comparison of Sample with School Population based on "Free/Reduced Lunch"

	School 1		School 2		School 3		School 4		School 5	
Variable	Sample	School	Sample	School	Sample	School	Sample	School	Sample	School
Free/Reduced Lunch	52%	59%	63%	65%	52%	49%	27%	34%	49%	75%

Correlation and prediction test analysis. "Tests of association and regression are used to estimate strength and direction of relationships between variables or to predict outcomes" (Rovai et al., 2013, p. 331). A multiple linear regression analysis was conducted to predict the influence technology use has on math scores and determine if there is a relationship between transformational leadership, motivation, and technology use.

For the first research question the following model applies:

$$\text{Model 1: } Y_i = f(\text{transformational leadership})$$
$$(X_1)$$

Model 2 formula was used to test the second research question:

$$\text{Model 2: } Y_i = f(\text{transformational leadership, motivation, technology use})$$
$$(X_1 + X_2 + X_3)$$

For both models, the relationship between the dependent and independent variables may indicate a positive or negative linear relationships or no relationship. The "t" values (greater than 2) or "*p*" values (less than .05) will indicate significant relationships indicating whether we "fail to reject" the hypotheses or accept the alternative hypotheses.

Determining the extent the student technology use and socio-economic status predicts an end of year mathematics score is substantial and aids in the improvement of school practices and implementation of optimal decision making. The results of transformational leadership, motivation, and technology use serves to determine the significance of leader behavior in the successful integration of technology in instruction. This study adds to the limited body of published research to address the gap in the literature for the significance of technology use and socio-economic status on student mathematics' achievement in primary grades, and the relationship of transformational leadership and teachers' motivation in regards to technology implementation.

Correlation tables. The relationships between the independent variables were investigated using the Pearson correlation coefficient. The correlation table (Table 4) displays the results of the correlation of the independent variables of principal transformational leadership, teacher motivation, student time on technology, and student demographic information. Significant correlations are verified by the subsequent regression analyses. Results indicate that student's free and reduced status, mathematics achievement, teacher's motivation, and principal transformational leadership have a negative association with gender and a significant positive relationship with ethnicity and technology. Between the components of students time on technology and the other independent variables, the range was from -.024 (free and reduced status) to .263 (principal's transformational leadership).

Table 4.

Correlation Matrix for Model Variables

	1	2	3	4	5	6	7	8	9
1. Gender									
2. Free reduced lunch	-.065								
3. Math	-.074	-.201**							
4. Teacher	-.039	.033	.023						
5. Principal	-.007	.023	.080	.534**					
6. Technology	.020	-.024	.095	.134*	.263**				
7. White	.054	-.330**	.221**	-.086	-.031	-.141*			
8. Hispanic	-.026	.308**	-.237**	-.003	-.061	-.041	-.338**		
9. Asian	.012	-.036	.097	-.007	-.074	.031	-.189**	-.199**	
10. Other	.001	-.004	.007	.070	.042	.114*	-.132*	-.139*	-.078

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The researcher conducted a preliminary check for collinearity since all of the independent variables are being used as predictor variables in the regression models. According to Lewis-Beck (1995), a correlation between independent variables should yield results lower than .80 to prevent concerns for potential collinearity. All the correlations in the predictor variables in the study are below the threshold, and there is no concern about the potential of collinearity in the regression analysis.

The empirical tool used was a simple regression analyses of the relationship between principal's transformational leadership and teachers' motivation to integrate technology in instruction. The first research question ascertained whether there was a relationship between a principal's transformational leadership and teachers' motivation to integrate technology. To test research question one, a simple regression model was used to determine the significance of transformational leadership as a predictor of motivation. Table 5 displays the individual participants (n=18) survey results including *x* (principal's transformational leadership) and *y* (teacher's motivation) data.

The independent variables used in the model were continuous data. The principal's transformational leadership and teacher motivation survey data were given a point value of 7=strongly agree, 6=moderately agree, 5=slightly agree, 4=neutral, 3=slightly disagree, 2=moderately disagree, and 1=strongly disagree and was divided into two total scores: principal transformational leadership and teacher motivation. Descriptive statistics were used to analyze the variables and are presented in Table 5. The subscale mean between teachers identified principal transformational leadership (66.506) and their motivation (71.478) to integrate technology.

The researcher conducted a simple linear regression analysis of the data (n=18); results are shown in Model 1. The value calculated of the correlation coefficient was 0.534, which suggests that 28.5% of the variability in teacher motivation could be explained by the linear regression. The regression line, expressed in the form given in Equation (1), is $Y = 38.199 + 0.500X$, where the predictor value X represents the principal's transformational leadership style, and the outcome variable Y represents teacher's motivation.

Table 5.

Principal's Transformational Leadership (TL) Score and Teacher Motivation (TM) Score from Survey Results

Participant No.	TL Score	TM Score	Total
1	74	54	128
2	67	48	115
3	67	69	136
4	80	75	155
5	78	70	148
6	76	71	147
7	77	71	148
8	64	67	131
9	54	66	120
10	80	65	145
11	68	66	134
12	62	61	123
13	74	63	137
14	75	65	140
15	75	75	150
16	61	50	111
17	84	81	165
18	69	72	141
Mean	71.39	66.06	137.44
SD	7.65	8.36	13.90

The estimated regression parameters are a = 38.199 (intercept) and b = 0.500 (slope). Specifically, from this positive association between variable, one can conclude that, on average, for a one-point increase in transformational leadership, the model predicts a 0.500 point increase in teacher motivation. The effect of transformational leadership is statistically significant (p = 0.000 < .05); therefore, the null hypothesis (H_{01} is rejected). Thus, the researcher confirms the alternative hypothesis (H_{a1}), there is a significant positive correlation between a principals' transformational leadership and teachers' motivation to integrate technology in primary grades. Residual plots imply no major deviations from normality or homoscedasticity, which satisfies the assumptions of the model and demonstrate that the assumptions of the model appear reasonable.

Table 6.

MODEL 1: Principal's Transformational Leadership Style on Teacher Motivation

	β	t	P	R^2	Adj. R^2	SE
Principal	.534	11.443	.000*	.285	.283	.044

*P < .05

A multiple regression analyses of the relationship among principal's transformational leadership, teachers' motivation to integrate technology, and student's time on technology was assessed. Research question number two sought to understand the relationship between technology integration in instruction and student achievement in mathematics for 2nd grade students. To adequately answer this question a multiple regression analysis was conducted to examine the amount of variance of student achievement that can be accounted for by the principal's leadership style, teacher motivation, and student time on technology. The researcher used these data to examine the relation between the student's SPG mathematics score (dependent variable) and several independent variables of interest, including principal leadership, teacher motivation, and student's time on technology by minutes.

Multiple regression series 1: Principal's transformational leadership. The first regression of the series examined principals transformational leadership as a potential predictor in students' mathematics achievement. Specifically, Model 1 reports the regression results demonstrating that principal's transformational leadership is not significant falling at the $p = .147$ level. The R^2 was 0.006, and an adjusted R^2 was .003. The very low percentage of the 0.6% variation in mathematics SPG scores is explained by the variable of transformational leadership. This variable cannot be used to predict mathematics achievement scores for students.

Multiple regression series 2: Teachers motivation to integrate technology. Model 2 displays the second series of regressions for teacher's motivation to integrate technology into

instruction. The results suggested that principal's transformational leadership along with teachers motivation to integrate technology is not significantly related to students' mathematics achievement, explaining 0.7% of the variance. The multiple regression was expressed in the form $Y=72.705 + .190(X_1) – 0.058(X_2)$, where X_1 represents principal's transformational leadership, X_2 represents teacher's motivation and the coefficient are unstandardized coefficients. The multiple regression analysis revealed that the model was not statistically significant in predicting students' mathematics achievement $\beta = .094$, $p= .148$ for principal's transformational leadership and $\beta = -.027$, $p= .679$ for teacher's motivation to implement technology into instruction where β represents standardized coefficients. The R^2 was 0.07, and an adjusted R^2 was .001. The variable of teacher's motivation to integrate technology cannot be used to predict mathematics achievement scores for students.

Multiple regression series 3: Students time on technology. The multiple regression was expressed in the form given in Equation (2) is $Y= 74.924 + 0.147 (X_1) – 0.056 (X_2) + 0.019 (X_3)$, where X_1 represents principal's transformational leadership, X_2 represents teacher's motivation, and X_3 represents student's time on technology. The unstandardized estimated coefficient of X_1, the indicator of principal's transformational leadership in the regression model, is 0.147. This coefficient estimate implies that, if all other independent variables remain fixed, student's mathematics achievement scores would increase based upon the level of transformational leadership the principal demonstrates from the mean. The interpretation of unstandardized coefficients for continuous independent variables is similar. For example, the model estimates that, if all other independent variables were fixed, an increase of one unit in teacher motivation would correspond to an average decrease of 0.056 in the student's mathematics SPG score. In addition, with all other independent variables fixed, an increase of

one unit in student's time on technology would correspond to an increase of 0.019 in student's mathematics SPG score. The *P* values in Model 3 correspond to tests of the null hypothesis that a particular coefficient is equal to zero. On the basis of the results in Model 3, it appears that student mathematics score, as measured by the dependent variable, is not significantly associated with any of the factors, principal leadership, teacher motivation, or student's time on technology.

The multiple regression analysis revealed that the model was not statistically significant in predicting student's mathematics achievement, F (3, 326) = 1.399, p= .274 for principal transformational leadership and p= .686 for teacher's motivation and p = 0.168 for student's time on technology. All p values > .05 indicating that neither principal transformational leadership, teacher motivation nor student's time on technology are significant predictors of student's mathematics achievement. The R^2 was 0.013, and an adjusted R^2 was .004. The very low percentage of the 0.4% variation in mathematics SPG scores is explained by the variables of transformational leadership, teacher motivation, and student's time on technology. These three variables cannot be used to predict mathematics achievement scores for students. Effects of both the intercept and slope are not statistically significant for principal's transformational leadership (P = 0.274 > .05), teacher's motivation (P = 0.686 > .05), nor time on technology (P = 0.168 > .05); therefore, the null hypothesis (H_{02} is not rejected).

Multiple regression series 4: Student demographics. In order to test the last part of Hypothesis 2, a multiple regression analysis was calculated to predict student mathematics scores with teacher's survey data to predict student achievement, from the three variables of interests along with categorical variables that can give differentiated information such as gender, socioeconomic status (SES), and racial/ethnicity. The multiple regression equation with unstandardized coefficients is $Y=74.995 – 3.326 (X_4) – 3.326 (X_5) + 7.688 (X_6) – 4.283 (X_7)$

Table 7.

Models 1, 2, 3, and 4 with Math Score as Dependent Variable

		β	*t*	*p*	R^2	Adj. R^2	*SE*
Model 1	Principal	.080	1.454	.147	.006	.003	.111
Model 2	Principal	.094	1.449	.148			.131
	Teacher	-.027	-.414	.679	.007	.001	.140
Model 3	Principal	.073	1.097	.274			.134
	Teacher	-.026	-.404	.686			.140
	Technology	.079	1.383	.168	.013	.004	.014
Model 4	Principal	.069	1.081	.281			.129
	Teacher	-.011	-.170	.865			.134
	Technology	.095	1.713	.088			.013
	Gender	-.097	-1.839	.067	.122	.097	1.809
	Free_red	-.105	-1.837	.067	.122	.097	1.965
	White	.192	3.071	.002*	.122	.097	2.503
	Hispanic	-.110	-1.792	.074	.122	.097	2.390
	Asian	.112	1.962	.051	.122	.097	3.258
	Other	.012	.225	.822	.122	.097	4.272

*p < .05

+ 6.394 (X_8) + .962 (X_9).

In Model 4, X_4 represents gender, X_5 represents socio-economic status, and X_6 represents White race, X_7 represents Hispanic race, X_8 represents Asian race, and X_9 represents Other races. These independent variables are categorical data, and their frequency are shown in Tables 8 - 10. Gender and socio-economic status were coded as a dichotomous variable. Gender was coded as Male=0 and Female=1. Socio-economic status was coded as students who did not qualify for free or reduced lunch=0 and students who qualified for free and reduced lunch=1. Ethnicity was coded using dummy coding with Black chosen as the comparison group due to its larger representation among the students in the sample. White, Hispanic, Asian and Other (Two or More and Hawaiian/Island Pacific) were coded as separate ethnic categories. To explain this

influence, a simultaneous multiple regression analysis with Alpha set at .05 was performed to assess the relationship between student's mathematics achievement and gender, socio-economic status, and race/ethnicity. Model 4 shows that white ethnicity was the only variable that was significant (t = 3.071, p = 0.002), indicating a significant difference in mathematics achievement between black and white ethnicities. The remaining predictors were not significant. Results show gender is not significant (p = 0.067) indicating that there was no difference in student achievement between males and females. The R^2 is 0.122, and the adjusted R^2 is 0.097. Despite the non-significance of some of the predictors, overall this model is a useful model for predicting student math achievement (F = 4.934, p = .000 < .05), and, therefore, H_{02} was rejected.

Table 8.

Student's Gender

Gender	Frequency	Percent
Male	156	47.3
Female	174	52.7
Total	330	100

Table 9.

Student's Free/Reduced Lunch Status

Status	Frequency	Percent
No	172	52.1
Yes	158	47.9
Total	330	100

When conducting a multiple regression test, an important consideration is multicollinearity, which occurs when a high correlation exists between two or more predictor variables (Rovai et al., 2013). The multicollinearity check did not reveal significant violations. Variance Inflation Factor (VIF) values did not suggest multicollinearity with the values ranging from .665 to .992.

Table 10.

Student's Race/Ethnicity

Race	Frequency	Percent
Black	113	34.2
White	80	24.2
Hispanic	87	26.4
Asian	33	10.0
Other	17	5.1
Total	330	100

These results provided the researcher with information to allow for conclusions on the principal, teacher, and technology's impact on student achievement. This data provides information for discussions and conclusions to be made on the relationship between principal's leadership style as perceived by teachers, teacher's motivation to integrate technology, and student's time on technology and student learning gains.

Summary of the Findings

The purpose of the study was to determine if there is a relationship among principal leadership, teacher motivation, and student performance, with the integration of technology being the primary focus. The independent variables were second grade mathematics assessment scores, transformational leadership and motivation from the teacher survey, minutes each student spent on technology, students' socio-economic status, and race and gender. The dependent variable was students' mathematics scores. All elementary schools were ranked using a univariate analysis, with CCRPI score as the variable, and twelve schools were selected that fell within one-point of the mean. The building principals were contacted via email three times and asked to return a signed form indicating their willingness to participate. Follow-up phone calls were made to principals failing to respond. The final sample consisted of a total of five schools, which is a 42% return response rate from principals.

The 2nd grade teachers were emailed and asked to complete a survey that assessed their perceptions of his/her school principal's transformational leadership and their own motivation to integrate technology. School #1 had 50% response rate, school # 2 had 71% response rate, school #3 had 50% response rate, school #4 had 100% response rate, and school #5 had 60% response rate, averaging a 66% total teacher response rate. The researcher used study's survey items from Herold et al.'s (2008) leadership scale survey and Lam et al.'s (2010) motivation survey items. Data analysis revealed a significant relationship between teacher motivation to integrate technology in instruction and principal's transformational leadership. Additional data were collected including a report of students who met the FAY status for the 2016-17 school year along with their end of year SPG mathematics score, time on technology in minutes for the year, gender, free/reduced lunch status, and race/ethnicity information to complete a multiple regression analysis to determine the relationship between student's time on technology and their end of the year mathematics assessment score. Analysis of this data revealed that students that identified with the white race was the only variable that showed a significant relationship with the student's math SPG score.

Theoretical Implications

The theory of transformational leadership guided this study by providing a framework for assessing the principal's strategy in the implementation of technology to enhance the teaching and learning process in the classroom. Since Burns (1978) introduction of transformational leadership, numerous studies have found there is a positive relationship between transformational school leadership and factors in the school environment, such as teacher's job satisfaction, motivation, and organizational commitment (Alatawi, 2017; Arokiasamy et al., 2016; Herold et

al., 2008; Singh, 2013; Solaja et al., 2016). In addition, Sun and Leithwood suggest that transformational leadership has a small but significant effect on student achievement (2012).

Many researchers, such as Leithwood and Jantzi (2006), Moolenaar, Daly, and Sleegers (2010), and Moolenaar and Sleegers (2015) have suggested that the current educational trend in school reform requires a leader with transformational leader behaviors. Including the model of school leadership is crucial, because transformational leaders focus their efforts on increasing the capacity and motivation of teachers which improves the quality of teaching (Liu, Hallinger, & Feng, 2016). However to date studies including principal's transformational leadership's effect on teacher's motivation to integrate technology in instruction are quite rare. This study is an attempt to compensate for the lack of knowledge about factors that are responsible for teacher's motivation and students' mathematics achievement. The aim of this study was thus to examine the relationship among a school principal's transformational leadership, teacher motivation for technology integration in instruction, student's time on technology and student achievement.

As a result of the research question 1 from the study, a significant correlation has been found between principal's transformational leadership and teacher motivation according to the perceptions of teachers. This result is consistent with some studies on the relation between motivation and transformational leadership out in both school and nonschool contexts (Eyal & Roth, 2011; Hallinger, 2007; Kark & Shamir, 2002; Leithwood et al., 2012; Masood et al., 2006). Using a simple regression to test the hypotheses, the researcher found that a principal's transformational leadership style and a teacher's motivation to implement technology in instruction were significantly positively related, supporting Hypothesis 1. This result supports Kurlan et al.'s (2010) and Leithwood and Sun's (2012) statement that transformational leaders posess attributes for motivating their staff in positive ways. Leaders who use transformational

style can have a positive effect on teacher's motivation to integrate technology in instruction. In addition, the test results suggest principals' transformational leadership accounts for 28% of teacher motivation. This finding supports the research cited in the literature review that the principal's leadership behavior has a direct influence on teachers and the school's environment. Principals who support and share a clear vision have an impact on the process of integration technology to enhance instruction in the classroom (Seyel, 2015). This extends the research findings concerning the principal's transformational leadership-teacher's commitment relationship to a new domain—in this case, the teacher's commitment to integrate technology in instruction.

However, the study's results suggest that there are variables that account for 71.5% of teacher motivation. A problem can be the issue that there are many external (environment or people) and internal (personalities, belief system, values), that can influence teachers' motivation; or limit the ability of the principal to motivate teachers in the school at the same time and to the same level to improve performance (Almarshad, 2017; Heystek, 2015). Martin and Dowson (2009) expand upon this idea by explaining that relationships affect motivation by influencing beliefs and emotions of motivation. External factors can control the type and level of motivation required to perform what is expected, which can include a school's socio-economic environment or the infrastructure which are often out of the realm of the principal's area of influence (Gorozidis & Papaioannou, 2014). Teacher motivation is also connected to positive outcome such as job satisfaction (Dee, Henkin, & Singleton, 2006; Dou, Devos & Valcke, 2017) positive work attitudes (Ninkovic´ & Knežević Florić, 2018), a greater sense of personal accomplishment with a decrease in emotional exhaustion (Alatawi, 2017), lower teacher burnout (Sun et al., 2016; Walunbwa et al., 2003), greater persistance to implementing educational

innovations (Moolenaar et al., 2010), and more frequent use of research-based best teaching practices (Barrett & Breyer, 2014; Heystek, 2015). Lam et al. (2010) explain that competence, autonomy, and collegical support in schools can predict teacher motivation towards innovative teaching. With multiple factors influencing a teacher's commitment to implement a change, it would be beneficial for the study to include motivation factors as well as other attitudes and emotions associated with implementation of technology in instruction.

In conclusion, leadership and teacher motivation have been, and will continue to be notable fields of research for researchers and practitioners (Herold et al., 2008). The study has demonstrated the significance of transformational leadership on teacher's motivation. If successful change requires principals facilitating changes in schools, then federal, state, and local leaders need to examine the concepts in this investigation on the impact of leadership.

Practical Implications

The community often views a school principal as a manager and not an instructional leader of the school. Since the inception of No Child Left Behind Act of 2001, schools are under more pressure and scrutiny with the data driven accountability to change instructional practices to increase student achievement. The fading of educational funding with an increase of competition to obtain national Race To The Top initiatives have impacted how schools operate. Many school leaders are now shifting their leadership focus from a managerial style to a teacher-focused style to meet the demands of increasing student achievement (Nguyen et al., 2016). The school leaders leadership style influences teachers, which in turn effects student achievement (Kurland et al., 2010; Leithwood et al., 2012). From a practical point of view, school districts may want to give greater consideration to the degree to which the principal is perceived as transformational. Are school leaders who are being asked to implement change likely to produce

a commitment from their followers? Or, as Wahab, Rahmat, Sukor, Yusof and Mohamed (2016) have suggested, should the principals undergo transformational leadership training to help them develop transformational leadership behaviors in order to increase teacher motivation?

An additional practical consideration is how to train principals to become better change agents to implement new iniatives. Various articles, books, and seminars focus on immediate, change-specific behaviors for leaders and assume that the skills learned can be implemented with fidelity to improve communication, increase involvement, and reinforce new behaviors (Herold et al., 2008). However, teacher perceptions on their principal's transformational leadership behaviors are based on a relationship that takes time to build trust and identification with their leader (Kark & Shamir, 2002; Masood et al., 2006). The relationship-building component of leadership may be more difficult to train, or perhaps will take longer to master. The study's findings raises questions about how different leadership styles and behaviors can effect teacher's motivation to implement iniatives to increase student achievement.

Additionally, there is a growing body of knowledge in educational leadership research that seeks to understand and describe the impact of the principals on student learning (Hallinger, 2011; Leithwood & Jantzi, 2008). The need to use data to determine the effectiveness of a child's education has taken on a new role through test scores for students of all ages. For example, Race to the Top initiative has even tied money and other educational resources to student achievement. Student scores are directly influenced by their teachers with principals serving in an indirect capacity to improve student achievement. Dou, Devos, and Valcke (2017) along with Marks and Printy (2003) believe that in addition to transformational leadership, instructional leadership is important and the integration of these two styles of leadership positivively effect school success and enhance teacher motivation. Transformational leadership is based upon organizational

objectives and if teachers do not believe in the objectives, low motivation may occur (Eres, 2011). In line with this idea, teachers with low motivation may not be influenced by the transformational leadership of the principal.

Principal influence on the action of teachers is a crucial component in raising test scores. Hallinger (2007) has noted a subtle shift in literature that focuses on the exploration of transformational leadership within the context of a school including contextual variables of interest, such as student background and teacher competence. The current digital revolution is calling for educational leaders to encourage educators to make a shift in their teaching practices to align with the 21 century skills incorporating technology (Dede, 2010; Wallis et al., 2006). According to Goon (2012), researchers can receive valuable information when identifying variables with respect to educational technology to enhance instruction that may influence student achievement. The test of the second hypothesis produced p-values > .05 indicating that principal transformational leadership, teacher motivation, and student's time on technology are not significant predictors of students' math scores. For principal transformational leadership, the results for Hypothesis 2 support Hallinger and Heck's (1996) findings that suggest that the connection between principal leadership behaviors and student achievement is small and indirect. Technology as a means for increasing student achievement has yielded many different results. Studies from researchers, such as Boster et al. (2002) and Khalid et al. (2014) have shown an increase in mathematics scores when students used technology to enhance their learning. However, Biagi et al. (2013), Papanastasiou et al. (2006), and Wenglinsky (1998) have found negative influences regarding technology use and student achievement. This study is consistent with the finding of Aypay (2010) and Zhang et al. (2016) showing that there is no significant relationship between student technology use and student achievement.

Another factor to consider with the results is the finding from Afshari, Baker, Luan, and Siraj (2012) who discovered that the level of principal's technology competence has a significant relationship to their transformational role in promoting the technology use. The student's time on technology was measured based on minutes students were using the district's technology platform, eClass. The researcher noticed that some students had limited use of technology in a few schools. Transformational leaders facilitate change in their school by shifting the mindset of their staff toward what the leader considers meaningful learning to improve instructional practices and in return increase student achievement. If principals are not comfortable with eClass and do not see technology as an effective tool in instruction, then the principal has probably not set an expectation for usage or provided technology training to staff. This could be a valid explanation for teachers to use limited technology which directly aligns to Rogers' (2003) theory of adoption of a new innovation.

In line with a series of recent studies (Herold et al., 2008; Ninković & Knežević Florić, 2018) investigating relationships to obtain and examine variance in variables allowed for analysis of relationships not possible when studying a single factor to increase the generalizability of the findings. Therefore, in addition to principal's transformational leadership, teacher's motivation, and student's time on technology, the second part of Hypothesis 2 included the variables of gender, socio-economic status and race. The study result was that gender and socio-economic status were not significant factors in mathematics achievement. Whites showed a significantly higher mathematics score than the Black comparison group ($p = 0.002$). No other race category showed significance in mathematics achievement relative to the comparison group. Literature seems to suggest that incorporating technology in instruction will help bridge the gap among racial, gender, and socio-economic status (Narayah, 2015; Wilsom, 2013). Educators

frequently unconsciously stereotype students, such as socio-economic status and racial profiling, may prevent them from having high standards and challenging students (Du et al., 2004). Addressing racial issues is important, but the study's result shows that these variables only contribute about 10% of variation in the mathematics scores. This means there is other work that leaders and teachers can do to improve mathematics achievement. This result also gives a ray of hope that student race does not necessarily trap students. The researcher did not analyze specific programs used or identifying various factors, such as incorporation of learning styles and different ability levels because the quality of the technology used is beyond the scope of this study.

The results of this study show no matter how much time students spend on technology, there was no statistical significance showing that technology is a predictor of student achievement. This conclusion is in agreement with many researchers (Muijs, Kyriakides, van der Werf, Creemers, Timperley, & Earl, 2014) that the most important factor affecting student learning is the teacher. The implication is that by improving the learning environment and the instruction from the teacher we can in turn improve student achievement. Finnigan (2010) states that it is necessary for principals to provide support to teachers to develop their knowledge and skills, which in turn will likely improve their instructional practices. The researcher is confident in the potential of future research in this domain to further clarify the role of transformational leadership and teacher's motivation to integrate technology into instruction with student achievement.

Most teachers desire to be led by their principal (McKinney, Labat, & Labat, 2015). Teachers can feel insecure and abandoned in this new educational environment of merit pay and teacher cuts, which can impede quality teaching and effect student achievement (Yuan, Le,

McCaffrey, Marsh, Hamilton, Stecher & Springer, 2013). With this, teachers can experience a negative perception toward their principal if they feel abandoned and not supported (Khan, 2012). School leaders are charged with the responsibility of creating an environment of raising student achievement or be sanctioned with published low student performance data. If teachers are motivated to work collaboratively and deliver quality instruction to increase student achievement, the potential to excel beyond an educational system built on top-down mandates is within reach.

Policy Implications

Presently, the digital revolution is causing the educational community to significantly transform to meet the needs of the world (Collins & Halverson, 2009). The literature review described the need for immediate attention to change the design and teaching method in order to meet each students' need (Ackerman & Krupp, 2012) or we will "face a world in which there will be a lot of people without jobs and at the same time, a growing number of jobs without people" (Gordon, 2014, p.44). Educational researchers and reformers have attempted to address issues of serving students to fit their needs for decades. Labaree (1997) explains that these efforts can be categorized into three goals 1) democratic equality, 2) social efficiency, and 3) social mobility. Yet, these approaches to education only focus on an end goal and do not address the individual needs of students and how to support students in reaching goals, such as creating informed citizens who work to fuel the economy and live fulfilling lives. An additional challenge that has been facing educational policy is how to combine excellence and equity (Miliband, 2003).

Schools cannot create an equal society on their own, but people can change the organizational structure of education to create an equal society (Miliband, 2003). In order to have

effective technology implementation, there must be alignment between educational standards and competencies and substantial educator training. There may be a need for new designs for higher education to prepare teachers or redesigning teacher certification programs through different models of teacher preparation, as the integration of technology supports a more nontraditional approach to teaching. Current educators need professional development to address the shift in mindset from being the giver of information to being a co-learner and collaborator (Nagle & Taylor, 2017).

According to Gorozidis and Papaioannou (2014), policymakers and government officials need to create a charge to promote and support the autonomous motivation of teachers by establishing educational environments with appropriate conditions to thrive. States and school districts can take steps to implement technology without the support of a policy. However, a well thought out policy can create the conditions necessary for technology to thrive by removing barriers and direct educators to focus on student learning. Expanding on this idea, legislators need to take a careful look at budgets and decide how they can get additional funds allocated towards technology, training, and resources to schools. Students need access to technology to have meaningful educational opportunities and learning experiences to support the learning process. Educators need comprehensive and ongoing professional development to aid them in the integration of technology with state standards. If policy makers' goal is to increase teacher participation in training and implement the new learning, they must take into consideration teachers' need for satisfaction (Gorozidis & Papaioannou, 2014; Shields, 2010). Many literature studies, such as Datnow (2000) and Gorozidis and Papaioannou (2014), have shown that teachers want autonomy to have the choice to participate in customized trainings and programs according to their needs, while being part in the creation of current reforms. Teachers' desire for

competence can be satisfied by observing other educators, participating in the new innovative teaching method, and then monitored and given feedback, encouragement and guidance (Singh, 2013). Another idea to support successful implementation of technology might be for policymakers to rethink teacher evaluation components to support educators and help hold leaders accountable for supporting educator's development.

National, state, and local politicians direct school's business through a system of organized chaos. There is limited research available that shows a paradigm shift from a traditional system to adding more technology into the teaching and learning process will aid in closing the achievement gap and will increase equity in the education system. By gathering qualitative and quantitative data from teachers and school leaders who directly impact students, the measure of student achievement may improve. This study supports the need for states and school districts to train and support principal to build their capacity to motivate teachers in order to build capacity, which supports effective instructional practices to increase student achievement and set students up for success in college and career and as productive citizens in society.

Limitations of the Study

By examining the effects of leadership style at the local school level, the researcher's results have served to develop a comprehensive understanding of transformational leadership style especially with teacher's motivation in the implementation of technology in instruction. The study provides valuable insights to both researchers and practitioners, so they can expand upon the efforts of this study to refine future actions. Yet, like all research studies, this study has positive attributes with limitations, which are common to field research, and opportunities for further development.

Various limitations in the study suggest that one should proceed with caution in the interpretation of the results. First, the results imply that interrelations exist between transformational leadership and teacher's motivation to integrate technology, but does not suggest directionality or chronology. It is reasonable to believe that principals with transformational behavior appeal to teachers by appealing to their moral values, and creating sharing a vision of the future while building a foundation of credibility (Moolenaar et al., 2010). On the other hand, the opposite may be true. Keeley (1995) has raised concerns about the validity of measuring transformational leadership in organizations because of the potential of abuse of power.

Some transformational leaders rely upon deceitfulness and manipulate followers to follow their agenda to benefit the leader. Teachers could be influenced by negative methods, such as coercive (follow out of fear) or utility (follow out of an exchange of goods) (Tucker & Russell, 2004). A principal using powering could have a negative reaction if leaders do not focus on building the capacity of their followers (Tucker et al., 2004). As a consequence, teachers may have rated their principals based upon inauthentic transformational leadership behaviors. The survey did not measure the relational trust between the teacher and principal.

The principal's self-evaluation of a transformational leader was not included due to measuring transformational leadership using teacher evaluation.The measurement of principal's leadership was determined solely by the teacher with no principal input, increasing the chance that the results were magnified by response bias. Thereupon, it was quite possible that the teacher's rating of the principal may not match the principal's rating of themselves. It is also possible that common method variance influenced the results. Mediation of the relationship between the variables was not measured as a longitudinal process but as an explanation of the

present relationship between the variables. The presence of the implementation of technology is not enough to understand what activated the teacher's behavior to use technology and raises curiosity to understand what activated the choice and persistance of technology use. Perhaps, data collected at a different time or through a different method could produce different results. Bitan-Friedlander, Dreyfus, and Milgrom (2004) found that teachers successful adoption of an innovation does not take place until teachers are in their second year of inservice training. Yoon, Duncan, Lee, Scarloss and Shapley's (2007) study found that no impact is found on student achievement, until teachers have exceeded fourteen hours of professional development, and teacher training for approximately 49 hours can result in a 21% increase in student achievement. However, the researcher believes that literature has provided adequate research to suggest that transformational leadership process offers a shift in cultural change by changing the mindset of people within the organization.

Other limitations raise concerns of the results of the study, including the possibility that factors may have influenced generalizability of the results. Although the researcher had an adequate sample size for the analysis, the results only reflected a single school district in Georgia. Participants represented only one urban district in Georgia, and consisted only of data from a district-developed test of students attending public schools representing one single point in time (Spring 2017). Rural school districts along with private, charter, or alternative schools were not included in this study. The data used in this study were obtained from 2nd grade teachers and may not be generalizable to other grade levels. Therefore, one should proceed with caution in generalizing the findings to other settings and grade levels. This study warrants further testing on larger and more varied samples. Quantitative data were collected, which did not allow for

elaboration or explanation from the participants in the study. The limitations of this research can offer potential for future research and prompt further questions.

Recommendation for Future Inquiry

This study is unique in that to the researcher's knowledge, it is the first to explore the relationship among principal's transformational leadership, teacher motivation, and student performance, with the integration of technology being the primary focus using this research design method. The researcher's findings may set an example or offer implications for additional research. Based on the observations and findings of this study, the following recommendations are suggested for consideration:

1. A follow-up study is needed to confirm the researcher's findings. Longitudinal studies that examine transformational leadership behavior over time may broaden knowledge of teacher's motivation in the multiphased implementation of technology.
2. Utilizing more than one school district in scattered geographic areas would add to the fidelity of the study, which would provide more accurate generalizations of the findings. Additional samples would also add to an understanding and perhaps the opportunity to compare across different contexts.
3. This study relied on quantitative methodology of data collection and is therefore restrictive. A qualitative study methodology of data collection should be conducted to provide a wider perspective with more depth and detailed information and clarity to the present study.
4. An extension to this study could include gathering data through a mixed method design related to identifying which teaching methodologies and processes teachers implement in their classroom.

5. A possible extension to this study could include administering a survey to determine the teacher's attitude toward professional development regarding the integration of technology into the curriculum and incorporating the results into a qualitative study.
6. Analysis of student discipline reports, from the population sample, could be utilized to determine if there is a correlation in time between technology and lower discipline referrals.
7. Building on the researcher's findings, an additional study may investigate the correlation between transformational leadership and teacher motivations using data from administrators.
8. This study examined transformational leadership; future research should explore the connection between other leadership theories and teacher's motivation.

Conclusions

Thomas Edison stated "books will soon be obsolete in public schools" and "our schools will be completely changed inside of ten years" (Smith, 1913, p. 24). One hundred years have passed, and our American education system has still not been updated and does not match the needs of 21st-century learners in this Digital Age. Devlin and McKay (2016) state that educators having high academic standards and integrating a variety of technological resources and devices to enhance teaching and learning will ensure success for all students. Currently, there is limited research on the level of significance of technology use for teaching and learning.

The findings of this research study determined the extent to which time on technology predicts student achievement scores. Findings of this study indicate that student mathematics score is not significantly associated with any of the factors; principal leadership, teacher motivation, student's time on technology. School leaders can use this information to modify

existing practices or to create a new plan of action in an effort to optimize performance. Noeth and Volkov (2004) indicate that the most effective way to examine the impact of the application of technology is to complete an evaluation at the end of a program.

Leithwood (1992) stated that limited research has been conducted that focuses on the effects of transformational leadership in an educational organization. The study found a positive correlation between a principal's transformational leadership and teachers' motivation to integrate technology in primary grades. School districts that are seeking research-based methods of school improvement can examine the study's results to note their effect on teacher motivation to aid in the integration of technology for instructional purposes. This study provided additional research evidence that may benefit school leaders who want to maximize the level of motivation with their staff. Lastly, the study provided additional information to strengthen the research literature by revealing the relationships among school principal's transformational leadership and teachers' motivation in technology integration in instruction and student achievement.

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APPENDICIES

APPENDIX A: Teacher Survey

Using the scale below each question, circle the response that best reflects your assessment.

I implement technology into my instructional practices because . . .

1. it is a requirement for my school.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

2. my supervisor evaluates my work performance.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

3. if I didn't use technology to support instruction in my classroom my evaluation would be affected

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

4. I feel uncomfortable if I refuse to implement technology in my instruction.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

5. I like to strive for a good evaluation.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

6. I don't want others to think that I am incapable of implementing technology in my instruction.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

7. using technology is helpful to my students.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

8. mastering the instructional skills to implement technology enhances my teaching quality.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

9. it is important to me to be seen as an innovative teacher by administrators.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

10. I am interested in the use of instructional technology.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

11. learning new ways to use technology in my teaching is enjoyable.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

12. I feel satisfied when I can overcome the obstacles in the process of implementing technology.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

I believe my principal…

1. seeks new opportunities for technology in our school.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

2. leads by "using" technology rather than simply by "talking" about technology.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

3. fosters collaboration among work groups.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

4. acts without considering individuals' feelings.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

5. provides individuals with new ways of looking at things which are puzzling to them.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

6. insists on only the best performance from teachers.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

7. has ideas on the implementation of technology that have forced individuals to rethink some of their own ideas.

Strongly Disagree | Moderately Disagree | Slightly Disagree | Neutral | Slightly Agree | Moderately Agree | Strongly Agree

8. inspires others with his/her plans for the future.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

9. gets the group to work together toward the shared goal of increased technology use.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

10. behaves in a manner that is thoughtful of individuals' personal technological needs.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

11. is able to get others to commit to his/her goals for technology integration for the future.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

12. develops a team attitude and spirit among teachers, staff, and students.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree

APPENDIX B: Correspondence

Emails granting permission researcher to use transformational leadership and motivation survey items

RE: Article-The Effects of Transformational and Change Leadership on Employees' Commitment to a Change: A Multilevel Study

david@htwatlanta.com
To: Kristi_Ryczek@Gwinnett.k12.ga.us

Monday, November 14, 2016 09:29AM
Show Details

Kristi,
I retired nine years ago and don't have access to any of my research records anymore. Feel free to use whatever is in the published articles.
Best of luck with your research.
David

David Herold
Home TheaterWorks
8460 Holcomb Bridge Rd.
Alpharetta, GA 30022
(770) 643-7777
(678) 478-8638 (Cell)

-------- Original Message --------
Subject: Article-The Effects of Transformational and Change Leadership on Employees' Commitment to a Change: A Multilevel Study
From: Kristi_Ryczek@Gwinnett.k12.ga.us
Date: Sun, November 13, 2016 6:55 pm
To: david.herold@scheller.gatech.edu

Dr. Herold,

I enjoyed reading your article *The Effects of Transformational and Change Leadership on Employees' Commitment to a Change: A Multilevel Study*. I am currently in a educational leadership doctorate program at GA State University. I am beginning my dissertation journey and one of my research questions is "What is the relationship between a principal's transformational leadership and teacher's motivation to integrate technology in primary grades?" Some of your leadership scale items align with my study. May I use some of your items in my survey? If you grant me permission, I will cite you in my study.

Thank you,
Kristi Ryczek

Re: School Support and Teacher Motivation to Implement Project-Based Learning

lamsf
To: Kristi_Ryczek@gwinnett.k12.ga.us

Tuesday, November 22, 2016 08:37AM
Show Details

Dear Kristi,

You are welcome to use the scale as long as you give appropriate citation.

Best regards,
Shui-fong Lam, Ph.D.
Professor
Department of Psychology
The University of Hong Kong

E-mail: lamsf@hku.hk
Phone: (852) 3917-2388
Fax: (852) 2858-3518
http://www.psychology.hku.hk/~main/?page_id=1018

_____
From: Kristi_Ryczek@gwinnett.k12.ga.us <Kristi_Ryczek@gwinnett.k12.ga.us>
Sent: Tuesday, November 22, 2016 5:45
To: lamsf
Subject: School Support and Teacher Motivation to Implement Project-Based Learning

Dr. Lam,

I enjoyed reading your article School Support and Teacher Motivation to Implement Project-Based Learning. I am currently in a educational leadership doctorate program at Georgia State University in Atlanta, Georgia. I am beginning my dissertation journey and one of my research questions is "What is the relationship between a principal's transformational leadership and teacher's motivation to integrate technology in primary grades?" Some of your subscale items align with my study. May I use some of your items in my survey? If you grant me permission, I will cite you in my study.

Thank you,
Kristi Ryczek, Ed. S.

APPENDIX C: Principal Email and School Agreement

Congratulations! Your school has been selected to participate in a doctorate study because you are one of the 12 elementary schools that fall within a two-point range of the mean in GCPS, using CCRPI data. My name is Kristi Ryczek, and you may know me as an assistant principal here at XXX. However, I come to you today as a doctoral student at Georgia State University. The purpose of my study is to determine if there is a relationship among a principal's leadership style, teacher motivation, and student performance with the integration of technology being the primary focus. Performing this study within XXXX has been approved by the XXXX Institutional Review Board (IRB) and confirmation documentation is attached.

As the principal, your only requirement at this time is to review the documents and sign that you are willing to participate in the study. To participate in this research effort, simply open the attachment on this email and sign/date the agreement stating that you are willing to participate in the study. You can either submit it back to me electronically at kristi_ryczek@XXXXX or via intercampus mail to Kristi Ryczek/XXXX Elementary. Completion of the agreement by 7/24/17 would be greatly appreciated.

After school sites have been confirmed, then the study will be approved by GA State IRB, and I will contact you again to retrieve the scores of 2nd grade students that met FAY status along with categorical information, such as free/reduced status and gender. Depending on the experience of the staff member running the student reports, it should take between 15-30 minutes to collect all of the requested data. In addition, second grade teachers will be asked to complete a 24-item survey on transformational leadership and teacher motivation that will take each teacher approximately 10 minutes to complete.

Thank you in advance for your valuable time, input, and assistance.

Sincerely,

Kristi Ryczek
Assistant Principal

Re: File ID 2017-60

The research study, "Implementation of Technology in the Primary Grades: Transformational Leadership and Teacher Motivation," ID Number 2017-60 has satisfactorily met XXXX Research Standards and was approved by the Institutional Review Board. This approval is effective June 7, 2017 through April 30, 2018.

School Agreement:

The school listed below has chosen to participate in the Kristi Ryczek's Georgia State University research study. As part of this study, the school will provide the researcher with requested data from the selected population of second grade students. The sources of student data that will be given will include: (a) May 2017 Student Performance Gains (SPG) end of year mathematics assessment scores, (b) students' time on technology, (c) full academic year (FAY) status, and (d) categorical information including socio-economic status and race and gender information. The school will only grant access to the records that are specifically needed for the research.

The US Department of Education indicates that data that cannot be linked to a student by those reviewing and analyzing the data are not 'personally identifiable.' Student data will be released without consent under FERPA after all personally identifiable information has been removed from the records. The school will make a reasonable determination that a student's identity will not be identifiable. A code will be matched to students to allow the researcher to match information, but will not allow the researcher to identify a specific student. The code will not be based on any student personal information. The researcher has agreed to not re-disclose any student data and will be responsible for ensuring confidentiality of the information.

This agreement is with XXXX Elementary School and the study's researcher, Kristi Ryczek.

Signed: _____ (XXXX, Principal) of XXXX Elementary School on _____ (date).

APPENDIX D: Teacher Email and Informed Consent

Hello,

My name is Kristi Ryczek, and you may know me as an Assistant Principal here at XXXX. However, I come to you today as a doctoral student at Georgia State University.

As a 2nd grade teacher in an identified school, you are invited to participate in my research study to determine if there is a relationship among principal leadership, teacher motivation, and student performance, with the integration of technology being the primary focus. The only requirement to participate is to complete a brief, one-time survey on-line that takes approximately 10 minutes. All submissions are completely anonymous, and participation is voluntary.

Below is a full copy of the participant invitation and consent form that provides complete details. Performing this study within XXXX has been approved by the XXXX Institutional Review Board (IRB) and confirmation documentation is attached. Please review these documents prior to completing the survey.

To participate in this research effort, simply click the link at the bottom of this email (or copy and paste the link into your web browser). Completion of the survey by 8/31/17 would be greatly appreciated.

Thank you in advance for your valuable time, input, and assistance.

Sincerely,
Kristi Ryczek

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Participant Invitation and Informed Consent Form

Georgia State University
Department of Educational Policy Studies
Informed Consent

Title: "The Implementation of Technology in the Primary Grades: Transformational Leadership and Teacher Motivation"
Principal Investigator: Dr. Yinying Wang
Student Principal Investigator: Kristi Ryczek

I. Purpose:
You are invited to participate in the above titled research study. The purpose of the study is to determine if there is a relationship among principal leadership, teacher motivation, and student performance, with the integration of technology being the primary focus. You are invited to participate because you are a second grade teacher in an identified school. A total of 90 participants will be recruited for this study. As one of these 90 individuals, your participation will require approximately ten minutes of your time.

II. Procedures:
If you decide to participate, you will complete a ten-minute online questionnaire that has been designed to collect information on principal leadership style and teacher motivation.

III. Risks:
In this study, you will not have any more risks than you would in a normal day of life.

IV. Benefits:
Participation in this study may not benefit you personally. The results of transformational leadership, motivation, and technology use will serve to determine the significance of leader behavior in the successful integration of technology. Overall, the study hopes to gain information about the relationships among principals, teachers, and students in the effort to integrate technology into curriculum for primary students.

V. Voluntary Participation and Withdrawal:
Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:
We will keep your records private to the extent allowed by law. Dr. Yinying Wang and Kristi Marable Ryczek will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly (GSU Institutional Review Board, the Office for Human Research Protection (OHRP). We will use a pseudonym (number) rather your name on study records. The key code to identify participants will be stored separately from the data to protect privacy. Completed survey information is considered private and is only accessible by the researcher via a password protected interface. All data will be uploaded to the

computer and erased from the device once uploaded. All study data, including the key code, will be destroyed three years after study closure. The information you provide will be stored on a firewall-protected computer in the office of the student investigator. The researcher will not use your response information for any purpose outside of this research project. Data will be exported into statistical software for analysis and only cumulative summary data will be reported. Your name and other facts that might point to you, or your school district will not appear when we present this study or publish its results. The findings will be summarized and reported in group form.

VII. Contact Persons:
Contact Dr. Yinying Wang and Kristi Marable Ryczek at 214-663-0451 or krico1@student.gsu.edu. if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. If you want to talk to someone who is not part of the study team, call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

VIII. Copy of Consent Form to Participant:
Please print or save a copy of this consent form for your records.

If you are willing to volunteer for this research, please indicate your consent by clicking the link below to begin the survey. Thank you.