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Increasing Academic Achievement and Motivation Through the Use of One-to-one Technology in the Intermediate Classroom

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Increasing Academic Achievement and Motivation Through the Use of One-To-One Technology in the Intermediate Classroom

by
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Abstract

This study explored the impact of one-to-one technology on motivating students to higher academic achievement within math and reading curricula in the fourth-grade and fifth-grade intermediate classrooms. Located at an urban/suburban PreK-5 elementary school outside of the Twin Cities of Minneapolis and St. Paul, 14 educators implemented Apple iPad technology into their everyday instruction to engage students and personalize learning in order to accelerate equitable student achievement. Data was collected over a two year span and a comparison of the quantitative results based on classrooms without one-to-one technology versus one-to-one technology based classrooms, and used statistical measures to explore the impact of technology on motivation and academic achievement growth. Student growth was measured spring-to-spring using NWEA MAP math and reading assessments. These findings are reviewed with multiple significant differences indicated. This research could be beneficial to educators, administrators, and stakeholders within the educational community interested in ways to integrate one-to-one technology as means to impact academic achievement for students.

Dedication

This dissertation is dedicated to the following important people in my life…

To my wife and best friend, Kendall Davis. I am eternally grateful to her and my two children, Veronica and Camden, for standing by me, encouraging me throughout this journey, and for loving me like Jesus does. Kendall, I love you for putting up with me, keeping our life on schedule, and most importantly, thank you for all always pushing me to pursue my dreams. To my children, thank you for always putting a smile on my face and making me laugh throughout this journey.

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List of Abbreviations

ANOVA	Analysis of Variance
CPAA	Children's Progress Academic Assessment
CTO	Chief Technology Officer
FC	Flipped Classroom
FTL	Freedom To Learn
HRISW	Hearing and Recording Sounds in Words
LMS	Learning Management System
MAP	Measures of Academic Progress
MLTI	Maine Learning Technology Initiative
NWEA	Northwest Evaluation Association
OSELA	Observation Survey of Early Literacy Achievement
PDF	Portable Document Format
QR	Quick Response Code
RIT	Rasch Unit Scale
RQ1	Research Question One
RQ2	Research Question Two
TED	Technology, Entertainment, Design

Chapter I: Introduction

Introduction to the Problem

Ever since the early 1990s, the use of technology within education has grown significantly. Classrooms started off with a single green screen computer sitting in the back of a classroom. Years later, that one lone computer was soon replaced with a more efficient, slimmer, and faster model in each classroom for both students and teachers to use throughout the day. Soon after that, schools began incorporating new technology programs that placed a plethora of updated computers loaded with educational programs geared towards expanding resources, learning activities, and enhancing the minds of the students. Fast-forward to now where school districts have their choice of technology that could be used throughout classrooms, hallways, and sometimes even at home.

New technology and innovations continue to enhance student learning however, one must remember, "the magic isn't the new tools themselves, but how they enable us [teachers] to accomplish our goals – with a twist" (Harris, 2007, p. 20). During the present day, educators have computers in each classroom, wireless internet throughout the buildings, laptop computers, interactive whiteboards, tablets and the ability to communicate with parents, staff, and students with just a click of the button labeled "send." Since educators want students to be excited about completing their assignments why not introduce the use of one-to-one technology that allows for students to stay engaged at a high level be motivated, and ready to explore?

For the past couple of decades technology has changed in almost every aspect of the educational world. When one-to-one technology programs first started, laptop technology was the preferred choice but has since expanded to the use of tablets and other handheld technology

for every student and staff member. One-to-one programs have been the accelerant to the growing technology phenomena that continues to be investigated by a school district, in the development phase, or currently being used in classrooms across America.

Background of the Study

While technology continues to grow, the job of overseeing a school district's technology program has also grown exponentially in recent years. The Consortium of School Networking (CoSN, 2005) explained that the Chief Technology Officer (CTO) serves as the agent who was required to not only think within the short term of how technology was being used, but also think about what students need to know in five years. A CTO must wear multiple hats to maintain a successful and effective Information Technology department. "This means ensuring that communication is good between the techies and the non-techies and helping to empower stakeholders-both internal and external-to shape and embrace a collective vision for the role of technology within the district" (p. 41). Ultimately, the responsibility of ensuring that technology supported communication methods were reliable and available falls in the hands of one person, the CTO (or similar position).

Because technology has made such an impact on the world of education, different generations could be labeled by the type of technology that was used during that period of time. This generation was described as being digital natives, while most of their parents were considered digital immigrants (Cooper, 2009). Digital natives are defined as people who have been surrounded by digital technology while growing up and find technology as an integral part of life (2009). Digital immigrants are people who were born before the advancement of handheld devices were needed to adapt to and learn about these technologies. To digital natives,

technology was a necessity, not a modern convenience (Person, Carmon, Tobola, & Fowler, 2010).

Would educators incorporate more of this highly motivating technology to teach tech-savvy students? When it comes to technology, researchers believe that educators could be incorporating technology into their lessons in a way that helps their students connect on a deeper level. Professional development strategies need to be revamped providing educators with the necessary resources and training to prepare students. The students could be engaged while the educators delegate allowing the students to actually do the work. In order to meet student needs educators could relinquish some control in the classroom providing students the essential flexibility to be creative and collaborate. Establishing a project based learning community could be a great way to engage students (Bellanca & Brandt, 2010). Adams (2006) explained that technology has changed the way students learn. Adams research showed that mobile technology could be used to create active lessons that would engage students' and improve student performance. Students form an opinion of technology in early elementary school and view it as positive when used in the classroom. In the mathematics classroom, technology frees students from tedious work and boosts students' confidence on simple calculations (Dugdale et al., 2004; Erbas & Ledford, 2004). This boost in confidence has positive effects on students' achievement and attitudes towards math. Additionally, students were more likely to engage in individual practice and assessment when technological resources were provided (Capraro, 2008; Simba, 2007).

Students prefer audio books to reading "real" books, video games to movies and television, online classes to traditional instruction, infotainment to drill and practice, and if the entertainment does not come from the front of a wireless classroom, it comes from the Internet.

Adams (2006) went on to explain that a student in class with a laptop with wireless Internet access could take notes, carry on one or more instant messaging chat sessions, review online coursework, keep up with current news and sports, and still work on assignments.

While all forms of technology continue to influence the way students learn, educators must be willing to change how information was shared within the walls of the classroom. Petkov and Rogers (2011) asked the question, "If the way students interact with the world has changed, why is the education system not changing?" (p. 8). The way students were motivated to learn has evolved from decade to decade. In the past, student learning generally came from paperback and hardcover books to read in order for homework to be completed. Within a few years, those books were outdated but students were still motivated to learn. Students were able to access information from multiple sources that still include paperback and hardcover books, digital books, the internet and yes, video games that were geared towards captivating and motivating student learning both within and outside the walls of the classroom.

So what type of technology was needed in the classroom to increase students' motivation? Schools across the country adopted one-to-one technologies into classrooms (Asher-Shapiro & Hermeling, 2013; Bouterse, 2009; Murray & Olcese, 2011; Spires, 2012). Bouterse (2009) stated, "from one-to-one learning initiatives to laptop carts, schools all over the country are using portable computing models to achieve flexible technology access" (p. 14). Mobile technologies allow for learning to occur virtually anywhere (Asher-Shapiro & Hermeling, 2013; Greehill, American Association of Colleges for Teacher Education, & Partnership for 21st Century Skills, 2010; Koszalka & Ntloedibe-Kuswani, 2010). "The size, ease of use, portability, prevalence, and advanced features of mobile technologies (e.g.; voice, display, Internet access, interactivity) have sparked interest in integrating these technologies into

instructional environments" (Koszalka & Ntloedibe-Kuswani, 2010, p. 139). In classrooms where technology was used, students were able to focus on reflection, decision-making, reasoning, and problem solving. In the math classroom this allows students to construct knowledge and make their own generalizations using inductive reasoning (Dugdale, Guerro, & Walker, 2004; Erbas & Ledfor, 2004). The progression of blended learning environments has brought new ways for lessons to be taught, for how students were assessed, and for how to improve differentiated instruction for individual learners. Blended instructional models possess the ability meet the learning needs and style of diverse students, while continuing to engage them and place more control over their learning in their hands (Patrick, 2011). Blended learning environments offer research-based instructional design that combines online learning with improved learning resources both in and outside of the classroom with the flexibility for students to set a reasonable pace to help extend their learning time with increased interaction with an educator, both online and in person.

Lei and Zhao (2008) found that technology was being used in different ways. Instead of using the traditional paper and pencil to take notes, students were taking notes on their laptops instead of carrying around multiple notebooks for different subjects. Students now carry their portable technology from one classroom to the next and using various programs and apps to take notes, complete assignments, and communicate with one another to other various projects. The researchers (2008) reported finding that 80% of students felt more organized, were able to read their notes better, and could share electronic copies of notes with students who were absent from class.

In addition, evidence was found to support the use of iPad (tablet) technology as a way to help students stay organized. Shareski (2011) stated, "…the device's form factor allows users to

easily manipulate and 'own' it" (p. 58). Students were able to set up their iPad with applications that help to expand their thinking. In a follow-up study, Foote (2010) found that educators enjoyed using iPads in the classroom because, "It's a very engaging tool for any subject area that can appeal to students more readily, even in subjects they aren't interested in" (p. 18).

The infusion of technology in our world, lives and our education system does not come inexpensively. Kiker (2011) found that school districts were contacting technology vendors and were able to research pricing and plan options for creating custom programs that fit their budget and current interface. "We chose a vendor and selected equipment that would work well with our wireless network, had superior reliability reviews, and was available at a manageable price point" (p. 23).

Although some school districts were able to pay for technology programs within their school budget, others were not as fortunate. Communities were creating partnerships with local businesses to help support and expand their school district technology fund. This allows school districts to, "…make a small initial investment for wireless networks upgrades, access points, or firewall upgrades" (Kiker, 2011, p. 24). By doing this, school districts were also able to revamp or remodel the physical space to make the technology use more efficient and practical for all who use it. Furthermore, Jones (2011) found that some school districts would charge families a user fee to help offset the cost of the application technology and maintenance of the machine.

Statement of the Problem

Technology has matured over the years from its infant stage, where it was a single awkward sized green screen confined to one place within a school. Computers then moved into the classroom with a smaller, more portable sized, that still needed to be close to an Ethernet port

for access to the Internet. Technology has now moved into the adult form of a slimmer, faster, and more agile fitting design that allows for more freedom and longer use.

This being said, technology has not and probably will never be done growing or maturing due to its continuous upgrading. The computer revolution in education continues to garner massive amounts of hype and attention. "Judging from the media, one would assume that almost every student was learning on the Internet. But what's reported on were the innovative examples, the pioneering teachers, and the 'wow' potential" (Schwab & Foa, 2001, p. 620). It was because of this growth that educators must come to be involved and evolve with technology.

In 2002, Maine launched the Maine Learning Technology Initiative (MLTI) aimed in placing a laptop computer in the hands of 30,000 seventh-grade and eighth-graders (Mclester, 2011). The 37 million dollar MLTI program was put into place to "prepare young people to thrive in a world that doesn't exist yet, to grapple with problems and construct new knowledge which is barely visible to us today" (p. 34). Within the next few years, other states began implementing one-to-one technology programs, thanks in part, to the success of the state of Maine. For example, states such as Texas and Michigan followed the trail set by Maine. As a result of implementing technology one-to-one programs, Michigan's Freedom to Learn act found that, "schools across the state were showing higher student engagement, fewer suspensions and discipline problems, and in some places, significant increases in math and science scores as a result of the program" (p. 35).

With more school districts shifting to one-to-one programs, the challenge of creating new programs came with its own set of obstacles. According to Windschitl and Sahl (2002), "Laptop computer programs introduce a host of complex issues into a school community, not the least of which is how teachers will adapt to classroom settings in which every student owns a mobile

suite of technological tools and has telecommunications access to a global repository of information" (p. 166). Schools face numerous factors that determine the outcome of one-to-one programs, yet their main goal was to prepare learners for the challenges and complexities of navigating themselves through the 21st century.

Educators were aware that technology will consistently be advancing and tied to how students learn with said technology. One-to-one technology programs allow educators the ability to dive deeper into the world of knowledge and find out what added value laptop or tablet technology programs bring to teaching and learning for both educators and students. That said, there were a number of questions that need to be asked and answered regarding to how and why technology enhances or affects motivation and student achievement in today's high expectation and modernized classroom.

Research showed that when school administrators believed that technology integration was important to teaching and learning, they would impart this belief to their staff. Franklin (2008) found having school administrators on-board allowed for technology integration through professional development activities, curriculum, and instruction. Educators who feel confident in the use of technology were more likely to create a community where technology assists in the continuous exploration of learning.

Integrating the latest and greatest technology could be very expensive. School districts create a budget to help control the cost that comes with technology. However, not everything with technology could be accounted for. Tusch (2012) found that his school district in Montvale, New Jersey, was not prepared for everything as they learned the hard way:

> During the early years of the program, we believed we did not have the resources to manage laptop repairs and maintenance ourselves. Therefore, as part of its contract with

the manufacturer, the school district required the vendor provide both warranty and accidental damage repair coverage and manage all required paperwork. (p. 41)

Learning could occur wherever and whenever opportunities exist. Cookson (2009) suggested, "If we stop thinking of schools as buildings and start thinking of learning as occurring in many different places, we will free ourselves from the conventional education model that still dominates our thinking" (para. 36). One-to-one technology allows for a different style of educator to enter the classroom and lead a more powerful generation of students. Gullen and Zimmerman (2013) found that, "Teachers infuse technology into the classroom most successfully when they find new ways to enhance current practices, leveraging technology's ability to help them connect, collaborate, and enrich" (p. 66). When educators were equipped with the same or better technology that students were using outside of the classroom, educators have an improved chance to transform their classroom from a traditional learning environment into a modernized technology learning community.

Purpose of the Study

The purpose of this study was to explore the inner workings of how one-to-one technology was currently being used in the intermediate elementary classroom to help engage, motivate, build confidence, train students in the use of technology, and document the impact on academic achievement. The targeted population was fourth-grade and fifth-grade students from one school. Instructional strategies as well as classroom environment may be improved as a result of this study.

Rationale

The rationale for this study was the need to determine what effect one-to-one technology in the intermediate elementary classroom has on student motivation towards academic

achievement and which technology application provides the greatest motivation in the intermediate classroom.

Research Questions

Guiding the research and data collection of this study, were the following questions:

1. What are the reported impacts of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?
2. Which technology apps provided the greatest motivation in the intermediate elementary classroom?

Significance of the Study

The significance of this one-to-one technology study was to discover how the added value of one-to-one technology programs could motivate students in intermediate classrooms to higher academic achievement. Even with educational funding being cut dramatically across the board, technology continues to find a way into education. Good educators are able to adapt to almost all learning environments. However, teaching in a one-to-one laptop or tablet program demands a few more qualities and capabilities than the traditional classroom.

Not only do educators need to show a presence in the design and layout of the program, they must also have a cognitive presence in the classroom. "Cognitive presence reflects the intellectual climate and is associated with the facilitation of critical reflection and disclosure" (Garrison, 2003, p. 3). Educators hope to engage students in higher-order thinking but students in the K-12 setting cannot often do this on their own. The educator's presence in the cognitive process was critical and could be accomplished many different ways in the one-to-one program.

"The emergence of digital or digitized media that engages users in interactive and immersive experiences via information and computer-based platforms is placing unprecedented demands on education landscapes both within and across disciplines to restructure and transform" (Towdrow & Vaish, 2009, p. 208). This change in educational landscape greatly affected classroom infrastructure. Teaching with technology, predominantly with the use of laptops, provided new opportunities for teachers. "Teachers enter the classroom with a wide range of attitudes, experiences, and skills related to teaching with technology" (Dawson et. al., 2006, p. 145). Not every teacher was ready to teach with laptops, nor has the desire to engage with the fast pace of technology. Many teachers had concerns when a laptop program was initially implemented into a school.

Some educators were comfortable and embrace changes because they do not want their lessons and activities to become out-of-date. Other educators could be apprehensive about introducing new changes because they were not sure how to comfortably incorporate the new teaching method or technology into their already-full curriculum, or they were concerned about getting their students ready for the yearly-standardized tests. "Teachers may explicitly become curriculum makers, with all the time and knowledge intensity required to consider disciplinary and pedagogical issues as they choose resources and design activities" (Wallace, 2004, p. 482). Whether an educator chooses to embrace having laptops or tablets in the classroom, many would argue that teaching in the 21st century has dramatically changed.

Starting up and maintaining a one-to-one technology program requires a great amount of time, dedication, and energy from educators; however, the benefits were rewarding. "Lesson planning was […] more complicated, but the writing of lesson plans was simplified through the use of the available technology" (Maninger, 2006, p. 43). Not only does mobile technology

allow educators more flexibility with pedagogy, it also creates more opportunity for interpersonal relationships with a classroom. "Students found that adding technologies such as laptops to the classroom environment can strengthen faculty interactions with students, especially those students who were hesitant to participate in traditional classroom discussion" (Hall & Elliot, 2003, p. 303). Educators whom were motivated to build positive and healthy relationships with their students were able dive deeper with their students to help increase student achievement. If an educator was not motivated to put forth the effort to build said relationships, then why would the educator believe that their students would be motivated to complete the assigned tasks?

Definition of Terms

The following definitions were used for the purpose of this study.

1. Motivation: Urdan and Schoenfeder (2006) believed:

   > Motivation is a complex part of human psychology and behavior that influences how individuals choose to invest their time, how much energy they exert in any given task, how they think and feel about the task, and how long they persist at the task. (p. 332)

   Penticoff (2002) defined motivation as, "Motivation, level of engagement, and academic achievement of students are often connected to students' confidence in their ability to master academic activities" (p. 17).

2. Engagement: Engagement is the student's relationship with the school community, including the people, the structures, the curriculum and the content. Engagement includes curricular, co-curricular, and extracurricular opportunities (Yazzie-Mintz, 2007).

3. Mobile Technology: A generic term used to refer to a variety of portable electronic devices that allow people to access the Internet, data, and information from almost anywhere.
4. App: These software programs are run on Apple's iOS, Android, Google, and other operating systems. Each program has a specific application for the user.
5. MAP: Measures of Academic Progress creates a personalized assessment experience by adapting to each student learning level, precisely measuring student progress and growth for each individual. The MAP test is a product of the Northwestern Evaluation Association (NWEA) and is an achievement test for the subjects of mathematics, reading, and science in Grades 2-10.
6. RIT: The RIT Scale is a curriculum scale that uses individual item difficulty values to estimate student achievement. The RIT Scale is an equal interval scale.
7. Technology: A study of technology, which provides an opportunity for students to learn about the processes and knowledge related to technology that are needed to solve problems and extend human capabilities (Asunda, 2012, p. 352).

Assumptions and Limitations

The first assumption would be that 100% of the students would have been exposed to or used mobile technology before participating in the study.

The second assumption would be that due to the researcher being employed by the school district of the study, it could have influenced response rate and generalizability as well. Though anonymity was promised and maintained, the relationship with the researcher could have influenced the response rate, positively or negatively, as well as the choice in response with the mobile technology.

The main limitation of the study would be the time frame that the researcher had to collect the data. The researcher used a small window of time at the end of the school year to collect the data due to time constraints for completion of the study.

A second main limitation related to where the study was conducted. The study only focused on one school that was located within an urban suburb of Minnesota, limiting the generalizability of results.

The first limitation would be the sample size. The size was small (154 students) due to the richly detailed descriptions that were need for this study.

The second limitation would be the researcher chose to only examine intermediate elementary students (fourth-grade and fifth-grade) in one elementary school due to convenience sampling. The elementary school that was used in the study included grades pre-kindergarten through fifth-grade. Pre-Kindergarten through third grade was excluded from the study due to the one-to-one technology program only being available to the fourth-grade and fifth-grade students. This study was designed to analyze how the use of one-to-one technology could increase motivation within intermediate students to achieve greater academic success.

The third limitation that may affect the results of the study would be the participants' willingness to be truthful with the researcher. However, the researcher attempted to prevent this from being an assumption or by ensuring that the participants would remain anonymous. Though it was clarified to both students and parent(s)/guardian(s) that the survey would not affect his or her grades or academic performance in any way, some students could become nervous when asked about their performance at school. The nervousness could activate feelings of either egotistical or incompetence, resulting in an inaccurate self-assessment. It was hoped

that each student's answers would be honest and straightforward, but that quality was difficult to control.

The fourth limitation would be students' access to the Internet outside of school. This would affect students' ability to access or turn in assignments using the Schoology app or website. However, the researcher did work with students and parent(s)/guardian(s) to help create a solution to elevate negative opinions that could affect a student's motivation to achieve higher academic success.

The fifth limitation would be technology issues that could prevent a student from using their iPad, accessing course materials, or completing assignments. The researcher worked with the onsite technology educator and the school districts technology department to solve any technology issues.

Nature of Study

The results of this quantitative study were added to the body of knowledge about the value and effectiveness of one-to-one iPad technology programs for fourth-grade and fifth-grade intermediate students. It discussed opportunities that students had to enhance their learning with one-to-one iPad technology. This study investigated the correlation between the use of one-to-one iPads and student academic achievement, as well as motivation levels, which were prime justifications for an educational initiative. In addition, this study was designed explore whether one-to-one iPads have an influence on fourth-grade and fifth-grade students' motivation to achieve higher academic scores. This study could be significant because of the contributions to the existing research about one-to-one iPad technology being used in an intermediate grade level environment.

In summary, this study was designed to disclose the effects of one-to-one technology in the intermediate elementary classroom on student motivation towards academic achievement. The fourth-grade and fifth-grade students (154) were asked to complete a 27-question Qualtrics online survey. Educators (14) whose main focus was working with fourth-grade and fifth-graders were asked to complete an 18-question survey, which was analyzed after all the data had been obtained and the research analysis phase began.

Organization of the Remainder of the Study

The dissertation for this study was divided into five main chapters. The Introduction, Chapter one, provides a brief explanation and introduction into the framework and the direction for the study. Chapter two provides the review of literature and research. Within this chapter the academic foundations of the study were discussed followed by a broad review of related literature including multiple studies that have impacted and influenced this study. In Chapter three, the methodology of the study was outlined and explained. A rationale for decisions and choices that have been made regarding the data collection and data analysis methods were provided to guide the reader through the quantitative research process of the researcher. Chapter four presents the data findings that were collected and analyzed from the case study. Findings align to the academic foundations presented in Chapter two. Finally, Chapter five discusses the overall findings, conclusions, implications, and recommendations for research and practice based upon the presented data findings. These implications and recommendations support and extend the current research base and practitioner applications.

Chapter II: Literature Review

Introduction

After scanning the literature through key word searches on Google Scholar, ERIC, and multiple other site sources using key words such as, "technology," "elementary," "iPad," "interactive whiteboards," "SMART Boards," "laptop computers", and "classroom," it became apparent that today's students were living in a time when technological innovation was increasing at a rapid pace. More and more students enter schools with the ability to run a smartphone, a computer, and effectively navigate and use the Internet. When it comes to technology, educators could use it in a way that helps bring their lessons to life. "The underlying goal is to use technology to transform instruction, enhance learning, and increase student success" (Parrish, 2010, p. 22). Since educators want students to be excited, stay engaged at a high level, and be motivated to achieve their academic goals, why not use a product that encompasses all of these (Jonson-Reid, 2010)?

While educators were being trained in how to use technology across the curriculum, some teachers were not using the training that they received (Riley, 2007). Miners (2009) encouraged educators to not deceive their students into wanting to learn, instead to create a fun and interesting alternative learning opportunity to motivate the students to learn. Educators need to understand that with great technology resources comes great responsibility to use it in a way that motivates and actively engages students to explore the information on a deeper level.

As technology becomes more pervasive in the classroom, teachers tend to work more as collaborators with the students on curriculum (Fisher, 2006). Implementing technology into the classroom effectively does not occur overnight; teachers could integrate technology into their

curriculum based on their own comfort level (Windschitl & Sahl, 2002). The use of technology in the complex classroom environment could be viewed as a gradual process of implementation and change. Change could be viewed as a process not an event (Hall & Hord, 2001). It was important to take a long-term view of the process of change when implementing an innovative program.

Student Motivation What is it?

Many factors could impact student motivation. Many external forces that deflect their energies away from school confront today's students. "Many factors can impact student achievement and students' motivation levels. These factors include neighborhood violence, poverty and family stress, in addition to disinterest, overconfidence, and ignorance" (Henderson, 1990 as cited in Haywood, Kuespert, Madecky, and Nor (2008). Educators need to maneuver through these obstacles on a daily basis due to their effects on students' motivation to learning.

The classroom environment could also have an effect on student motivation. Skinner and Belmont (1993) noted that educators that clearly communicate their expectations, provide structure, incorporate technology, and offer help and support positively affect the involvement, enthusiasm, and interest of their students. Urdan and Schoenfelder (2006) found that educators who displayed a cold and uncaring attitude in the classroom had more students who were not interested or motivated to achieve higher scores.

The student and teacher relationship did have an impact on how motivated students were in the classroom. Mojavezi and Tamiz (2012) found that:

> Students care about their relationships with their teachers and respond with greater engagement and effort when they believe that their teachers care about them and are supportive. One way that teachers convey these qualities is through their discourse with

their students in the classroom. Classroom discourse structure concerns the manner in which teachers engage student participation in learning, promote intrinsic motivation, and balance appropriate challenges with skill levels. (p. 484)

Essentially, educators and students must be able and willing to work together to achieve high levels of engagement and motivation in the learning process.

Before educators could explore into how motivation affects academic achievement, there must first be a definition of motivation. The word motivation was derived from *motive,* which means to *move* (Graham & Weiner, 1996, p. 65). Urdan and Schoenfeder (2006) believed, "Motivation is a complex part of human psychology and behavior that influences how individuals choose to invest their time, how much energy they exert in any given task, how they think and feel about the task, and how long they persist at the task" (p. 332). Penticoff (2002) defined motivation as, "Motivation, level of engagement, and academic achievement of students are often connected to students' confidence in their ability to master academic activities" (p. 17). The actions and attitudes of educators could also impact the development and learning for understanding, therefore also affecting student motivation.

Furthermore, Price and Kadi-Hanifi (2011) found that motivation was a difficult perception to define. Motivation could come from multiple outlets and affects students differently. Price and Kadi-Hanifi went on to explain that motivation comes from ones' inner resource combined with external factors. Educators that work to build relationships with their students, while also incorporating technology into the curriculum, were more likely to uncover what type of motivation best works to produce the desired results despite their technological skill level.

Student Motivation

Much of the research that was completed on measuring motivation was about the difference between intrinsic and extrinsic motivation. Lopez and Hidalgo (2013) found intrinsic motivation to show inherent tendency to seek out challenges, to extend, explore, and to learn. stated that,

> Individuals are said to be driven to act for extrinsic reasons when they anticipate some kinds of tangible payoff, such as good grades, recognition, or gold stars. These rewards are said to be extrinsic because they are unrelated to the action. (Covington, 2000, p. 22-23)

By considering that students were motivated in different ways, educators could create better interactive objectives as a way to incorporate technology more strategically, while continuing to support student achievement on a higher and deeper level both in and outside of the classroom.

Intrinsically motivated behavior was demonstrated when students engaged in an activity primarily for its own pleasure (Bienkowski, 1999). These children tend to seek challenges and opportunities for independent mastery. When people were intrinsically motivated, they performed a task or assignment because they find either the task or assignment naturally fascinating, satisfying, interesting, or enjoyable (American, 2004; Deci & Ryan, 2009; Gagne & Deci, 2005; Hill, 2011; Niemiec & Ryan, 2009). An example would be using one of the many musical applications that could be downloaded on an iPad to practice singing because he or she was interested in learning a song or to improve his or her vocal range. The many benefits of intrinsic motivation do not exclude the difficulties one may still confront when trying to tap into a person's internal motivations. A student may have had initial interest but now has become

bored. The classroom also provided its own complications because of the number of students, behavioral difficulties, and the pressures put on educators to generate high test scores. It could be further noted that the attempt to control intrinsically motivated behavior could negatively influence the outcome of the task (Darner, 2009). Furthermore, Deci (2009) wrote that learners who were going through the motions and doing as the educator asks were controlled and were not fully engaged, when compared to a student who was autonomously motived to learn.

Additional difficulties with applying intrinsic motivation were the obstacles that were difficult to overcome in school settings. Understanding the energy that was needed to develop and preserve an individual's intrinsic motivation allowed one to see the struggles in intrinsically motivating a classroom. However, with twenty-five to thirty students, some of who have learning disabilities and others that struggle with behavior along with their different interest levels, educators could have their hands full getting through the subject matter for those who want to learn (Convington 2000).

A student may not have any interest in a certain topic. Intrinsic motivation permits students to feel free and enjoy the activity while having fun. Intrinsically motivated students not only achieve in the classroom, but they have a sense of well-being and were successful in their work, when compared to their extrinsically motivated peers (Moran, 2012; Vansteenkiste, 2006).

Intrinsic motivation was continuously the desired goal of incentives when motivating students, however, when the individual lacks motivation an extrinsic motivator may be required. Extrinsic motivation could be described as students relying solely on motivation from outside sources that does not relate to the completion of a personal goal. Extrinsic motivation had been used as a process to help achieve desired outcomes throughout the centuries in households, classrooms, and the office. While extrinsic motivation could provoke the feeling of bitterness or

resistance to complete an activity, it could also replicate an acknowledgment the value of the task (Ryan & Deci, 2000). Extrinsically motivated students rely on external factors to determine their accomplishment. "Society at large is based upon incentives and merits, so using rewards in the classroom is a natural way to go" (Horn, 1991, p. 5). In the case of the intermediate classroom, those extrinsic rewards could be free time with the iPad, extra recess, free homework pass, or computer time. In certain situations, rewards could be useful and in other situations they could be harmful. Educators who do use rewards must be cautious as to how and when they offer students these rewards because students could become dependent, or expect these rewards, which could alter order their thinking, the skills they learn, and the behavior they demonstrate.

Extrinsic motivators could be very effective in motivating a student that has no interest in a certain task. If used wisely, an external motivator may not only motivate a student to complete the task, but also help him or her see the significance of the task. This may encourage students' own intrinsic motivation by internalizing the value of it for a later time (Deci & Ryan, 1985). An extrinsic motivator, when used appropriately, could also give information about the improvement one was making on a task. Precaution must be taken when regulating a child's behavior with extrinsic contingencies in such a way that the directive will gradually be accepted by the child as his or her own, and that the use of the controls did not have unfavorable effects on related intrinsically motivated behaviors.

The shift from extrinsic to intrinsic motivation was critical since most educators were not interested in merely prompting certain behaviors; they generally desire that the children accept responsibility for themselves. The change in control for those behaviors frees the educator of larger quantities of responsibility and prepares the student for participation in the educational environment. An art student may not initially see the importance of practicing; if the student

ultimately sees the value of practice time and does it without the extrinsic motivator, he or she has internalized the value of practice time. Until the student sees the importance of it himself or herself, the extrinsic motivator encourages progress towards the goal of internalization.

With this premise in mind, educators need to first learn how technology could be used to motivate students to want to dig deeper into the information. "With mountain climbing, as with learning, setting the goal is the easiest part; the most challenging part is getting there" (Jalongo, 2007, p. 396). The process of finding out how technology could be used to motivate students to improved academic achievement requires effort to be put forth by everyone involved. Hubbell, Kuhn, and Pitler (2012) indicated that when learning goals were clearly stated prior to a lesson beginning, technology helped to increase motivation, while also encouraging collaborative learning and develop problem solving and critical thinking skills.

Motivation in the classroom was often overlooked when evaluating the effectiveness of technology (Reber, 2005). By incorporating technology, teachers could include interactivity, videos, sound, and other stimuli. These engage students in the learning process by capturing their attention and creating a hook for learning. Technology may not always increase the depth of content knowledge; however, students have shown more interest in a lesson incorporating technology (Liu, Horton, Olmanson, & Toprac, 2011).

Student Motivation

Petri and Govern (2004) wrote, "As scientists we almost never measure motivation directly. Instead we manipulate some stimulus (S) condition and then measure some behavior in the form of a response (R)" (p. 16). The literature supports the belief that a problem of student motivation still exists. Haywoord, Kuespert, Madecky, and Nor (2008) found that students lack of motivation was demonstrated in students' homework, grades, attitudes, class participation, and

overall performance. Student motivation was directly related to whether or not the time and effort invested was worthwhile, and most unmotivated students feel alienated from school.

> Effective teaching transcends merely imparting knowledge and relies, to a considerable extent, on educators' ability to motivate students to learn. Any characterization of learning that disregards the role of motivation and interest is shortsighted at best and destructive at worst. (Jaongo, 2007, p. 395)

Educators must remember that motivating students was more like climbing a mountain than climbing stairs. Whether the pinnacle was Mount Everest or academic achievement, the rate of advancement could be impressive one day and barely perceptible the next and both, for the climbers and the learners, each step demands a thoughtful appraisal of the next, best move. With mountain climbing, as with learning, setting the goal was the easiest part; the most challenging part was getting there. Understanding how students respond to different motivational situations could help guide instructional decisions resulting in enhanced or decreased engagement learning. If students believe they cannot succeed on specific tasks, they may, on the surface, attempt them, give up quickly, or avoid them (Margolis & McCabe, 2006).

A growing body of research indicated that the measuring of motivation was difficult due to the various styles that motivation could be expressed (Ahn, Bong, Cho, & Kim, 2012). "Motivation is an abstract phenomenon to study, with both internal and external factors affecting it" (p. iii, Gut, 2010). The concept of measuring motivation would seem best understood not as an on-again, off-again mechanism but rather as a constant flow of behavior that could be directed in many different ways. Thus, it appears that educators could be more interested in how motivation was directed first towards one behavior, than towards another than to try to analyze it as present or absent (Petri & Govern, 2004).

There was some research to support the notion that the attitude towards school mediates the effect of emotions and motivation on academic achievement.

> Mastery goals are characterized by the evaluation of competence through self-referenced perceptions of growth or improvement; whereas performance goals are characterized by demonstrations of one's ability, achieved by positive judgments such as 'you are smart', avoidance of demonstrations of inability, social comparison and competition. (Moe, Pazzaglia, Tressoldi, & Toso, 2009, p. 260)

The research team found that motivational variables affect academic achievement directly or through the mediation of emotions, which also affect attitude and achievement in school. The link between these two factors mixed in with academic achievement effectively show that students who may experience well-being in school, feel more positive and less negative emotions, and have effective motivation.

In a follow-up study De Beni, Mega, and Ronconi (2014) stated that positive emotional experiences were an important part of students' academic achievement. Students who displayed emotions of hope, pride, and other enjoyment feelings performed at an increased academic level. Margolis and McCabe (2006) discussed how many struggling learners have low self-efficacy for academics. Low self-efficacy could cause motivational problems if students believe they cannot be successful on a specific task. The negativity reinforces additional school difficulties and behaviors, such as low grades, conflicts with teachers and peers, and low achievement scores on high-stake assessments. The results suggested that feeling well in school seems to depend more on the emotions and motivations experienced that affect objective academic results.

With this premise in mind, Miller (2010) stated, "Motivation is a function of the value students place on becoming engaged in an instructional activity and their expectancy for being

able to complete an academic task if they expended appropriate levels of effort" (p. 43). Miller continues to examine the opportunity for students to complete challenging academic tasks collaboratively instead of alone, which was thought to increase student engagement and motivation.

In contrast to specifically focusing on how best to measure the motivational level of students, it was important to acknowledge the impact of the behavior of educators within the classroom contributes in promoting student motivation. "This model has as its cornerstone the notion that the source of motivation is internal to the child, so that when the social surround provides for children's basic psychological needs, motivation will flourish" (Skinner & Belmont, 1993, p. 572). Instructional methods and interpersonal relationships used by educators' support student motivation while at the same time influencing student attitudes and beliefs.

Educators play an essential role in nurturing students' integration of skill and will. For students to learn new concepts in meaningful ways, students need the will to want to understand the information and the skill to know how best to invest their energies in the learning process (Margolis & McCabe, 2003). Strahan (2008) found that educators, who, early on, establish positive relationships and a climate of trust with their students, were establishing a learning community that facilitated student academic success. "When a student learns to trust a caring teacher, he or she could begin to take chances, find the will to invest effort in a task, and receive the guidance needed to improve skills" (p. 6). Once students begin to trust educators, students then engage more in class activities, assess their own work, and begin to set goals for themselves. When students gain confidence, they start to investigate with new learning behaviors, reflections, and feelings until they gain enough self-efficacy and self-regulation to learn more independently. Ultimately, through this critical factor in the learning process,

educators may gain better insight into the teacher and student interaction portion. Educators who were perceived as being nurturing, supportive, and helpful developed a sense of confidence and self-determination within students, which aided in the transformation of a positive intrinsically motivated student.

In a follow up study, Seifert (2010) believed that students who believed themselves to be capable were more likely to be motivated while those who see themselves as being incapable did not be motivated to achieve more. This explanation was important because if students did not believe they could achieve more, the measurable outcome could result in students making negative choices that would increase the risk of the student failing the test instead of attempting to answer a question on the assignment or test. "In other words, students believe that academic outcomes were the result of an external, stable, uncontrollable entity and their own judgments of that entity give rise to emotions and behavior" (p. 145). This line of thinking is based on behavior being an added measurable regarding motivation. When given a particular task, some students generated an effective response that prompted their will or drive to exhibit positive motivation versus allowing negative motivation to determine the outcome of the situation. Students may also allow the negative motivation to be displayed as work avoidance if they feel they were not capable of doing their work or see no reason for completing the work. These students find little to no challenge, stimulation, satisfaction or meaning in the work they complete, and complete the bare minimum amount of work to get by.

Attitude Towards Impact of Academic Achievement

Academic achievement was important for the successful development of young people. Henderson and Mapp (2002) stated that student achievement was measured in different ways. Academic achievement was conditional upon many factors (e.g., mastery of reading, writing, and

math skills) working together for the successful development of children. Consistent evidence reveals that the school, family, and the community have impacted academic achievement. In order for children to realize the maximum benefits of the educational process, it was critical for connections to be made between all stakeholders (i.e., school, family, and the community). With young adolescents, basic human needs, which Maslow refers to as the hierarchy of needs (i.e., physiological, safety and security, belongingness and love, esteem, and self-actualization) must be satisfied in order to achieve academic success (Davis & Thompson, 2004; Maslow, 1970). While a child was acquiring and developing skills that structure the fundamentals of academic success and literacy, that same student was simultaneously developing personal knowledge of necessary skills (e.g., social interaction and sense of responsibility) that enabled him or her to be well balanced.

According to Shechtman (2002), there was a correlation between student academic achievement and social performance. In order for academic achievement to improve, the social and emotional aspects of a child need to be addressed. The development of the necessary skills that structure the fundamentals of academic success and literacy allowed them to concurrently develop personal knowledge and afford them the opportunity to express success in school and in the future. Furthermore, Weglinksky (2004) identified classroom practices associated with high student achievement as activities that focus on higher-order thinking skills and engage students in hands-on learning.

Educators who utilize varied teaching strategies make student understanding the center of their instruction. The learner centered classroom environments that integrate instructional strategies and that create enthusiasm about learning enable students to express success outside of the school setting. It was believed that activities that focus on higher-order thinking skills and

engage students in hands-on learning increase academic achievement. "When teachers are asked what they do to motivate learners, the common response is 'hands-on' learning" (Guthrie, 2006). It was important for all children to develop character, which encompasses morals and ethics. However, a lack of character oftentimes compromises children in terms of academics and behavior. Further, academic achievement continues to be contingent upon students being actively engaged in learning. For students to be academically successful, they need to be engaged in active learning. Active learning takes place when adolescents were active participants in the discovery of knowledge (Bishop & Pflaum, 2005b).

Additionally, the pressure of public accountability challenged middle school teachers to effectively engage students in learning (Bishop & Pflaum, 2005a). Studies showed that among minorities there was less participation in classroom-based activities (Finn, Pannozzo, & Voelkl, 1995) and therefore less active engagement. It was important that teaching techniques and tools be employed that stimulate and interest these students to achieve optimal active engagement in learning and hopefully encourage less absenteeism. Moreover, learning that was relevant to the lives of students addresses both their personal and social concerns. Relevance was crucial to engagement in that students could make a connection between knowledge and how it could realistically be applied to everyday existence.

The research team of Hofe, Lichtenfeld, Murayama, and Pekrun (2013) found that students who perceive to have control of their learning were linked to activating a effortful commitment to learning. The study also suggested that perceived control could help students acquire new knowledge and could show positive growth in their academic achievement. With this premise in mind Brackett, Reyes, Rivers, Salovey, and White (2012) revealed how important engagement was to academic achievement. Students who were not engaged were more passive

learners and display little to no motivation to learning. Student engagement and academic achievement could be seen as individual student traits but not as outcomes of how lessons were structured. Educators who were aware of emotional and academic needs of their students produce lessons that interest their students, create a real-world connection for their students, and encourage self-expression.

Another aspect that was essential to engagement could be the place that the teaching and learning process takes. Vygotsky's (1995) theory suggested that the pace of the instruction be at the appropriate level of challenge and within the scope of adolescent's cognitive development (Bishop & Pflaum, 2005b). Students who were actively engaged in learning activities and experience some degree of success build confidence. Further, it was important to investigate the critical constructs that were relative to learning (i.e., classroom behavior, homework time, attitudes and perceptions of students, self-efficacy, etc.). It was imperative that educators gave attention to those factors because it was during the middle school years that students mediate and negotiate their future progressions (Singh, Granville, & Dika, 2002).

The research team of Keengwe, Mills, and Schnellert (2012) conducted a study that was focused on how one-to-one laptop initiative affected student learning. Their findings suggested that one-to-one laptop technology did positively impact student academic engagement and learning. The study went on to point out that one-to-one technology encouraged students to ask questions using technology instead of feeling pressure to ask the question in front of their peers.

In a follow-up study, Lowther, Inan, Ross, and Strahl (2012) looked at how school districts were increasing students' knowledge and skills with the use of educational technology. The state of Michigan was among the first states implement a state wide called Freedom To Learn (FTL) one-to-one technology initiative. The FTL initiative integrated 20,000 laptop

computers with K-12 teaching and learning. The study revealed positive impacts from both students and educators when it came to be engaged in meaningful activities. Those activities involved critical thinking skills to process information in order to reach a solution to the meaningful activity. The research team (2012) used a series of 2x2 chi-square to compare the FTL to comparison schools. While the results did not show a significant difference, the evaluation of the FTL one-to-one program showed promising results in relation to student centered teaching strategies, project based learning, and overall student attitudes and motivation towards the use of one-to-one technology.

Research on factors related to student outcomes have documented that active engagement was the fundamental condition for student achievement. Henderson and Mapp (2002) and the Southern Regional Education Board (1999) suggested that schools with high academic expectations create an environment whereby students could perform on a higher level. While schools differed in size, organizational structure, and financial resources, they all have one thing in common: there was a shared vision of a common goal – "the causes of every single child" – and the essential role that each stakeholder played in reaching that goal. All stakeholders in these schools shared a common vision and went beyond ordinary expectations to ensure student success. Student achievement was greater if there were high quality benchmarks in place that stimulate an adolescent's cognitive and social development. Schools that were successful at educating all of their students have provided the motivation for research on school climate and its relationship to student achievement. Academic engagement was the primary path to achievement.

Attitude Towards Measuring Academic Achievement

Further evidence to support the impact of climate on student achievement was provided by a study conducted by Smith, Hoy, and Sweetland (2001) that examined the relationship between student achievement and a school climate that has an emphasis on academics. The conceptual framework established by the effective schools' research, specifically the characteristics in effective schools that facilitate student achievement, informed the work. Ninety-seven schools participated in the Ohio study. The study used a climate survey, looking at the organizational indexes of the schools. The survey focused on institutional vulnerability, collegial leadership, professional educator behavior, and achievement press. Smith, Hoy, and Sweetland (2001) found a collective measure of school climate and academic emphasis influenced student achievement across the schools. Academic emphasis refers to serious and orderly climate in which educators believe students could achieve, students' work to succeed, and they were respected for their effort.

The Smith, Hoy, and Sweetland (2001) samples came from diverse areas of the state. There were two issues with the sample: one was the sample being limited geographically to the Midwest, and, two, participants were not randomly chosen. This survey was used to provide a measure of the school climate, yet failed to explain the elements of the climate.

An educational climate that sets high expectations and supports the individual efforts of educators and students to meet the expectations was indicative of an environment conducive to learning for all (DuFour & Eaker, 1998). In these environments educators employ instructional strategies, which meet students at their point of need and presented students the opportunity to relearn concepts that may have eluded them. The climate of a school was a key impact on the organizational behavior within the school and the administrator could have a considerable

influence on the development of the climate in the school (Carter, 2000; Cawlti & Protheroe, 2001; Deal & Peterson, 1990; DuFour 2000).

In addition, there was evidence to show that one-to-one technology was able to increase academic achievement in math. Carr (2012) conducted a study to see if using one-to-one technology increased fifth grade student mathematic achievement in two rural Virginia elementary schools. For one academic quarter students in the experimental one-to-one technology group during one or more mathematic activity during a daily math lesson. The students in the control group did not use one-to-one technology during a daily math lesson. Carr found that students in the control group showed a significant increase of 6.67% while the experimental group posted a 6.74% increase from pretest to posttest scores. Thus, it appears that the use of one-to-one technology provided a 0.07% higher growth of mathematic achievement.

Furthermore, studies showed the impact that educators had on student achievement. One such study was conducted by Sanders and Horn (1994), and reviewed by Marzano (2003) which revealed a 39 percentage-point difference in student achievement between student with "most effective" and "least effective" teachers. In classrooms lead by educators characterized as "most effective," students posted achievement gains of 53 percentage points over the course of one academic year, whereas in classrooms led by "least effective" educators' student achievement gains averaged 14 percentage points (Marzano, 2003). Was it possible that these educators that were termed "least effective" were less motivated because of the stress of reaching the goals? Determining the students' attitude towards education enabled educators to consider and evaluate their districts' education program and its appropriate structure.

Intermediate Classroom Technology

The traditional classroom has changed due to the integration of new technology devices such as the Apple iPad and other mobile devices. Although technology has been integrated into the classroom for many years in multiple forms (filmstrips, audiotapes, videotapes, overhead projectors, calculators, and computers) (Hubbard, 2009), the newest technology devices, often referred to as "mobile technology," continue to be combined with students in today's classrooms and change the way students learn and instructed. Mobile devices were becoming more prevalent in education because of their versatilities (Johnson, Adams, & Haywood, 2011). With these devices being integrated into today's classroom in large numbers, the modernized classrooms were labeled as "digital classrooms" (Puerling, 2012; Smaldino, Lowther, & Russell, 2012).

Some educators and school districts continue to be cautious about the use of these devices because they were unaware of how to properly utilize the one-to-one technology as learning tools. Puerling (2012) showed evidence by quoting a colleague, Chip Donohue, Ph. D., director of distance learning at the Erickson Institute and senior fellow at the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College. Donahue (as cited in Puerling, 2012) stated:

> That's our challenge in the digital age: turning these tools into…instruments that support young children, parents, families, and educators. I don't think we need an app for that. We just need to start playing with the tools and figure out how best to use them, and to think about how our smartphones and tablet computers were already fabulous instruments. (p. 5)

Donahue's quote indicated that educators could learn and understand how to use educational technology effectively in the classroom in order to meet the needs of the diverse learning styles of today's students. However, due to the recent development of these devices, there was a limited amount of research on the topic of how educators could incorporate the educational technology into their classrooms.

Some school districts, and even some entire states, have pursued a completely different approach to transforming learning: one-to-one wireless laptop initiatives. Mobile learning technologies coupled with ubiquitous computer use, according to Shih and Mills (2007), were the next steps in the emerging evolution of technology mediated teaching and learning because these innovations would, "connect people in information-driven societies effectively and offer the opportunity for a spontaneous, personal, informal, and situated learning situation" (p. 2). However, the authors presaged these innovations could create a challenging need for strategies, applications, and resources in order to support the concept of "anywhere-anytime" connections in both formal and informal learning situations" (p. 2). Innovative technologies were promised to be the best way to deliver high quality instruction to a student directly to the one-to-one device whether that was in school or the home.

The emphasis was to place one wireless laptop into every student and educator's hands. By doing so, districts were hoping to eliminate the frustration and competition for computer lab or technology stations time. In a ubiquitous computer environment, technology was available to every student all the time. Rapid change and advances in technology capabilities and access guaranteed that the concept of technology integration continues to evolve. While tablets and other digital technology become less expensive, more user-friendly, smaller, faster, more powerful and more abundant, the perceived purpose of technology in education has changed, and

so have the perceptions of what educators could be learning, doing, and teaching with technology (Bebell, Russell, & O'Dwyer, 2004; Mandinach, Honey, & Culp, 2005).

School leaders believed that a technology-infused one-to-one classroom enhanced student learning even though previous efforts to use technology to transform education showed little fulfillment of this promise (Chai & Chin-Chung, Lim, Tondeur, & Zhao, 2013). Why was this? Fullan (2005) argued that to change a system, the context within the system must be changed. Certainly, the introduction of one-to-one technology changed the context of a traditional classroom. With one-to-one iPad and/or laptop connected to the Internet and in the hands of every student and educator, the classroom dynamics changed. Access to information and each other was now open to all. Bi-directional communication changed to multi-directional. The fundamental control of learning was no longer solely in the hands of the educator, but on the fingertips of every student within the classroom.

Schlechty (2002) argued that enhanced student learning was a direct result of enhanced student engagement in their learning. Thus, if a one-to-one technology educational environment enhanced student engagement and increased or improved daily interactions between student and educator, this technology could be capable of improving student learning (2002).

Using Technology to Motivate Intermediate Students

Research on technology's impact on learning showed mixed results. During the early years of one-to-one technology implementation there was inadequate evidence to support the belief that technology was transformational in nature. Historically, individuals both inside and outside of education had placed high hopes on technological innovations to reform education. Throughout different times in our history, the radio, motion pictures, and even the computer itself were proclaimed as instruments of change for education. In each case, there was ample

evidence to suggest that the technology failed to make major impacts on daily instruction, or individual student learning (Cuban, 2001; Oppenheimer, 2003).

Another researcher, Cohen (2011), conducted a study on student and parent perceptions of the iPad. The results showed that the iPad could be a successful tool in the classroom because students were more motivated to use these devices. The researcher conducted the study to assess children's perspectives of the iPad as well as the applications that were housed on the device. In this qualitative study, Cohen found that the students were more motivated to use the device due to the touch screen capabilities and the accessibility of the application. Yet, the study noted that the device does not guarantee engagement and learning. Cohen recommended that future studies examine how educators could optimally utilize touch screen technology and apps.

Follow-up studies that were conducted on the use of the iPad have focused on intermediate and higher education. These researchers found the iPad to be a beneficial tool for learning and teaching (Hinrich, 2012; Melhuish & Falloon, 2010). However, Heinrich (2012) pointed out that, "a device is only as useful as the tool or apps that it uses" (p. 9). There were a handful of studies on the use of apps in the elementary classroom.

What was it about the one-to-one laptop initiative that modern educational leaders believed were different? There were some early studies that indicated student motivation, attendance, and test scores increased in school districts with one-to-one programs (Belanger, 2002; Coffey, 2004; Jeroski, 2003; Silvernail & Lane, 2004; Vandergugten, 2004; Zardoy & Fico, 2002). There was ancillary evidence to suggest that discipline problems decrease (Mitchell Institute, 2004; Public Policy Institute of New York State, Inc., 2003). Some one-to-one districts indicate students were better organized, especially special education and at-risk students (Harris & Smith, 2004; Public Policy Institute of New York State, Inc., 2003). There were few research

studies that indicated students within wireless one-to-one environments create more developed projects which exhibit higher order thinking skills (Johnson, 2003; Rockman, 2000; Waskowitz, 2001). Even though research was limited, the promise of transformation of learning was raised once again. The literature supported the use of one-to-one technology as a tool to improve instruction and reach the needs of the digital students (Couse & Chen, 2010; Grant & Mims, 2010; Hansen & Borthwick, 2012; Swan, Hooft; Labbo & Reinking, 2003; Kratcoski, & Unger, 2005). However, there was a lack of research that examined how educators were implementing one-to-one technology to enhance instruction.

McCrea (2010) examined a one-to-one laptop initiative in Grand Prairie, Texas, and found a growth in student motivation and engagement through the use of one-to-one technology. Students using one-to-one laptops were enthusiastic about learning and tended to pay attention for longer periods of time than did students without laptops (McCrea, 2010). In addition, students used one-to-one laptops to confront challenging content and pursue more difficult tasks (McCrea, 2010). McCrea found that the learning environment was more efficient and enriched because students had access to their own devices and did not have to share a classroom computer with other students. In addition, the one-to-one laptops allowed students of all ability levels to work effectively and get the additional support they needed (McCrea, 2010).

Educators were able to engage students in their classrooms actively, encourage group participation, provided frequent interaction and feedback, and make real-world connections through the use of technology in an effort to influence how students learn (Roschelle, 2001). In addition to using technology to influence how students learn, educators also used technology to influence what students learned. By utilizing the capacity of technology for simulation and interactivity, students were able to achieve command of sophisticated concepts. Educators used

technology applications utilizing visualization, modeling, and simulations as tools in many content areas. According to Roschelle, efforts to maximize the effectiveness of technology as a learning enhancement tool could be selective in technology incorporation as a means to improve education, and policy makers could continue to study the progress and results of technology integration overtime.

Several scholars suggested that the use of the flipped classroom (FC) model helped to motivate students within the classroom. "The objective in this model is to provide online access to learning contents and materials and to help students' in-depth and active learning in the classroom" (Yilmaz, 2017, p. 251). The FC model differs from the traditional face-to-face style intermediate lesson. Instead of students sitting and listening to a lesson, the students were charged with watching an instructional video, produced by the educator, outside of the classroom. Educators possess the choice to incorporate video clips, photographs, and images to help students understand the lesson. Educators could add on work problems for students to complete either during or after completing the video (Alvarez, 2012).

Research demonstrated that one of the motivational factors that made the FC model of instruction was the e-learning readiness of the students. E-learning readiness was thought to be the ability of individuals to utilize e-learning resources and multimedia technologies to improve the quality of learning (Kaur & Abas, 2004). Another motivational factor could be the self-directed learning portion. The self-directed portion of the FC model allowed individuals to take the initiative of being responsible for their own learning experience. "The flipped classroom is not about finding the panacea for educational success, but rather it offers a way to engage students" (Flansburg, 2016, p. 43). In other words, when the FC model was implemented

correctly with technology, Flansburg found that there was a relationship between motivation and a willingness to achieve higher academic success.

Intermediate students were surrounded by visual and video images daily. With this premise in mind, educators could continue to motivate and engage students by producing projects that incorporate the use of video production. Video projects became an addition to instructional strategies to motivate students to learn a concept more clearly. "The technology boom over the past 20 years has led to a new demand for educators to teach students in a manner allowing them to function well with multimodal media" (Morgan, 2013, p. 51). Creating a video project versus a written assignment encouraged students to communicate their emotions and thoughts that otherwise might not be to be recognized on paper (Siegle, 2009).

In a follow-up study, Marich (2016) found educators using Twitter to engage and motivate students in literacy and digital citizenship. The study was completed over an eight-week period. For two weeks students participated in activities regarding cyber-safety, online relationships, online symbols, and communicating thoughts with 140-character limit. Marich reported that during the third week students were displaying an increased development of detail and sophistication. As time went on, students continued to illustrate clear messages about the "what" and "why" of their learning. By the seventh week Marich found students constantly being able to tweet concise and complete stories about various classroom projects.

Marich's (2016) study also found that using Twitter, educators discovered other technology resources available to use. An example would be the use of Skype Classroom. The use of Skype Classroom allowed educators to bring students on virtual field trips, engage in conversations with TED (Technology, Entertainment, Design) speakers, and connect with other classrooms around the globe. Educators could also schedule author visits using Skype

Classroom. Prior to the authors visit, students would tweet the author questions regarding the books they had read.

Further research continues to be a necessity regarding one-to-one technology to confirm potential benefits to teaching and learning. If, as the limited research suggested, students within a one-to-one classroom environment were more engaged, have more interactions between themselves/peers, and improved communication with their educators, then research from authors like Schlechty (2002) and Fullan (2005) indicated that this technological tool could ultimately provide a positive impact on student learning.

Measuring Specific Motivational Factors

Student motivation was a concern of many educators (Deci & Ryan, 2009). When students lack achievement motivation, they do not put forth their greatest efforts in the classroom. With a plethora of research on motivation and the related practices to increase student motivation available, why aren't all educators incorporating these practices into their classrooms on a daily basis (Jesus & Lens, 2005)? Convincing and reassuring educators to integrate research-based strategies and techniques into their classrooms could increase student learning (Skinner & Belmont, 1993). Also, motivating students could assuredly impact test scores and allow students to reach their fullest potential (Wentzel, 1997).

Much research was focused on how to motivate students in the classroom; however, little was known about educators' motivation to implement best practices into their classroom or how building leadership and support influences this implementation (Davis & Wilson, 2000). On a daily basis, educators glancing through classroom windows as through the hallways of schools could observe students in other educators' classrooms who do not always display indicators of good motivational achievement, which include good attendance, punctuality, homework

completion, class participation, higher order thinking, and maximum effort. These were steps educators could take to help influence and boost the levels of student motivation in their classroom. With an abundance of information and knowledge available on how to effectively increase student motivation and engagement in the classroom, why would educators withhold the implantation of technology that could help implementing such strategies within their lesson on a regular basis? Some suggested the inequality was due to lack of teacher motivation (Jesus & Lens, 2005).

For children to benefit from their education, they had to do more than simply attend and sit in the classroom. Instead students also had to connect with the classroom environment in ways that motivate and engage, while also supporting their learning styles. Ladd and Dinella (2009) identified three forms of engagement: behavioral, emotional, and cognitive. Behavioral engagement was participation in or resistance to, the learning environment; emotional engagement related to a student's attitude, or receptiveness toward education; and cognitive engagement refered to the intellectual effort the students put forth accomplishing educational tasks. Schlechty (2000) characterized five levels of engagement, or types of responses students might make when engaging in school tasks.

- Authentic engagement was the highest level of engagement. The task was associated with a result that had clear meaning and relatively immediate value to the student.
- Ritual engagement occurred when the assigned work had little or no direct value to the student, but the student associated it with extrinsic outcomes and results that were of value.

- Passive compliance was common when the student was willing to expend whatever effort was needed to avoid negative consequences, although he or she saw little meaning in the tasks assigned or the consequences of doing those tasks.
- Retreatism could take place when the student was disengaged from the tasks, expends no energy in attempting to comply with the demands of the tasks, but did not act in ways that disrupted others and does not try to substitute other activities for the assigned task.
- Rebellion was sometimes witnessed when a student refused to do the task assigned, acts in ways that disrupted other, or attempted to substitute tasks and activities to which he or she was committed in lieu of those assigned.

With ever-growing external variables affecting student achievement, educators focused on those variables within the realm of education that could be controlled. The quality of the instruction, technology implementation, and relationships between students and educators were three such variables. Goddard, Tschannen-Moran, and Hoy, 2001; Smith-McIlwain, 2005; and Strahan and Layell, 2006 indicated the significance of building positive relationships between students and educators in order to maximize student achievement and engagement. In the 60's, the well-known Rosenthal experiment recognized the Pygmalion effect, the observation that educators' expectations of students affect students' learning (Goodwin, 2008). The study demonstrated how, when an educator over time expressed confidence in the student's ability to succeed, that student responded with greater effort and achievement (Lumpki, 2007). When educators care enough to build positive relationships with their students, these same educators use multiple instructional strategies, proven classroom practices, and were actively learning to best support the varied needs of the learners in their class, leading to increased motivation and engagement (DeCastro-Ambrosetti & Cho, 2005).

Yazzie-Mintz (2007) defined student engagement as "the student's relationship with the school community: the people, the structures, the curriculum and content, the pedagogy, and the opportunities (curricular, co-curricular, and extracurricular)" (p. 18). The degree to which a student was engaged dependent on the quality, depth, and breadth of the student's relationship with those aspects of the school. Motivation could be seen as the student's effort towards a particular task. Motivation could be affected by a number of factors and had an impact on engagement (Albrecht, Happanen, Hall, & Mantonya, 2009).

Juvonen (2007) conducted a similar study of educator support and engagement and found that students who felt supported and respected by educators were more likely to engage in appropriate behaviors and expectations than those who felt a disconnect from the educators. Students who did not sense their educators cared for and respected them disengaged from school activities as well as from school itself. Educators' perceptions of student motivation and of their students' characteristics influenced the strategies they used in the classroom (Yazzie-Mintz, 2009), and what educators do could influence students' motivation and learning (Greene, Miller, Crowson, Duke, & Akey, 2005).

Research suggested that student learning was positively affected by instructional methods that involved more hands-on active student engagement before, during, and after class (Cruce, Flowers, Gonyea, 2008; Kinzie, Kuh, Pascarella, & Pierson, 2000, & Shoup). Students that were more likely to invest in specific behaviors, such as interacting with peers and faculty, also were more likely to be engaged and continued in their educational endeavors (Astin, 1999; Berknr & Cataldi, 2002).

The background of the student was another important consideration. Even if the results of a study were to show little educational effect, a thoughtful division of a study population

could show surprising trends (Winn, Stahr, Sarason, Fruland, Oppenheimer, & Lee, 2005). One result showed that in general the more experience a student had in a subject, the less useful simulation was in their learning cycle. As students' mastery increased, so did the value of real-world activities just as the need for stimulation decreased. Two students experiencing the same series of units with varying use of virtual and hands-on learning could experience different learning outcomes simply because of their distinct levels of proficiency and familiarity with the simulation tools.

When implementing any new tool, and especially iPads, it was critical to note the wide variety of background experiences students possessed. Just as exposure to computers in the home could vary from student to student, there was a wide array of experience with hand-held technologies in the form of laptops and iPads. Project Tomorrow, a national nonprofit organization, summarized national data on technology use in education collected from 185,000 student surveys and 15,000 educators surveyed in its report titled *Our Voices, Our Future: Student and Teacher Views on Science, Technology, and Education* (Speak Up, 2006). The survey focused on the use of technology and Internet tools in both the classroom and home by educators and students. This survey gave evidence that more students at younger ages were using technology and the Internet at home with 30% of K-3 students reported having their own email account (Speak Up, 2006). Students interviewed in Grades 3-6 reported that they used the Internet most commonly for on-line games. The survey also indicated that young students were using search engines and visiting websites. The results from the survey revealed that one-fourth of the students used a search engine in the past week of the report and 40% visited a favorite website. This study was completed in 2006, and six years later, even more students were accessing the Internet for online learning.

Students now use social media networks like Twitter and Facebook, along with multiple other social media apps to communicate. They were also using blogs and Wikis to discuss their learning. They were even taking on-line courses and many were included in distance learning opportunities (Puerling, 2012; Roblyer & Doering, 2013; Smaldino, Lowther, & Russell, 2012). Technology changes at a very rapid pace and students were moving at the very same fast pace.

Educational Technologies

The literature supported the use of technology as a tool to improve instruction and reach the needs of the digital student (Course & Chen, 2010; Grant & Mims, 2010; Hansen & Borthwick, 2012; Labbo & Reinking, 2003; Swan, Hooft, Kratcoski, & Unger, 2005). However, there was a lack of research that examined how educators of elementary students were using the iPad and its apps to enhance instruction.

There were few studies conducted that produced evidence the Apple iPad could increase students' achievement at the elementary level. One school district in Auburn, Maine was the first district to investigate the effects of one-to-one iPad programs. The study was conducted over a nine-week randomized control trial and found that the students who used the iPad had gains in scores that were consistently greater when compared to the Rigby Benchmark Assessment and the CPAA (Children's Progress Academic Assessment) gains. Still, the differences in gains across the two groups were not large enough to be considered statistically significant (Bebell, Dorris, & Muir, 2012).

Conversely, when looking at the data from the *Observation Survey of Early Literacy Achievement* (OSELA) assessment, the students who used the iPad made gains that were statistically significant when the study groups were compared. Students who used the iPad scored higher in the Hearing and Recording Sounds in Words (HRISW) subtest, a test that

measured the students' abilities to represent sounds with letter and phonemic awareness (Bebell et al., 2012). The superintendent of Auburn School District, Katy Gordin, stated, "The results from this study reinforce our belief that the iPad is a wonderful and effective addition to the collection of educational resources we're providing our teachers" (Bebell, Dorris, & Muir, 2012). This was one study out of a small collection that gave evidence that if used correctly, the iPad could be an effective tool for increasing student achievement.

Literacy has moved beyond paper and pencil technologies to include other forms of literacy such as visual, informational, and media literacies. Literacies have become multiple in nature and were continually emerging.

> While it is clear that many new literacies are emerging rapidly, we believe the most essential ones for schools to consider cluster around the Internet and allow students to exploit the extensive ICTs (information and communication technologies) that become available in an online, networked environment. In an information, age, we believe it becomes essential to prepare students for these new literacies because they are central to the use of information and the acquisition of knowledge. Traditional definitions of literacy and literacy instruction will be insufficient if we seek to provide students with the futures they deserve. (Leu, Kinzer, Coiro, Cammack, 2000, p. 109)

Literacy today required more than decoding text and basic linear comprehension. It required a critical approach to literacy and reading comprehension (Street, 2003), comprehension that was socially constructed and situated within context (Gee, 2003; New London Group, 1996), and comprehension based on intertexuality (Bakhitn, 1981; Bazerman, 2004; Smolin & Lawless, 2003).

As technologies were being used to foster literacy, new literacies were being created, and as literacies were evolving their forms and functions, they were also transforming the use of how technologies were used in the more modernized classroom and throughout education. The new literacies were thus multimodal with popular culture often impacting literature behaviors at home and schools (Dyson, 1999). Literacy became multidimensional and interactive while taking on multiple forms and functions. Being able to express knowledge in a multimodal way in which there was a transaction between the technology and the literacy allowed individuals to articulate themselves in a much richer and complex way than through just standing written reports (Kist, 2005).

Henry (2006) researched critical literacy's role within a new literacy classroom. Effectively reading and comprehending information on the Internet takes additional skills and strategies beyond those required for success with the foundational literacies (Coiro, 2003; Coiro & Dobler, 2007). Henry (2006) suggested that educators use the acronym SEARCH to assist students in critically reading the Internet. SEARCH represented six stages: (a) set a purpose for reading, (b) employ effective search strategies, (c) analyze search-engine results, (d) read critically and synthesize information, (e) cite sources, and (f) how successful was the search. The fourth stage, reading critically and synthesizing information, was vital within a new literacy, online environment. Through practice evaluating websites, students began to recognize what to attend in order to verify the legitimacy of a website or source; for example, noticing the author and institution the author was associated with, the purpose of the website, the intended audience, and the copyright information. Henry (2006) stated that students must be supported when developing these critical literacy skills, "especially when reading on the Internet is extracted not only from multiple sources but from multiple contexts" (p. 621). Technology alone did not

revolutionize curriculum and instruction, but was evolutionary, and it was changing how educators teach and students learn. "They [computers] are only as effective as the teacher who implements them," (Grenawalt, 2004, p. 14).

Real-world experiences within the educational environment to promote the development of problem-solving strategies could be encouraged (Dewey, 2011). The use of one-to-one technology allowed students the opportunity to become proficient with curriculum while taking responsibility for their own assignments (Ray, 2005). While the use of one-to-one technology could improve how students learn, it also supported what they learn by providing exposure to experiences and ideas that would otherwise be unavailable (Roschelle et al., 2001). The use of one-to-one technology in classrooms allowed students opportunities to experience incidental learning as they develop technology skills when completing assignments in core subjects (Brown & Duguid, 2009). An example would be students using keyboarding skills when they use a word processor to do a writing assignment. The use of handheld devices as not only one-to-one technological tools, but also holistically integrated cognitive tools in the classroom that allowed educators to teach, learn, create, communicate, and deliver feedback to students effectively (Weston & Bain, 2010).

Retention of mathematics skills had long been a concern of educators. Not only do educators have to deal with students "losing" some knowledge over the summer, educators had to deal with students' lack of retention of procedures taught during the traditional school year. Rohrer and Taylor (2006) found that long-term retention was increased by distributed practice. In 1995, Wineland and Stephens concluded that spiral testing with continuous review did aid in the retention of mathematical concepts for below-average mathematics students. Research showed that constant and cumulative review was best for students to retain the knowledge

(Burns, 2005; Hazlett, 2001). Ideally, the review could be daily. This study looked at whether or not using technology in the classroom improved students' retention of mathematical skills.

Educators were always looking for different ways to incorporate technology with multiple curricula. One way that could be done was through computer games. Holmes (2005) commented, "basic skills such as reading, spelling, and arithmetic are ideally suited to being imparted by drill and practice using simple video games techniques" (p. 107). Originally, computers were used frequently for drill and practice games. Wenlinsky (1998) looked at 6,227 fourth-graders and 7,146 eighth graders' mathematics achievement on the National Assessment of Educational Progress. He found eighth-graders gained more in math scores when using simulation and higher order thinking software than fourth-graders using similar technology. However, both fourth-grade and eighth-grade students who used drill and practice software received lower math scores than students who did not use drill and practice games. Ke (2008) also found no significant effect on students' cognitive test performance when studying 15 fourth-grade and fifth-graders who used drill and practice computer games in a summer school mathematics class. She found that students did develop more positive attitudes towards mathematics. Now role-playing games were opening up virtual worlds to students to help them learn and solve problems (Barab, Gresalfi, & Arici, 2009).

Today's students were very comfortable using technology. Many of them play video or computer games daily. Students communicate with computers and cell phones. Teachers need to find a way to harness the motivational tool of computer gaming without harming learning. Even with different results, most researchers commented on educators needing to find the best way to use computers to supplement instruction for further comprehension in reading and math.

Motivational Differences using Different Technologies

Technology continues to rapidly develop and constantly be a changing tool in the world of education; it was more accessible for some than it was in the past. District leaders were starting to realize the necessity of one-to-one technology and the importance of increasing student learning. "For the last decade technology policies emphasized teacher technology preparation as the single most important step toward technology integration in classrooms" (Lei, 2009, p. 87). Although technology was alleged to be more accessible, researchers found that instructional practices of teachers and student learning had changed minimally (Walling, 2012). With school districts feeling the pinch on the amount of accessible currency, educational technology had experienced the negative effects and had to answer the tough question of how to pay for and/or how to continue to invest in the continued up-keep that today's technology requires. Therefore, just having access to technology many not be enough to have an impact on student learning. Van Dijk and Van Dick (2009) added that mere access to technology was not propitious if students were not benefiting academically and educators' instructional practices were not improved.

The problem with the incorporation of technology was the rapid pace of change where the best tools could change radically in a relatively short time and educators were expected to make the necessary adjustments at the same time (Lancaster & Topper, 2013). It no longer takes years or months for new ideas to evolve. For example, the apps that both students and educators accessed for information were frequently updated, refreshed, and improved to provide a variety of resources for educators and administrators to integrate into classroom environments. Educators could use mobile devices to search the Internet for a resource to use in class, such as videos on YouTube, Apple Music for music, or download a portable document formats (PDF) on

the latest version of Adobe for student access on iTunes via their iPads (Schachter, 2009). This process alone had been known to overwhelm the best of educators when a full classroom of students competing for their attention surrounded them. Therefore, administrators who understand the high desire of educators to produce high quality results could take the lead in assisting them instructionally, producing benefits for all concerned (Boschee, Jensen, & Whitehead, 2013).

Plair (2008) found that teachers and administrators must make a concerted effort to make training resources available to not only veteran teachers lagging behind, but also to new "freshman" educators who already have enough on the plate to juggle to help close the widening gap between themselves and their increasingly tech-savvy students. Educators feeling intimidated by unfamiliar devices brought into the classroom by their students may choose to eliminate technology from their instructional plans until their comfort and confidence with the one-to-one technology increases. At the same time, students could be exhibiting considerable knowledge and understanding of technology in their social lives, music listening, video gaming, interacting on social networks, and searching the Internet.

Many educators see themselves as the conductor of the classroom; they often overlook accepting the role of student to learn new techniques and increase their confidence in different technological aspects (Jochems, Rohaan, & Taconis, 2013). Educators who perceive their limited knowledge as a negative statement on their abilities usually exhibit low self-efficacy. The negative self- images held by these educators must be understood and addressed in order to increase their assurance. Educators with high assurance in technology usually achieve positive and effective results when using technology to meet pedagogical practices versus educators that

carry low self-esteem (Swackhamer, Koelllner Basile, & Kimbrough, 2009). The more collaboratively the educator structured the classroom the more interactive the class becomes.

Chapter III: Methodology

Philosophy and Justification

With the evolution of education continuously refreshing and upgrading itself, educators were put in between a desktop (rock) and an iPad (hard place). "Technology" has become a "buzz word" in education. Despite contradictory data indicating both that technology enhanced instruction and that technology had no negative effects on learning; schools were still pushing teachers to use computers in their lesson plans (Pflaum, 2004).

Technology implementation or integration could begin with student achievement in mind. Collaboration and creativity were just a few advantages the iPad was being used for within mobile learning in education. Prensky (2010) believed, "The iPad combines all of the great features of the iPhone and iPod Touch in a size which is likely to be much more appealing to K-12 teachers – and possibly to students as well" (para. 2). With significant and rapid technology developments occurring in short periods of time, mobile devices were some of the learning tools found in the modernized classroom (Sevens, 2011). This required a new set of skills for both student and educator. Quinn's (1983) words from over thirty years ago were still true today, "The students of tomorrow should be expected to understand each of the technologies conceptually, appreciate their interrelations, know their applications, and, eventually, be able to use each effectively" (p. 38). iPads were relatively new tool being used in the classroom. iPads were emerging as a strategy to support students in the classroom. McClanahan (2012) documented the use of an iPad to facilitate reading improvement with a fifth-grade student who struggled with ADHD. The use of the iPad in a learning environment allowed the educator to modify the content and strategies for this student as needed or requested.

The phenomenon of the integration of one-to-one technology devices like Apple's iPad into the elementary classroom has been happening for years; however, there was limited research on how the technology was successfully helping educators reach the new generation of learners. This study attempted to assist filling in the gap by utilizing a quantitative research design in order to describe this phenomenon.

Research Questions

Guiding the research and data collection of this study were the following questions:

1. What are the reported impacts of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?
2. Which technology apps provided the greatest motivation in the intermediate elementary classroom?

Theoretical Framework

The objectives and theoretical framework of this study represented a quantitative study approach to determine whether or not the addition of one-to-one iPad technology in a fourth-grade and fifth-grade intermediate elementary classroom motivated students towards academic achievement in math and reading and if students were motivated by specific apps.

According to the authors of the book, *Educational Research*, within quantitative research, "The dominant methodology is to describe and explain features of this reality by collecting numerical data on observable behaviors of samples and by subjecting these data to statistical analysis" (Gall, Gall, & Borg, 2003, p. 634). Quantitative research tends to be impersonal, and the relationship between participants and researchers were somewhat separate. This research

study used the quantitative approach to determine the relationship between iPads and the effect on student motivation towards math and reading academic achievement.

The quantitative research method focused on collecting numerical data on observable behaviors. Data consisted of surveys or polls that allowed little interaction between the participants. According to Myers (1997):

> Quantitative research methods were originally developed in the natural sciences to study natural phenomena. Examples of quantitative methods now well accepted in the social sciences included survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modeling. (p. 2)

Quantitative variables were often measured on an interval, ordinal, or ratio scale.

Many students used technology to help increase their academic ability. They were the stakeholders in their own education. Technology integration into K-12 classrooms was essential to providing the education needed for the success of current-day students (Watson, 2007). Students in the intermediate elementary classroom provided both positive and negative feedback about their experiences with and impressions of technology. Did the use of one-to-one technology motivate or distract students from higher academic achievement in math and reading? What do they perceive as its benefits and drawbacks? Most importantly, did students believe one-to-one technology helped motivate them to grow and achieve higher academic ambitions?

Until now, little research was focused on elementary, specifically the intermediate grade level, students and their perceptions. Technology was a tool that needs to be used to educate learners and provide a vigorous learning atmosphere (Stansbury, 2007). Therefore, the theoretical framework of this study was to gain more knowledge from students' and educators'

about how one-to-one technology in the intermediate elementary classroom was used as a motivational factor towards achieving higher academic success.

Variables

There were multiple variables to take into account when preparing for this quantitative study. The researcher used multiple independent, dependent, and controlled variables throughout the course of this research study.

The first independent variable would be how the intermediate educators used the one-to-one iPad technology within their classroom. The fifth-grade educators had a year of experience with the one-to-one iPad technology and a plan for the academic year 2016-2017. The use of the one-to-one technology looked different compared to the fourth-grade educators who entered their first year of one-to-one iPad technology integration. An example of how the one-to-one iPad technology could be used differently would be the ability of fifth-grade students to use their iPads outside of school at an earlier date than the fourth-grade students. The date when fifth-grade students were able to bring their iPads outside of the school differed from educator to educator. Therefore, the first independent variable was the instructional use of the iPad.

A second independent variable would be the apps used on the iPads during the math and reading courses. Educators selected the apps that their students used on their iPads. Educators also used the apps in various ways. One example would be the Notability app. One educator could use this app for students to complete math classwork and homework, while another educator could have student's use the Google Docs app to complete the same classwork and homework.

The first dependent variable would be the fourth-grade and fifth-grade students' motivation. Each student could have differences in thought processes, perceptions, experiences, and levels of everyday cognitive thinking, family background, poverty, demographics, and a plethora of other experiences that would set them apart from one another while the instructor was teaching.

The second dependent variable was the students' MAP test scores in math.

The third dependent variable was the students' MAP test scores in reading.

A fourth dependent variable would be the fourth-grade and fifth-grade students' motivation levels towards higher achievement in math of the voluntarily participants in this quantitative study. The fourth-grade and fifth-grade students that entered the academic year 2016-2017 at different academic math and reading levels that could influence their feelings towards their math and reading courses.

A fifth dependent variable would be the fourth-grade and fifth-grade students' motivation levels towards higher achievement in reading of the voluntarily participants in this quantitative study. The fourth-grade and fifth-grade students entered the academic year 2016-2017 at different academic math and reading levels that could influence their feelings towards their math and reading courses.

Research Design Strategy

In the past few years, educational technology has changed and evolved into hand-held devices, also referred to as mobile technologies. The devices were histrionically changing the way that people exist in today's society. Devices such as, cell phones, notebook computers, and tablet computers, give instantaneous access to the Internet, email, and applications (Brooks-Young, 2010) and this technology "…supplies a learner with general electronic information and

educational content, and aids in acquisition of knowledge regardless of location and time" (Lai, Yang, Chen, Ho, & Chan, 2007, P. 341). It was presented in one study that students from ages 8-18 spend an average of six hours a day connected to a digital communication device (Sprenger, 2009). For this reason, schools could consider implementing these devices into the curriculum because mobile technology has shown to attract and engage the youngest and the oldest of students.

The utilization of mobile technology in a 21st century education delivered students a variety of new ways to enrich essential skills such as, "problem solving, critical thinking and communication skills. Technology helped students practice transferring those skills to a different context, reflect on their thinking and that of their peers, practice addressing their misunderstandings, and collaborate with peers" (Saavedra & Opfer, 2012, pp. 11-12). In discussions about technology and education, it was frequently referred to as an essential part (Hertz & Aungst, 2011). Information, media, and technology skills incorporated concepts the 21st century learner needed to evaluate, achieve, create, research, and communicate (Greenhill, 2010). Spires (2012) stated, "The addition of technology ubiquity within the classroom does not in and of itself add value. Value is added depending on the ways the technology ubiquity is applied in the overall design for learning" (p. 235).

The fourth-grade and fifth-grade students received their iPads on Friday, September 9, 2016. Educators started integrating the one-to-one iPad technology into their curricula starting on Monday, September 12, 2016. This gave the fourth-grade and fifth-grade educators nine months to integrate the one-to-one iPad technology prior to the online Qualtrics survey going live. The depth and speed of one-to-one technology integration into the curriculum varied from educator to educator.

The fifth-grade educators completed one year of integrating one-to-one technology into the various curricula. The fifth-graders were eligible to bring their one-to-one iPad technology outside of the school earlier than the fourth-grade students. The preliminary date for fifth-graders being able use the iPad outside of school was Monday, October 3, 2016. However, even with the date set, iPad use outside of school did fluctuate from educator to educator.

The fourth-grade educators started their first year of one-to-one technology integration. Fourth-grade educators did integrate Apple iPads into their math and reading curricula using seven iPads per classroom during the academic year 2015-2016. Due to two of the three fourth-grade educators beginning their first year at the urban/suburban K-5 elementary school during the academic year 2016-2017, one-to-one iPad technology integration was partially delayed due to the two new educators not being familiar with the online curricula. Fourth-grade students were eligible to bring their iPads outside of school starting on Monday, December 5, 2016. However, as with the fifth graders, even with the date set, iPad technology use outside of school did fluctuate from educator to educator.

The fourth-grade and fifth-grade educators utilized the Schoology website and application for students to access curriculum materials. "Schoology is a learning management system (LMS) like Blackboard or Moodle, but it has more features. It offered a way to manage lessons, engage students, share content, and connect with other educators" (Doe, 2012, p. 29). Schoology was the primary location for students to access online materials such as homework and resources. Schoology was also where students submit completed assignments to educators for grading. Students had online access to the Synergy website and application for access to their grades.

The researcher explored the study in the form of a quantitative study. The focus was on determining if the use of technology did, in fact, motivate students to high academic achievement within the math and reading curricula used in the fourth-grade and fifth-grade intermediate elementary classrooms. The one-to-one technology that educators, fourth, and fifth-grade students used was the Apple iPad Air 16GB. Students and staff also had access to Hewlett Packard PC laptop and desktop products.

There were 154 students that comprised the fourth-grade and fifth-grade intermediate classrooms. Only students who received parental/guardian permission were permitted to complete the survey. The online Qualtrics survey questions asked questions that were geared towards finding out student's technology experience prior to their participation in the one-to-one iPad technology program, if they believed the one-to-one iPad technology to be a motivational factor for them to complete higher level academic work in their math and reading courses, and to see if one-to-one iPad technology helped them achieve greater academic grades in their math and reading courses. To connect the students' answers to academic growth using the iPad, the researcher had the students input their May 2016 and May 2017 MAP reading and math scores. At the completion of the survey, the researcher used statistical measures to explore the impact of technology on motivation and academic achievement.

Different apps provided educators the ability to improve productivity, creativity, and communication. The use of multiple apps with one-to-one technology pushed educators to rethink how instructional pedagogy was delivered, and how homework could be completed. The survey included questions to help the researcher understand which iPad apps were the best choice of one-to-one technology to motivate students to achieve higher academic success in math and reading.

Students who participated in the fourth-grade and fifth-grade one-to-one iPad technology program at the urban/suburban elementary PreK-5 school were asked to complete a 27-question survey towards the completion of the third trimester. The survey was live for approximately two weeks commencing during two weeks in mid-May 2017.

Intermediate educators from the urban/suburban elementary PreK-5 school were asked to complete an online survey during the academic year 2016-2017. The educators' survey was an 18-question survey. The 14 educators' technology experience and years of teaching varied. The survey asked how the educators perceived technology being used in their classrooms, if they believed the one-to-one technology had a motivational effect on student achievement, if they supported the district in the continued use of the Apple iPad, what type of technology they would like to see in the hands of their students, and what type of technology they believed best motivates students to achieve higher academic grades.

Measures

The researcher prepared the survey questions with the research questions in mind. Integrating demographics, previous technology experience, use of technology as an academic tool, academic motivation, and survey feedback into each question would have been unnecessary and ineffective, so the survey was designed by organizing the areas individually. The number of field test questions were modified due to the survey being rolled out during the summer months of 2015 when the fifth-grade students did not have access to their one-to-one iPads.

Fourth-grade and fifth-grade students received their one-to-one iPads on Friday, September 9, 2016 and returned the iPad on Wednesday, June 7, 2017. During the nine and a half months of the academic year 2016-2017 of students having iPads integrated into the various curricula, the intermediate educators observed three different characteristics prior to completion

of the survey. The three categories were student engagement levels, preferred apps, and academic achievement within math and reading courses.

The surveys were scheduled to go live towards the end of the third trimester. Only students who obtained parental/guardian permission were invited to complete the survey.

All voluntary intermediate fourth-grade and fifth-grade participants who received parental/guardian permission, were asked to complete the survey using their iPad during school hours. The researcher worked with the intermediate educators to schedule an appropriate time for the fourth-grade and fifth-grade students to complete the survey. The intermediate educators had the choice of completing the voluntary survey either using their iPad, desktop computer, or personal computer.

The online 27-question survey was created with five different categories: demographics, previous technology experience, using technology as an academic tool, academic motivation, and MAP scores. The researcher did adjust the survey questions from the modified Google Forms survey given out during the summer of 2015. The researcher believed that the adjustments helped to create a more accurate picture of the one-to-one iPad impact in the intermediate classrooms. The answer selections were modified for the Qualtrics survey for improved clarity.

The survey used checkbox/multiple choice style of questions that were geared towards revealing how fourth-grade and fifth-grade students viewed the one-to-one iPad in math and reading and what apps provided additional motivation in the intermediate classrooms.

The first section of the student survey focused on demographics. Students selected their gender and the grade they were in during the academic year 2016-2017. The second section centered on the intermediate students' previous technology experience prior to entering the one-to-one iPad program.

The third section of the survey questions measured the use of the iPad as an academic tool in math and reading. Students were asked whether or not they believed their learning improved while using the iPad and if having the iPad increased their motivation to complete their math and reading assignments. The third section asked students to identify the different apps that were used throughout the math and reading curriculums.

The fourth section of the student survey related to academic motivation. Students were asked to identify if the use of the iPad did in fact create greater motivation to achieve higher academic success in math and reading.

The fifth and final section of the online survey asked students to enter their academic year 2016-2017 MAP math and reading RIT scores. The researcher also asked the students to identify if they were on free or reduced lunch. The researcher used the students MAP RIT scores and the free or reduced lunch to correlate the data provided by the survey.

The school district used for this study used the Northwest Evaluation Association (NWEA) standardized assessment. The NWEA Map assessment allowed all stakeholders to see student growth from spring to spring starting in second grade. Students were given as much time as they need to complete the assessment. Students who had an IEP or a 504 did receive additional test accommodations. School districts used for this study had students complete the assessment using a computer that was hardwired to the Internet. Although some school districts did allow students to complete the assessment using iPads, the school district used for this study only allowed students in grades six and above to complete the assessment using iPads. By doing so, a greater number of students were able to complete the assessment at the scheduled time which also freed up computer labs. For students who had previously completed the assessment, the district used the students previous score to generate a target goal for each student to strive for

each year. The assessment gave students an individualized RIT score once all 52 questions were answered.

Educators who work with intermediate students were asked to complete an 18-question survey. The educator's survey used a checkbox/multiple choice style of questions and consisted of three sections; demographics, use of one-to-one technology in the classroom, and academic motivation.

The first section of the educators' survey focused on demographics. Educators selected which intermediate grade they taught during the academic year 2016-2017. The second section focused on the use of one-to-one technology within their classrooms. The third section asked educators to answer questions related to the use of digital technology to motivate their students to achieve higher academic success within math and reading.

Sampling Design

Because of the role of the researcher, the following steps were used to delimit the study. First, the researcher had an educator outside of the elementary PreK-5 school preview the survey prior to the intermediate educators and students completing the survey. Second, the researcher attempted to eliminate all personal bias towards the two research questions by having experts review and critique the survey items and questions.

This quantitative research study used convenience sampling and concentrated on the intermediate grade levels, fourth-grade and fifth-grade. Class sizes in the urban/suburban elementary PreK-5 elementary school ranged from the mid-twenties to the low thirties, depending on enrolment and grade level. The participants involved in this survey were included on a voluntary basis, and were identified by grade and gender. Educators were identified by grade level position and gender. Fourteen intermediate level educators were willing to

participate in the survey as a component of the one-to-one iPad program during the third trimester of the academic year 2016-2017.

The researcher focused on the subjects of math and reading due to multiple reasons. The first reason was that both the math and reading curricula were being presented online using Schoology. Schoology was a web and application based learning management system (LMS) that provides features to support online learning, communication, and collaboration among educators, students, and families. Within Schoology, students had the ability to access course materials and resources.

The second reason the researcher focused on the subjects of math and reading was that these two courses were part of mandated state and district testing at the end of the academic school year. Both the state and district set high expectations for students on the math and reading tests. All testing was completed using 21st century technology. The use of one-to-one iPads helped to prepare students to be ready to complete the tests by practicing how to read the questions on a computer screen, how to manipulate parts of the questions to better understand what the question was asking for, and how to best answer questions correctly by accessing the online tools provided.

The third reason the researcher was focused on the subjects of math and reading was due to the consistency of assignments used to track academic achievement. The researcher attempted to compare the difference in academic achievement of the students prior to the implementation of one-to-one iPads to the students within the one-to-one program. This, however, depended on two important factors; when the iPads were deployed to the fourth-grade and fifth-grade students and how educators utilized the iPad in different ways.

Data Collection Procedures

Maxwell (2005) described research methods as "the *means* to answering your research questions" (p. 92). When selecting research methods, researchers consider multiple factors, which include the type of research questions and the kind of facts one would need to address those questions (2005). This research study was influenced by the influx of technology into the intermediate elementary classroom in an effort to increase student involvement, cognitive development, motivation, and to increase students' abilities across all curricula areas to achieve higher academic success. Marshall and Rossman (1999) recommend that a researcher "maximize the opportunities for gathering data" (p. 85).

Data collection for the online 27-question student survey and 18-question educator's survey was completed at one urban/suburban elementary PreK-5 school, during the academic year 2016-2017. The student and educator survey went live in mid-May. The fourth-grade and fifth-grade students received their iPads on Friday, September 9, 2016 and returned them on Wednesday, June 7, 2017 leaving nine and a half months for intermediate educators to integrate the one-to-one iPad technology into the reading and math curriculums.

Fourth-grade and fifth-grade students who returned a signed permission slip were able to complete the survey using the QR code reader app on their iPad. The QR code brought the students to the secure online survey. Students' were asked to enter their NWEA MAP math and reading RIT scores from spring of 2016 and 2017.

The data in the quantitative study was descriptive, relying on statistics and numbers, and intended to explore why the one-to-one mobile technology program was so vital to today's classrooms. "Therefore, as quantitative research is essentially about collecting numerical data to explain a particular phenomenon, particular questions seem immediately suited to being

answered using quantitative methods" (Muijs, 2011, p. 2). The numerical data was collected and analyzed to answer the research questions being asked.

Field Test

The field test was conducted in order to gain experience in data collection and analysis for this research study. The purpose of this study was to explore the motivational influences of technology, the impact of technology on achievement, and effective incorporation or application of technology. A Google Forms survey was created with 15 questions broken down into six categories:

1. Demographics
2. Previous technology experience
3. Reading and completing of course material on one-to-one technology compared to traditional printed out materials
4. Using technology as an academic tool
5. Academic motivation
6. Survey Feedback

The Google Forms field test survey was sent to 27 students who were in the researcher's fifth-grade classroom during the academic year 2015-2016. All 27 students participated in the first year of the one-to-one fifth-grade iPad program. Each student was sent an invitation to his or her school email account with the Google Forms survey link attached. Parent(s)/guardian(s) were also blind carbon copied onto the email that explained what the 15-question survey consisted of. Prior to sending the Google Forms invitation, parent(s)/guardian(s) were made aware of the survey during the academic school year.

The field test was from the first survey that the researcher created to reflect the changes the researcher made to the two research questions. The Google Forms survey allowed the researcher to collect data from 27 academic year 2015-2016 fifth-grade students. The survey field test was modified as a result of the field-testing.

The field test survey was developed using checkbox/multiple choice style questions. The questions were geared toward unlocking how fifth-grade students truly viewed the one-to-one iPad technology regarding the effect on student motivation towards academic achievement in math and reading and which technology apps generated the greatest motivation in the intermediate elementary classroom. To increase reliability and validity, the survey was assessed for face and construct validity. Prior to students being able to complete the field test survey, parent(s)/guardian(s) were first emailed asking for permission for their child to complete the survey.

At the beginning of the field test survey, students' and educators were greeted with a carefully assembled introductory message. It was the researcher's assumption that students would voluntarily complete the survey, without the influence of adults or peers. However, this issue was out of the researcher's control and was considered a limitation. The email message to parent(s)/guardian(s) requested honest answers to the best of the student's ability regarding their experience of the one-to-one iPad program they participated in during their final elementary school year related to its impact on motivation towards academic achievement during their math and reading courses.

The first question asked for the student's gender. The following two questions probed the previous technology use by the students prior to starting the one-to-one iPad technology program. These questions were presented in an "item-in-a-series format, with a common

introduction that defines the general question and response format…" (Dillman, 2007, p. 100). Heinrich (2012) as well as Melhuish, and Falloon (2010) conducted studies on the use of the iPad focused on intermediate education. Heinrich (2012) pointed out that, "a device is only as useful as the tool or apps that it uses" (p. 9). However, some students viewed technology unfavorably, due to frustration or unfamiliarity with it.

The next questions on the field-test survey focused on the topic of reading and completing course materials on one-to-one technology compared to traditional print materials. Students were asked to rate whether or not they believed their learning improved while using the iPad and how motivated they were to complete their assignments in their math and reading courses. To possibly determine causality, students were asked to rate how motivated they were to complete their assignments. The students were asked a series of questions related to using the iPad as an academic tool. These questions sought student perceptions regarding their belief that the iPad was the correct technology to motivate them to achieve higher academic standards.

Following using technology as an academic tool, students were asked questions connected to academic motivation. The intention was that these responses would provide additional data and narrative.

After the academic motivation questions were asked, the final question of the survey asked the students to rate the survey's questions on clarity and ease of understanding. All data was collected while students were on summer vacation.

The field test data collection provided insight into the strengths and weaknesses of the interview questions and the 15-question survey provided great feedback in regard to the questions and process. Although not all 27 fifth-grade students who were invited to participate completed the survey, the researcher believed that the eight participants (30%) who did complete

it found the survey to be easy to navigate and respond to as indicated in the feedback section of the Google Forms survey.

The field test data collection raised questions regarding how to best word questions for the fourth-grade and fifth-grade students to answer with ease. The researcher wanted to balance education with student-friendly terminology that the intermediate students would be able to comprehend.

The field test data also revealed the need to ask clarifying questions. An example would be question number six, "Did having the iPad motivate you more or less when it comes to completing reading homework?" A follow up question that was added to the academic year 2016-2017 Qualtrics survey was, "Why do you feel that you are more or less motivated?" By asking this follow-up question, the researcher gained insight as to why the students responded as they did.

Another example would be question 12, "If you selected would prefer another device, what type of one-to-one technology would you recommend for students to use?" Students were asked the follow-up question, "If the type of one-to-one technology you recommended was selected, would you be motivated to achieve higher academic success in math and reading?" The answer to this question could shed light on the second research question and could possibly provide insight for the school district to consider when the Apple iPad contract expires as whether to continue with Apple iPads or move onto a different one-to-one technology device.

The field test data collection process from Google Forms provided a great foundation for the researcher to continue the research. It provided an insight into how the process worked and how effective this study could be once revised and pilot tested. It could be beneficial to future

research to conduct face-to-face interviews with the participants to find out if anything needs to be changed or added to the survey.

Data Analysis

The data from the surveys were first analyzed using the tools available within Qualtrics and broken down by multiple sub-categories and two research questions. The data analysis process started once all the volunteer students and educators had completed the survey. The final day to complete the survey was Wednesday, June 7, 2017.

A multiple regression analysis was used to measure the math and reading scores. The first dependent variable would be the student's MAP math score. The first independent variable would be how the educator's used the one-to-one iPad technology within their classroom. The second independent variable would be the apps used on the iPads during math and reading. The first dependent variable would be fourth-grade and fifth-grade students' motivation. The second dependent variable would be the student's MAP math score. The third dependent variable would be the student's MAP reading score. The fourth dependent variable would be student's motivation levels towards higher achievement in math. The fifth dependent variable would be student's motivation levels towards higher achievement in reading. The main consideration would be that 100% of the students would have used one of the digital technology items that were listed in question three. A second consideration would be that the apps selected by the fifth-grade students would be significantly different than the fourth-grade student's due to the fifth-grade student's using their iPads on a more consistent basis and because fifth-grade students had the ability to use their iPad outside of school, where the fourth-grade students were not able to do so until December.

The researcher analyzed the survey data from the 118 fourth-grade and fifth-grade intermediate students and 14 intermediate educators. The descriptive data from the five categories on the 26-question student survey and the 17-question staff survey was processed into various graphs to better help break down the survey data.

The results from both surveys provided adequate information to answer the two research questions: the reported impact of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement (RQ1), and which apps provided the greatest motivation in the intermediate classroom (RQ2).

Limitations of Methodology

The first limitation was the overall design of the survey. The survey was quantitative. However, there were four qualitative questions on the student survey to further explain some of the students' perceptions. The qualitative questions were not factored into the overall results. Future studies could involve open-ended questions to supply additional insight into the effects of one-to-one iPads in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement.

The second limitation would be that some intermediate educators and fourth-grade and fifth-grade students might be biased towards the Apple iPad due to any experience with the technology.

The third limitation was the population sampled. This quantitative study was limited to one urban/suburban elementary PreK-5 school that houses 154 intermediate fourth-grade and fifth-grade students with wide diversity, academic, and technology abilities.

The fourth limitation was that the six core intermediate elementary educators would likely be using the iPad in different ways. Some of the educators allowed the iPads to leave the

school on a regular basis while other educators did not allow the iPads to leave at all. Educators adjusted the use of the iPads to best fit their style of instruction as well as the individual needs of the students that made up their class roster.

The fifth limitation was the deployment and return dates of the iPads. The researcher worked with the intermediate educators to schedule an appropriate time for the fourth-grade and fifth-grade students to complete the survey.

The sixth limitation was the students' accessibility to the Internet outside of the school building. All intermediate educators worked with students and parent(s)/guardian(s) whom did not have access to the Internet outside of the school to come up with a plan to support students with their academics.

The seventh limitation was the potential distractibility that could show with any modern technology. While all the intermediate educators continuously reminded students that the iPads were to be used as an academic tool, there were students who made the choice to push the limits of the iPad Code of Conduct policy that was put in place by the school district's technology department.

The eighth limitation was the fourth-grade and fifth-grade students that entered the academic year 2016-2017 at different academic math and reading levels that could influence their feelings towards their math and reading courses.

The ninth limitation was the fourth-grade and fifth-grade students' motivation levels towards higher achievement in reading of the voluntarily participants in this quantitative study. The fourth-grade and fifth-grade students entered the academic year 2016-2017 at different academic math and reading levels that could influence their feelings towards their math and reading courses.

Ethical Considerations

Because this study involves humans, the researcher made sure to establish responsible and respectful ethics that provided for a fair and truthful representation on the effect of one-to-one technology in the intermediate elementary classrooms. This means that even if the researcher did not agree with data provided, the researcher was committed to remaining unbiased and did continue to speak in a professional manner that was respectful to all parties involved.

The researcher protected the students and staff identities by only identifying their gender and grade level. The researcher also protected the intermediate educators, fourth, and fifth-grade students by keeping the data collected through the Qualtrics survey password protected with only the researcher having access to the confidential data. The researcher explained to all the parent(s)/guardian(s) and intermediate students that the results of the survey did not have any positive or negative effect on student academic grades.

Because of the role of the researcher, the following steps were used to delimit. First, the researcher had an educator outside of the urban/suburban elementary PreK-5 school preview the survey prior to the educators and students completing them. Secondly, the researcher actively sought to identify and remove any bias that was found.

Summary

The purpose of this study was to investigate if the effects of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement and determine which iPad apps provided the greatest motivation. The researcher obtained data from the student and staff online surveys. The study added to the body of knowledge about one-to-one technology being used in intermediate classrooms. The results

deemed useful to other classroom teachers, administrators, and stakeholders within the educational community interested in ways to integrate one-to-one technology were shared.

Chapter IV: Results

This chapter includes the findings of the study's two research questions. The results were from the Statistical Package for the Social Sciences (SPSS) test through a series of one-way ANOVAs, independent two-tail t-tests, and one-tail chi-square analyses with the four dependent variables (MAP reading & math scores from the academic year 2016-2017). These tests were used to determine if a significant difference was indicated. A chi-square and independent t-test were used to determine the relationship between gender and grade levels. A one-way ANOVA was used to determine the relationship between MAP reading and math growth and different sub-groups of results of students. A multiple regression analysis was used to measure the math and reading score.

The researcher received approval from the school district in February and the Bethel IRB committee in April of 2017. Thirteen of the 14 or 93% of the intermediate educators voluntarily completed an 18-question survey in early May. Because third through fifth-grade students needed to complete other state assessments, along with second through fifth-graders who needed to complete MAP assessments, intermediate students who received permission from a parent/guardian were not able to complete the online survey until late May.

A link to the Qualtrics survey was sent out the educators, while students used a QR code reader app on their iPad to connect with the survey. The survey was left open for two weeks, closing on Wednesday, June 7, 2017 when students returned their iPads for summer storage. A total of 118 of the 154, intermediate students (77%) completed the survey.

Data Analysis Approaches

A two-way t-test, ANOVA, and chi-square were used to analyze the relationship between MAP reading and math growth scores. Tables for both research questions include: frequency, percent, valid percent, cumulative percent, significance, mean square, sum of squares, mean difference, number, standard deviation, standard error mean, lower bond, upper bond, minimum, and maximum. Growth examination for research question one was analyzed with the dependent variable being NWEA MAP reading and math test scores. A 95% confidence level was used for analysis. The level of statistical significance was set at 0.05. If the value was greater than or equal to 0.05 the result did not show a significant difference. If the value was less than 0.05 the result did show a significant difference.

Student Survey Findings

Table 4.1

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	47	39.8	41.2	41.2
	Female	67	56.8	58.8	100.0
	Total	114	96.6	100.0	
Missing	System	4	3.4		
Total		118	100.0		

Table 4.2

Grade

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4th	55	46.6	47.8	47.8
	5th	60	50.8	52.2	100.0
	Total	115	97.5	100.0	
Missing	System	3	2.5		
Total		118	100.0		

During the 2017-2018 school year there were 69 students in fourth-grade and 85 students in fifth-grade for a total of 154 intermediate students. A total of 118 out of 154 students completed the online survey for a 77% completion rate. The gender ratio routinely showed a higher female to male ratio in the intermediate hallway.

Educator Survey Findings

Figure 4.1

Gender

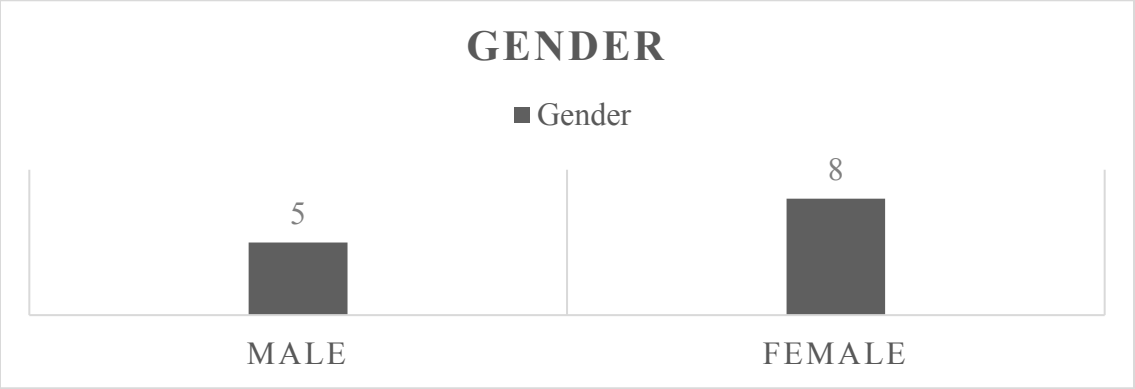
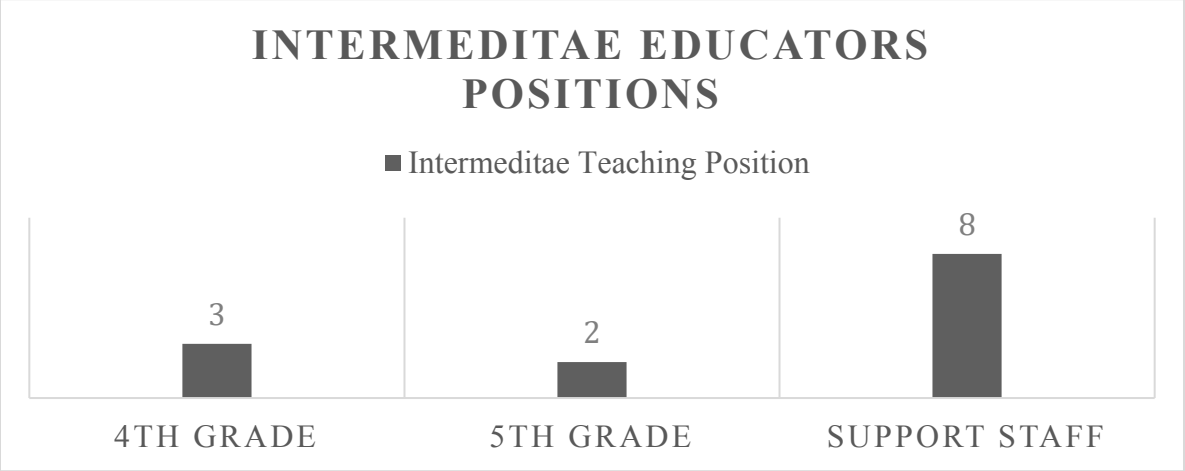


Figure 4.2

I teach…



The intermediate educators were separated into teams: fourth-grade, fifth-grade, and support staff. The fifth-grade educators did have an extra year of working with one-to-one technology over the fourth-grade team. A total of 13 out of 14 educators completed the online survey for a 93% completion rate. Three of the 14 intermediate educators were new to the school. There were only two surveys completed from the fifth-grade educators' perspective since the researcher was a fifth-grade educator and did not complete the survey. The school did have a higher male to female intermediate educator staff, 8:5.

Research Question One

- What are the reported impacts of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?

Student Survey Findings

Table 4.3

Are You More Motivated to Read Course-Work Using The iPad?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	62	52.5	56.9	56.9
	Unsure	38	32.2	34.9	91.7
	No	9	7.6	8.3	100.0
	Total	109	92.4	100.0	
Missing	System	9	7.6		
Total		118	100.0		

Table 4.4

Descriptives - Are You More Motivated to Read Course-Work Using The iPad?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	57	5.9825	7.33507	.97155	4.0362	7.9287	-15.00	23.00
	Unsure	34	8.2353	8.04931	1.38045	5.4268	11.0438	-6.00	37.00
	No	8	8.0000	7.03055	2.48567	2.1223	13.8777	1.00	21.00
	Total	99	6.9192	7.56965	.76078	5.4095	8.4289	-15.00	37.00
MAP Math Growth	Yes	57	7.8421	8.00622	1.06045	5.7178	9.9664	-12.00	22.00
	Unsure	34	10.5588	9.15917	1.57078	7.3630	13.7546	-13.00	37.00
	No	8	11.3750	9.59073	3.39084	3.3569	19.3931	-5.00	21.00
	Total	99	9.0606	8.57478	.86180	7.3504	10.7708	-13.00	37.00

Table 4.5

ANOVA - Are You More Motivated to Read Course-Work Using the iPad?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	118.253	2	59.127	1.033	.360
	Within Groups	5497.100	96	57.261		
	Total	5615.354	98			
MAP Math Growth	Between Groups	203.800	2	101.900	1.397	.252
	Within Groups	7001.836	96	72.936		
	Total	7205.636	98			

Table 4.6

Post Hoc Tests – Are You More Motivated to Read Course-Work Using the iPad?

Dependent Variable	(I) Are you more motivated to read course-work using the iPad?	(J) Are you more motivated to read course-work using the iPad?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-2.25284	1.63974	.359	-6.1564
		No	-2.01754	2.85697	.760	-8.8189
	Unsure	Yes	2.25284	1.63974	.359	-1.6507
		No	.23529	2.97352	.997	-6.8435
	No	Yes	2.01754	2.85697	.760	-4.7838
		Unsure	-.23529	2.97352	.997	-7.3141
MAP Math Growth	Yes	Unsure	-2.71672	1.85061	.311	-7.1223
		No	-3.53289	3.22437	.519	-11.2088
	Unsure	Yes	2.71672	1.85061	.311	-1.6888
		No	-.81618	3.35591	.968	-8.8053
	No	Yes	3.53289	3.22437	.519	-4.1431
		Unsure	.81618	3.35591	.968	-7.1729

The analysis indicated a 48.6% difference between the students who were motivated compared to those who were not. This suggested that a higher number of students were more motivated to read course-work material using their iPad. However, an examination of table 4.4 suggested that students who were not motivated earned higher math RIT scores but lower reading RIT score.

Table 4.7

Do You read More or Less Often When Using The iPad?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	More often	37	31.4	33.6	33.6
	About the same	46	39.0	41.8	75.5
	Less often	27	22.9	24.5	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.8

ANOVA - Do You read More or Less Often When Using The iPad?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	355.363	2	177.681	3.271	.042
	Within Groups	5268.427	97	54.314		
	Total	5623.790	99			
MAP Math Growth	Between Groups	196.634	2	98.317	1.358	.262
	Within Groups	7024.366	97	72.416		
	Total	7221.000	99			

Table 4.9

Descriptives - Do You read More or Less Often When Using The iPad?

						95% Confidence Interval for Mean		
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum
MAP Reading Growth	More often	34	4.2647	7.76671	1.33198	1.5548	6.9746	-15.00
	About the same	42	8.1905	5.86947	.90568	6.3614	10.0195	-4.00
	Less often	24	8.3333	9.00563	1.83827	4.5306	12.1361	-1.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00
MAP Math Growth	More often	34	7.1471	7.71513	1.32313	4.4551	9.8390	-12.00
	About the same	42	10.1429	8.69418	1.34154	7.4336	12.8522	-13.00
	Less often	24	10.0417	9.23358	1.88480	6.1427	13.9407	-7.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00

Table 4.10

Post Hoc Tests - Do You read More or Less Often When Using The iPad?

Dependent Variable	(I) Do you read more or less often when using the iPad?	(J) Do you read more or less often when using the iPad?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	More often	About the same	-3.92577	1.70019	.059	-7.9726
		Less often	-4.06863	1.96482	.101	-8.7453
	About the same	More often	3.92577	1.70019	.059	-.1211
		Less often	-.14286	1.88580	.997	-4.6315
	Less often	More often	4.06863	1.96482	.101	-.6081
		About the same	.14286	1.88580	.997	-4.3458
MAP Math Growth	More often	About the same	-2.99580	1.96318	.283	-7.6686
		Less often	-2.89461	2.26875	.412	-8.2947
	About the same	More often	2.99580	1.96318	.283	-1.6770
		Less often	.10119	2.17751	.999	-5.0818
	Less often	More often	2.89461	2.26875	.412	-2.5055
		About the same	-.10119	2.17751	.999	-5.2841

Table 4.7 showed that there was a 9.1% difference when it came to students being motivated to read more compared to the students who were completing the amount of reading with the one-to-one technology. Future research could ask the 27 students who selected "less often", what they were doing with their iPad instead of reading more. The results suggested that the students who were reading more on their iPad had higher reading RIT scores.

Table 4.8 showed a significant difference and supported the findings of the impact of one-to one technology in the intermediate elementary classroom on student motivation as

measured by math and reading academic achievement. With that said, the results from Table 4.10 contradicted the significant difference.

Table 4.11

When Reading Course Materials in Any Format (Paper, iPad or Other) do you find yourself Easily Distracted?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	36	30.5	32.7	32.7
	Unsure	37	31.4	33.6	66.4
	No	37	31.4	33.6	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.12

Descriptives – When Reading Course Materials in Any Format (Paper, iPad or Other) do you find yourself Easily Distracted?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	33	8.6061	8.61300	1.49933	5.5520	11.6601	-6.00	37.00
	Unsure	35	5.3429	7.53792	1.27414	2.7535	7.9322	-15.00	23.00
	No	32	6.8125	6.05586	1.07053	4.6291	8.9959	-4.00	18.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	33	10.1515	9.21317	1.60381	6.8847	13.4184	-8.00	37.00
	Unsure	35	8.1429	9.04285	1.52852	5.0365	11.2492	-13.00	21.00
	No	32	9.0625	7.30858	1.29199	6.4275	11.6975	-11.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.13

ANOVA – When Reading Course Materials in Any Format (Paper, iPad or Other) do you find yourself Easily Distracted?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	181.150	2	90.575	1.614	.204
	Within Groups	5442.640	97	56.110		
	Total	5623.790	99			
MAP Math Growth	Between Groups	68.597	2	34.298	.465	.629
	Within Groups	7152.403	97	73.736		
	Total	7221.000	99			

Table 4.14

Post Hoc Tests - When Reading Course Materials in Any Format (Paper, iPad or Other) do you find yourself Easily Distracted?

Dependent Variable	(I) When reading course materials in any format (paper, iPad or other) do you find yourself easily distracted?	(J) When reading course materials in any format (paper, iPad or other) do you find yourself easily distracted?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	3.26320	1.81753	.177	-1.0629
		No	1.79356	1.85842	.601	-2.6299
	Unsure	Yes	-3.26320	1.81753	.177	-7.5893
		No	-1.46964	1.83209	.703	-5.8304
	No	Yes	-1.79356	1.85842	.601	-6.2170
		Unsure	1.46964	1.83209	.703	-2.8911
MAP Math Growth	Yes	Unsure	2.00866	2.08355	.601	-2.9506
		No	1.08902	2.13042	.866	-3.9819
	Unsure	Yes	-2.00866	2.08355	.601	-6.9680
		No	-.91964	2.10024	.900	-5.9187
	No	Yes	-1.08902	2.13042	.866	-6.1599
		Unsure	.91964	2.10024	.900	-4.0794

The analysis indicated that 1/3 of the students chose each response. This suggested that an equal number of students were distracted as not. But after the introduction of the iPad, the percent of students who reported being distracted when reading went down. It was interesting to note table 4.12 indicated those who were distracted achieved the highest growth in math.

Table 4.15

Do You Find Yourself More Distracted When Reading on the iPad Compared to Traditional Printed Papers?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	34	28.8	30.9	30.9
	Unsure	26	22.0	23.6	54.5
	No	50	42.4	45.5	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.16

Descriptives - Do You Find Yourself More Distracted When Reading on the iPad Compared to Traditional Printed Papers?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	32	9.3125	7.92887	1.40164	6.4538	12.1712	-2.00	37.00
	Unsure	24	7.3750	6.83223	1.39462	4.4900	10.2600	-5.00	23.00
	No	44	4.8636	7.19687	1.08497	2.6756	7.0517	-15.00	16.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	32	9.1563	10.72865	1.89657	5.2882	13.0243	-13.00	37.00
	Unsure	24	9.1667	8.45277	1.72541	5.5974	12.7360	-11.00	22.00
	No	44	9.0227	6.83523	1.03045	6.9446	11.1008	-12.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.17

ANOVA - Do You Find Yourself More Distracted When Reading on the iPad Compared to Traditional Printed Papers?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	374.108	2	187.054	3.456	.035
	Within Groups	5249.682	97	54.120		
	Total	5623.790	99			
MAP Math Growth	Between Groups	.471	2	.235	.003	.997
	Within Groups	7220.529	97	74.438		
	Total	7221.000	99			

Table 4.18

Post Hoc Tests - Do You Find Yourself More Distracted When Reading on the iPad Compared to Traditional Printed Papers?

Dependent Variable	(I) Do you find yourself more distracted when reading on the iPad compared to traditional printed papers?	(J) Do you find yourself more distracted when reading on the iPad compared to traditional printed papers?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	1.93750	1.98652	.594	-2.7909
		No	4.44886*	1.70917	.029	.3807
	Unsure	Yes	-1.93750	1.98652	.594	-6.6659
		No	2.51136	1.86682	.374	-1.9321
	No	Yes	-4.44886*	1.70917	.029	-8.5171
		Unsure	-2.51136	1.86682	.374	-6.9548
MAP Math Growth	Yes	Unsure	-.01042	2.32976	1.000	-5.5558
		No	.13352	2.00449	.998	-4.6376
	Unsure	Yes	.01042	2.32976	1.000	-5.5349
		No	.14394	2.18938	.998	-5.0673
	No	Yes	-.13352	2.00449	.998	-4.9047
		Unsure	-.14394	2.18938	.998	-5.3551

Table 4.15 showed 45.5% of students were not distracted when reading on the iPad. A significant difference could be seen in tables 4.16 and 4.17 between the math and reading growth means. Thus, it appeared that the results supported the findings of the impact of one-to one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement.

Table 4.19

Does Having the iPad Motivate You to Complete Reading Homework?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	44.9	48.2	48.2
	Unsure	30	25.4	27.3	75.5
	No	27	22.9	24.5	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.20

Descriptives - Does Having the iPad Motivate You to Complete Reading Homework?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	49	5.1020	6.89881	.98554	3.1205	7.0836	-15.00	17.00
	Unsure	27	9.7778	8.76327	1.68649	6.3111	13.2444	-4.00	37.00
	No	24	7.2917	6.45034	1.31667	4.5679	10.0154	-3.00	23.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	49	6.8571	8.26892	1.18127	4.4820	9.2323	-12.00	22.00
	Unsure	27	12.7037	9.12231	1.75559	9.0950	16.3124	-13.00	37.00
	No	24	9.6250	7.13724	1.45688	6.6112	12.6388	-5.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.21

ANOVA - Does Having the iPad Motivate You to Complete Reading Homework?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	385.675	2	192.838	3.571	.032
	Within Groups	5238.115	97	54.001		
	Total	5623.790	99			
MAP Math Growth	Between Groups	603.745	2	301.873	4.425	.014
	Within Groups	6617.255	97	68.219		
	Total	7221.000	99			

Table 4.22

Post Hoc Tests - Does Having the iPad Motivate You to Complete Reading Homework?

Dependent Variable	(I) Does having the iPad motivate you to complete reading homework?	(J) Does having the iPad motivate you to complete reading homework?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-4.67574*	1.76128	.025	-8.8680
		No	-2.18963	1.83088	.458	-6.5475
	Unsure	Yes	4.67574*	1.76128	.025	.4835
		No	2.48611	2.06158	.453	-2.4209
	No	Yes	2.18963	1.83088	.458	-2.1683
		Unsure	-2.48611	2.06158	.453	-7.3931
MAP Math Growth	Yes	Unsure	-5.84656*	1.97961	.011	-10.5585
		No	-2.76786	2.05784	.374	-7.6660
	Unsure	Yes	5.84656*	1.97961	.011	1.1346
		No	3.07870	2.31713	.383	-2.4366
	No	Yes	2.76786	2.05784	.374	-2.1302
		Unsure	-3.07870	2.31713	.383	-8.5940

The analysis suggested that approximately half of the students did not find motivation using the iPad to complete their reading homework. This showed that the number of students that were motivated with the implementation of one-to-one technology increased. Table 4.20 confirmed that while also indicating that those students produced the highest RIT scores and growth in reading. It was surprising that the math growth mean indicated students who were "unsure," posted the highest growth and RIT scores. Table 4.21 indicated a significant difference with both MAP math and reading growth with Table 4.22 confirming that the results

supported the findings of the impact of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement.

Table 4.23

Does Having the iPad Motivate You to Complete Word Sort Work (Spelling) Homework?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	44.9	48.2	48.2
	Unsure	33	28.0	30.0	78.2
	No	24	20.3	21.8	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.24

Descriptives - Does Having the iPad Motivate You to Complete Word Sort Work (Spelling) Homework?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	51	4.8824	6.81952	.95492	2.9643	6.8004	-15.00	23.00
	Unsure	29	8.7586	6.21436	1.15398	6.3948	11.1224	-4.00	23.00
	No	20	9.3000	9.71759	2.17292	4.7520	13.8480	-11.00	37.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	51	7.2549	8.17030	1.14407	4.9570	9.5528	-12.00	22.00
	Unsure	29	11.6207	6.29293	1.16857	9.2270	14.0144	.00	21.00
	No	20	10.1500	11.22626	2.51027	4.8959	15.4041	-13.00	37.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.25

ANOVA - Does Having the iPad Motivate You to Complete Word Sort Work (Spelling) Homework?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	422.986	2	211.493	3.945	.023
	Within Groups	5200.804	97	53.617		
	Total	5623.790	99			
MAP Math Growth	Between Groups	379.936	2	189.968	2.694	.073
	Within Groups	6841.064	97	70.526		
	Total	7221.000	99			

Table 4.26

Post Hoc Tests - Does Having the iPad Motivate You to Complete Word Sort Work (Spelling) Homework?

Dependent Variable	(I) Does having the iPad motivate you to complete word sort work (spelling) homework?	(J) Does having the iPad motivate you to complete word sort work (spelling) homework?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-3.87627	1.70298	.064	-7.9297
		No	-4.41765	1.93187	.062	-9.0159
	Unsure	Yes	3.87627	1.70298	.064	-.1772
		No	-.54138	2.12830	.965	-5.6072
	No	Yes	4.41765	1.93187	.062	-.1806
		Unsure	.54138	2.12830	.965	-4.5245
MAP Math Growth	Yes	Unsure	-4.36579	1.95316	.070	-9.0147
		No	-2.89510	2.21567	.395	-8.1689
	Unsure	Yes	4.36579	1.95316	.070	-.2832
		No	1.47069	2.44096	.819	-4.3393
	No	Yes	2.89510	2.21567	.395	-2.3787
		Unsure	-1.47069	2.44096	.819	-7.2807

Tables 4.19 and 4.23 showed similar data points with a majority of intermediate students stating that the one-to-one technology did motivate them to complete their reading and word work homework. The interesting part of those two tables was that there was only a 2.7% difference when comparing the students that selected unsure. Table 4.24 suggested students who were not motivated received higher reading RIT scores while those who were motivated showed the most growth.

Table 4.25 showed a significant difference with MAP reading growth and supported the findings of the impact of one-to one technology in the intermediate elementary classroom on

student motivation as measured by math and reading academic achievement. However, the Tukey's post hoc test did not reveal significant differences between any of the groups. Those types of results could occur when the omnibus *F* test was just barely statistically significant difference.

Table 4.27

Does Having the iPad Motivate You to Complete Math Homework?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	47	39.8	43.1	43.1
	Unsure	21	17.8	19.3	62.4
	No	41	34.7	37.6	100.0
	Total	109	92.4	100.0	
Missing	System	9	7.6		
Total		118	100.0		

Table 4.28

Descriptives - Does Having the iPad Motivate You to Complete Math Homework?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	43	6.1395	7.75083	1.18199	3.7542	8.5249	-15.00	23.00
	Unsure	17	10.0000	9.65013	2.34050	5.0384	14.9616	-3.00	37.00
	No	39	6.4359	6.08188	.97388	4.4644	8.4074	-4.00	23.00
	Total	99	6.9192	7.56965	.76078	5.4095	8.4289	-15.00	37.00
MAP Math Growth	Yes	43	9.0233	9.03561	1.37792	6.2425	11.8040	-12.00	22.00
	Unsure	17	10.8235	9.67106	2.34558	5.8511	15.7959	-13.00	37.00
	No	39	8.3333	7.62038	1.22024	5.8631	10.8036	-9.00	21.00
	Total	99	9.0606	8.57478	.86180	7.3504	10.7708	-13.00	37.00

Table 4.29

ANOVA - Does Having the iPad Motivate You to Complete Math Homework?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	196.601	2	98.301	1.742	.181
	Within Groups	5418.753	96	56.445		
	Total	5615.354	98			
MAP Math Growth	Between Groups	73.522	2	36.761	.495	.611
	Within Groups	7132.114	96	74.293		
	Total	7205.636	98			

Table 4.30

Post Hoc Tests - Does Having the iPad Motivate You to Complete Math Homework?

Dependent Variable	(I) Does having the iPad motivate you to complete math homework?	(J) Does having the iPad motivate you to complete math homework?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-3.86047	2.15244	.177	-8.9846
		No	-.29636	1.66132	.983	-4.2513
	Unsure	Yes	3.86047	2.15244	.177	-1.2636
		No	3.56410	2.18349	.237	-1.6339
	No	Yes	.29636	1.66132	.983	-3.6586
		Unsure	-3.56410	2.18349	.237	-8.7621
MAP Math Growth	Yes	Unsure	-1.80027	2.46939	.747	-7.6789
		No	.68992	1.90596	.930	-3.8474
	Unsure	Yes	1.80027	2.46939	.747	-4.0784
		No	2.49020	2.50502	.582	-3.4733
	No	Yes	-.68992	1.90596	.930	-5.2273
		Unsure	-2.49020	2.50502	.582	-8.4537

The findings from table 4.27 were surprising because a 5.5 difference separated the motivated from the non-motivated students. Further research could explore if curriculum selection affects the use of one-to-one technology. Table 4.28 specifies students who selected "unsure," posted the highest growth and RIT scores. It was interesting to note that students who were motivated by having the iPad had the highest RIT reading scores.

Table 4.31

Would You Be More Motivated to Complete Your Math Bookwork on the iPad?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	38.1	40.9	40.9
	Unsure	28	23.7	25.5	66.4
	No	37	31.4	33.6	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

Table 4.32

Descriptives - Would You Be More Motivated to Complete Your Math Bookwork on the iPad?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	42	7.0476	8.37229	1.29187	4.4386	9.6566	-11.00	37.00
	Unsure	23	5.1304	5.70729	1.19005	2.6624	7.5985	-6.00	12.00
	No	35	7.8571	7.53089	1.27295	5.2702	10.4441	-15.00	23.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	42	9.9524	9.13036	1.40885	7.1072	12.7976	-11.00	37.00
	Unsure	23	9.6522	7.06855	1.47389	6.5955	12.7088	-9.00	22.00
	No	35	7.7143	8.74330	1.47789	4.7109	10.7177	-13.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.33

ANOVA - Would You Be More Motivated to Complete Your Math Bookwork on the iPad?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	104.991	2	52.495	.923	.401
	Within Groups	5518.799	97	56.895		
	Total	5623.790	99			
MAP Math Growth	Between Groups	104.735	2	52.367	.714	.492
	Within Groups	7116.265	97	73.364		
	Total	7221.000	99			

Table 4.34

Post Hoc Tests - Would You Be More Motivated to Complete Your Math Bookwork on the iPad?

Dependent Variable	(I) Would you be more motivated to completed your math bookwork on the iPad?	(J) Would you be more motivated to completed your math bookwork on the iPad?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	1.91718	1.95661	.591	-2.7400
		No	-.80952	1.72633	.886	-4.9186
	Unsure	Yes	-1.91718	1.95661	.591	-6.5744
		No	-2.72671	2.02466	.373	-7.5459
	No	Yes	.80952	1.72633	.886	-3.2995
		Unsure	2.72671	2.02466	.373	-2.0924
MAP Math Growth	Yes	Unsure	.30021	2.22182	.990	-4.9882
		No	2.23810	1.96032	.491	-2.4279
	Unsure	Yes	-.30021	2.22182	.990	-5.5886
		No	1.93789	2.29909	.677	-3.5345
	No	Yes	-2.23810	1.96032	.491	-6.9041
		Unsure	-1.93789	2.29909	.677	-7.4102

In examining tables 4.27 and 4.31, the researcher believed the results were due to the current math curriculum not being fully connected with technology. The district had asked for volunteers to pilot two new math curricula during the 2017-2018 school year with the possibility of one curriculum being selected for the 2018-2019 school year. Both curricula possess integrated technology lessons. The current intermediate math curriculum relies on educators to integrate technology into lessons. It was interesting to note that table 4.32 illustrates students who were motivated to complete bookwork on their iPad showed the high growth and RIT scores.

Table 4.35

Would You Recommend That The District Continue Use of the Apple iPad For Future Students or Select Another Device?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	83	70.3	77.6	77.6
	Unsure	14	11.9	13.1	90.7
	No	10	8.5	9.3	100.0
	Total	107	90.7	100.0	
Missing	System	11	9.3		
Total		118	100.0		

Table 4.36

Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	80	6.3125	7.75184	.86668	4.5874	8.0376	-15.00	37.00
	Unsure	11	10.1818	6.46248	1.94851	5.8403	14.5234	-1.00	23.00
	No	9	8.0000	6.14410	2.04803	3.2772	12.7228	-1.00	17.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	80	9.8250	8.04068	.89898	8.0356	11.6144	-12.00	37.00
	Unsure	11	4.2727	10.94615	3.30039	-3.0810	11.6265	-13.00	20.00
	No	9	8.5556	8.76229	2.92076	1.8203	15.2909	-9.00	20.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.37

ANOVA - Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	156.966	2	78.483	1.393	.253
	Within Groups	5466.824	97	56.359		
	Total	5623.790	99			
MAP Math Growth	Between Groups	301.046	2	150.523	2.110	.127
	Within Groups	6919.954	97	71.340		
	Total	7221.000	99			

Table 4.38

Crosstab - Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

			Gender:		
			Male	Female	Total
Would you recommend that the district continue use of the Apple iPad for future students or select another student?	Yes	Count	33	50	83
		Expected Count	32.6	50.4	83.0
		% within Gender:	78.6%	76.9%	77.6%
	Unsure	Count	6	8	14
		Expected Count	5.5	8.5	14.0
		% within Gender:	14.3%	12.3%	13.1%
	No	Count	3	7	10
		Expected Count	3.9	6.1	10.0
		% within Gender:	7.1%	10.8%	9.3%
Total		Count	42	65	107
		Expected Count	42.0	65.0	107.0
		% within Gender:	100.0%	100.0%	100.0%

Table 4.39

Post Hoc Tests - Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

Dependent Variable	(I) Would you recommend that the district continue use of the Apple iPad for future students or select another device?	(J) Would you recommend that the district continue use of the Apple iPad for future students or select another device?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-3.86932	2.41413	.249	-9.6155
		No	-1.68750	2.63943	.799	-7.9699
	Unsure	Yes	3.86932	2.41413	.249	-1.8769
		No	2.18182	3.37426	.795	-5.8497
	No	Yes	1.68750	2.63943	.799	-4.5949
		Unsure	-2.18182	3.37426	.795	-10.2133
MAP Math Growth	Yes	Unsure	5.55227	2.71610	.107	-.9126
		No	1.26944	2.96958	.904	-5.7988
	Unsure	Yes	-5.55227	2.71610	.107	-12.0172
		No	-4.28283	3.79632	.499	-13.3189
	No	Yes	-1.26944	2.96958	.904	-8.3377
		Unsure	4.28283	3.79632	.499	-4.7533

Table 4.40

Chi-Square Tests - Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.444[a]	2	.801
Likelihood Ratio	.456	2	.796
Linear-by-Linear Association	.174	1	.676
N of Valid Cases	107		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.93.

The findings suggested that intermediate students were pleased with the choice of selecting the Apple iPad as the one-to-one technology. Another reason that students selected, "unsure," or "no" could be that while multiple intermediate students stated to the researcher that a laptop, or something similar with a dedicated keyboard, would be more useful for the work load, they were happy to just have one-to-one technology. Forthcoming research could emphasize student work load and participation in selection of the one-to-one device. Table 4.36 suggested that the 77.6% of students who would recommend the Apple iPad showed higher RIT scores and growth means in math and reading.

Table 4.41

The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	64	54.2	59.8	59.8
	Unsure	37	31.4	34.6	94.4
	No	6	5.1	5.6	100.0
	Total	107	90.7	100.0	
Missing	System	11	9.3		
Total		118	100.0		

Table 4.42

Descriptives - The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	61	6.4590	7.68673	.98418	4.4904	8.4277	-15.00	37.00
	Unsure	34	7.0588	6.88407	1.18061	4.6569	9.4608	-11.00	23.00
	No	5	11.0000	10.22252	4.57165	-1.6929	23.6929	1.00	23.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	61	8.1475	9.10464	1.16573	5.8157	10.4793	-13.00	37.00
	Unsure	34	10.0000	7.44271	1.27641	7.4031	12.5969	-9.00	21.00
	No	5	14.6000	6.80441	3.04302	6.1512	23.0488	4.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.43

ANOVA - The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	96.760	2	48.380	.849	.431
	Within Groups	5527.030	97	56.980		
	Total	5623.790	99			
MAP Math Growth	Between Groups	234.128	2	117.064	1.625	.202
	Within Groups	6986.872	97	72.030		
	Total	7221.000	99			

Table 4.44

Crosstab - The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

			Gender:		
			Male	Female	Total
The use of digital technology (i.e. iPad and laptops) motivated me to achieve higher academic success in reading?	Yes	Count	27	37	64
		Expected Count	25.1	38.9	64.0
		% within Gender:	64.3%	56.9%	59.8%
	Unsure	Count	13	24	37
		Expected Count	14.5	22.5	37.0
		% within Gender:	31.0%	36.9%	34.6%
	No	Count	2	4	6
		Expected Count	2.4	3.6	6.0
		% within Gender:	4.8%	6.2%	5.6%
Total		Count	42	65	107
		Expected Count	42.0	65.0	107.0
		% within Gender:	100.0%	100.0%	100.0%

Table 4.45

Post Hoc Tests - The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

Dependent Variable	(I) The use of digital technology (i.e. iPad and laptops) motivated me to achieve higher academic success in reading?	(J) The use of digital technology (i.e. iPad and laptops) motivated me to achieve higher academic success in reading?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-.59981	1.61554	.927	-4.4451
		No	-4.54098	3.51141	.402	-12.8989
	Unsure	Yes	.59981	1.61554	.927	-3.2455
		No	-3.94118	3.61550	.522	-12.5469
	No	Yes	4.54098	3.51141	.402	-3.8170
		Unsure	3.94118	3.61550	.522	-4.6645
MAP Math Growth	Yes	Unsure	-1.85246	1.81641	.566	-6.1759
		No	-6.45246	3.94800	.236	-15.8496
	Unsure	Yes	1.85246	1.81641	.566	-2.4710
		No	-4.60000	4.06503	.497	-14.2757
	No	Yes	6.45246	3.94800	.236	-2.9447
		Unsure	4.60000	4.06503	.497	-5.0757

Table 4.46

Chi-Square Tests - The Use of Digital Technology (i.e. iPad and laptops) Motivated me to Achieve Higher Academic Success in Reading?

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.582[a]	2	.747
Likelihood Ratio	.586	2	.746
Linear-by-Linear Association	.538	1	.463
N of Valid Cases	107		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.36.

The results from table 4.41 indicated that only 5.6% of students were not extrinsically motivated by the iPad. In this case, it was in favor of students being more motivated when using digital technology to achieve higher academic success in reading. The analysis from table 4.44 indicated that a higher percentage of males to females were motivated to achieve higher academic success with the use of the iPad while a higher number of females to males were "unsure." The results suggested non-motivated students had the highest math and reading RIT scores, while also posting the highest math growth.

Table 4.47

The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	67	56.8	62.6	62.6
	Unsure	24	20.3	22.4	85.0
	No	16	13.6	15.0	100.0
	Total	107	90.7	100.0	
Missing	System	11	9.3		
Total		118	100.0		

Table 4.48

Decriptives - The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	65	6.8154	7.85392	.97416	4.8693	8.7615	-11.00	37.00
	Unsure	20	7.1500	8.19033	1.83141	3.3168	10.9832	-15.00	21.00
	No	15	6.8667	5.34344	1.37967	3.9076	9.8258	-1.00	15.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	65	9.8308	8.69549	1.07854	7.6761	11.9854	-11.00	37.00
	Unsure	20	6.8000	8.65478	1.93527	2.7494	10.8506	-13.00	20.00
	No	15	9.0000	7.64386	1.97364	4.7670	13.2330	-9.00	21.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.49

Chi-Square Tests - The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.374[a]	2	.009
Likelihood Ratio	11.367	2	.003
Linear-by-Linear Association	8.536	1	.003
N of Valid Cases	107		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.28.

Table 4.50

The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	1.722	2	.861	.015	.985
	Within Groups	5622.068	97	57.959		
	Total	5623.790	99			
MAP Math Growth	Between Groups	140.662	2	70.331	.964	.385
	Within Groups	7080.338	97	72.993		
	Total	7221.000	99			

Table 4.51

Crosstab - The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

			Gender:		
			Male	Female	Total
The use of digital technology (i.e. iPads and laptops) motivated me to achieve higher academic success in math?	Yes	Count	32	35	67
		Expected Count	26.3	40.7	67.0
		% within Gender:	76.2%	53.8%	62.6%
	Unsure	Count	9	15	24
		Expected Count	9.4	14.6	24.0
		% within Gender:	21.4%	23.1%	22.4%
	No	Count	1	15	16
		Expected Count	6.3	9.7	16.0
		% within Gender:	2.4%	23.1%	15.0%
Total		Count	42	65	107
		Expected Count	42.0	65.0	107.0
		% within Gender:	100.0%	100.0%	100.0%

Table 4.52

Post Hoc Tests - The Use of Digital Technology (i.e. iPads and Laptops) Motivated me to Achieve Higher Academic Success in Math?

Dependent Variable	(I) The use of digital technology (i.e. iPads and laptops) motivated me to achieve higher academic success in math?	(J) The use of digital technology (i.e. iPads and laptops) motivated me to achieve higher academic success in math?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-.33462	1.94670	.984	-4.9682
		No	-.05128	2.18074	1.000	-5.2419
	Unsure	Yes	.33462	1.94670	.984	-4.2990
		No	.28333	2.60037	.993	-5.9061
	No	Yes	.05128	2.18074	1.000	-5.1394
		Unsure	-.28333	2.60037	.993	-6.4728
MAP Math Growth	Yes	Unsure	3.03077	2.18464	.351	-2.1691
		No	.83077	2.44728	.938	-4.9943
	Unsure	Yes	-3.03077	2.18464	.351	-8.2307
		No	-2.20000	2.91820	.732	-9.1460
	No	Yes	-.83077	2.44728	.938	-6.6558
		Unsure	2.20000	2.91820	.732	-4.7460

Table 4.41 painted a different picture when compared to table 4.47. It was interesting to note that a higher number of females to males stated that digital technology motivated them achieve higher academic success. Although 43.1% of students stated that one-to-one technology motivated them to complete their math homework, an increase of 19.5% stated that the use of digital technology motivated them to achieve higher academic success in math. The results from table 4.48 suggested that the 62.6% of students who were motivated to achieve higher academic

success in math recorded the higher RIT scores in math and reading while also having the highest growth mean in reading.

Table 4.53

Descriptives – Academic Year 2016-2017 MAP Reading and Math Scores

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
2016 MAP reading score.	4th	45	189.33	40.519	6.040	177.16	201.51	13	234
	5th	55	212.53	17.271	2.329	207.86	217.20	162	241
	Total	100	202.09	32.045	3.204	195.73	208.45	13	241
2016 MAP math score.	4th	45	191.76	41.223	6.145	179.37	204.14	11	236
	5th	55	223.35	16.025	2.161	219.01	227.68	181	259
	Total	100	209.13	33.835	3.384	202.42	215.84	11	259
2017 MAP reading score.	4th	46	196.67	40.603	5.987	184.62	208.73	14	240
	5th	55	218.85	16.600	2.238	214.37	223.34	161	245
	Total	101	208.75	31.842	3.168	202.47	215.04	14	245
2017 MAP math score.	4th	46	203.52	43.005	6.341	190.75	216.29	14	257
	5th	55	230.16	21.026	2.835	224.48	235.85	174	275
	Total	101	218.03	35.338	3.516	211.05	225.01	14	275

Table 4.54

t-test – Academic Year 2016-2017 MAP Reading and Math Scores

	Gender:	N	Mean	Std. Deviation	Std. Error Mean
MAP Reading Growth	Male	38	7.0789	9.17512	1.48840
	Female	62	6.7742	6.41059	.81415
MAP Math Growth	Male	38	7.3684	10.17262	1.65022
	Female	62	10.1613	7.25235	.92105

Table 4.55

Independent Samples Test – Academic Year 2016-2017 MAP Reading and Math Scores

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
MAP Reading Growth	Equal variances assumed	3.737	.056	.195	98	.846	.30475
	Equal variances not assumed			.180	59.237	.858	.30475
MAP Math Growth	Equal variances assumed	3.567	.062	-1.600	98	.113	-2.79287
	Equal variances not assumed			-1.478	60.105	.145	-2.79287

Table 4.56

t-test for Equality of Means – Academic Year 2016-2017 MAP Reading and Math Scores

		t-test for Equality of Means		
			95% Confidence Interval of the Difference	
		Std. Error Difference	Lower	Upper
MAP Reading Growth	Equal variances assumed	1.56038	-2.79176	3.40127
	Equal variances not assumed	1.69652	-3.08969	3.69919
MAP Math Growth	Equal variances assumed	1.74582	-6.25740	.67166
	Equal variances not assumed	1.88985	-6.57300	.98727

Table 4.53 showed the intermediate students' MAP reading and RIT means prior to students participating in the one-to-one technology program. The results suggested that the use of one-to-one technology did have a positive impact on the intermediate students MAP reading and math RIT mean scores. The analysis from table 4.54 indicated that females had the highest growth in math as well as summative RIT scores in math and reading.

Student Survey Discussion

The results presented for the first research question suggested that the one-to-one iPad technology did motive students to achieve higher academic success in reading however, not in math. It was surprising to the researcher in that a higher number of students were motivated to complete their reading and word work homework versus math homework. These results could be due to several factors. First, the lack of technology in the current math curriculum. Secondly, math homework was primarily completed using the traditional paper and pencil method. Finally,

students may not know how, where, or even want to access additional math help using the one-to-one technology.

According to the 2015 NWEA student growth norms, the findings from fourth-grade students' MAP RIT mean scores from 2016 and 2017 showed a decrease of 9.63 RIT points, in math, and 7.90 RIT points, in reading during year one of one-to-one technology implementation. Those results could be due to several factors. First, in 2016 a new educator was hired a week before the school year started. Secondly, in 2017 two new educators were hired to replace the new educator hired in 2016 along with two veteran halftime educators. Finally, behavioral issues along with the implementation of one-to-one technology could have been contributing factors to the decrease in MAP RIT scores. The NWEA typical growth scores also indicated whether the school results were higher or lower than the national means. Thus, it appeared that the results suggested that one-to-one technology did not have an impact on motivating intermediate students to achieve higher academic success in math and reading.

An analysis of fifth-grade students' MAP RIT mean scores from 2016 and 2017 showed an average growth of 6.81 RIT points, in math, and a growth 6.32 RIT points, in reading, and with the use of one-to-one technology. The analysis indicated that in year two of one-to-one technology implementation, fifth-grade students posted a decrease of 3.09 in math however, a growth of +0.22 was displayed in reading according to the 2015 NWEA student growth norms of 9.9 in math and 6.1 for reading. Thus, it appeared that the results suggested, and supported the findings, that one-to-one technology did have an impact on motivating intermediate students to achieve higher academic success in reading. However, an examination in this finding also suggested that one-to-one technology did not have an impact on motivating intermediate students to achieve higher academic success in math.

Figure 4.3

Summary Chart of Research Question One

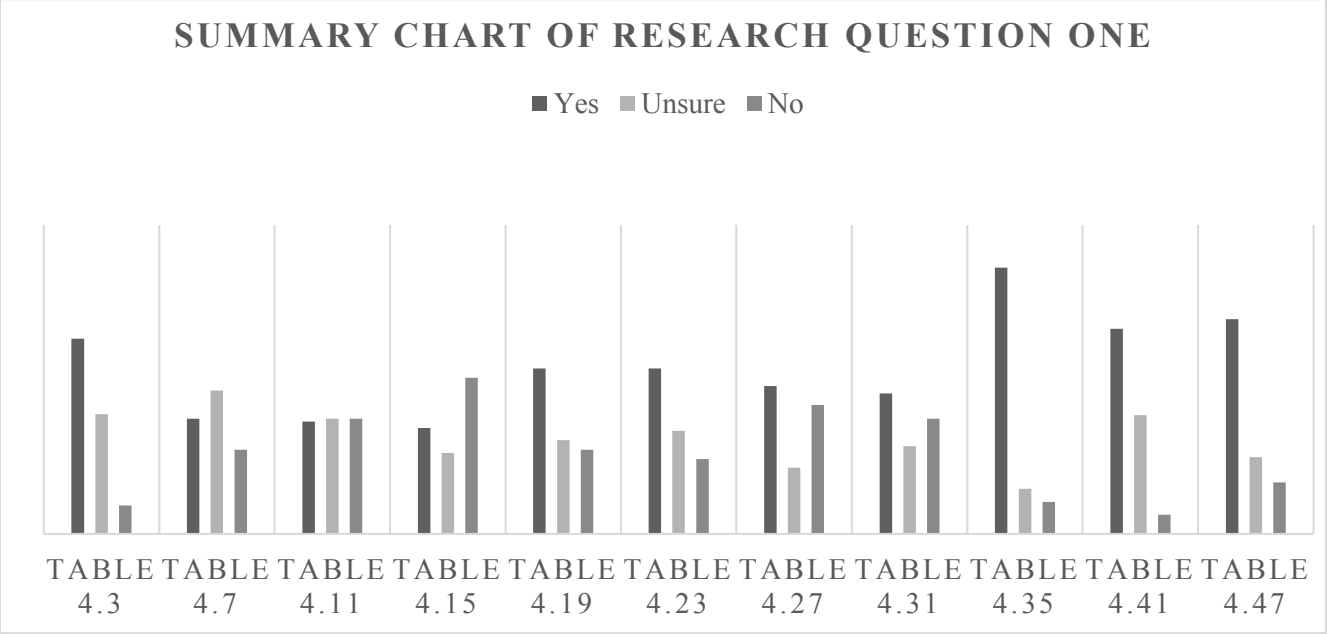


Table 4.3 – Are You More Motivated to Read Course-Work Using the iPad?

Table 4.7 – Do You Read More or Less Often When Using the iPad?

Table 4.11 – When Reading Course Materials in Any Format (Paper, iPad, or Other) Do You Find Yourself Easily Distracted?

Table 4.15 – Do You Find Yourself More Distracted When Reading on the iPad to Traditional Printed Papers?

Table 4.19 – Does Having the iPad Motivate you to Complete Reading Homework?

Table 4.23 – Does Having the iPad Motivate you to Complete Word Sort Work (Spelling) Homework?

Table 4.27 – Does Having the iPad Motivate you to Complete Math Homework?

Table 4.31 – Would you be More Motivated to Complete Your Math Bookwork on the iPad?

Table 4.35 – Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

Table 4.41 – The Use of Digital Technology (i.e. iPad and Laptops) Motivated me to Achieve Higher Academic Success in Reading?

Table 4.47 – The Use of Digital Technology (i.e. iPad and Laptops) Motivated me to Achieve Higher Academic Success in Math?

Educator Survey Findings

Figure 4.4

In Your Opinion, How Effective is the iPad as an Instructional Tool for Your Students During Language Arts?

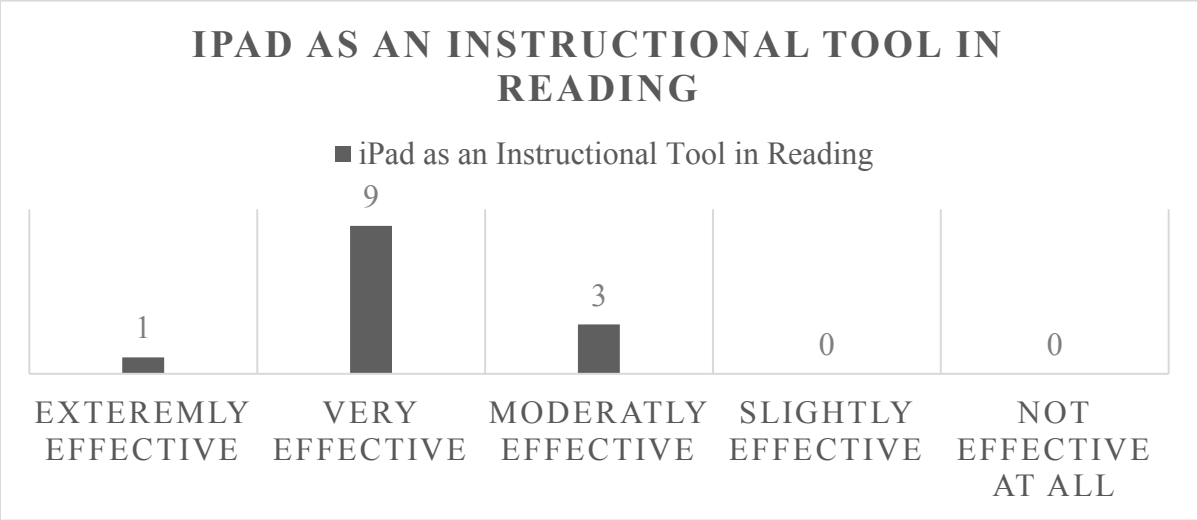
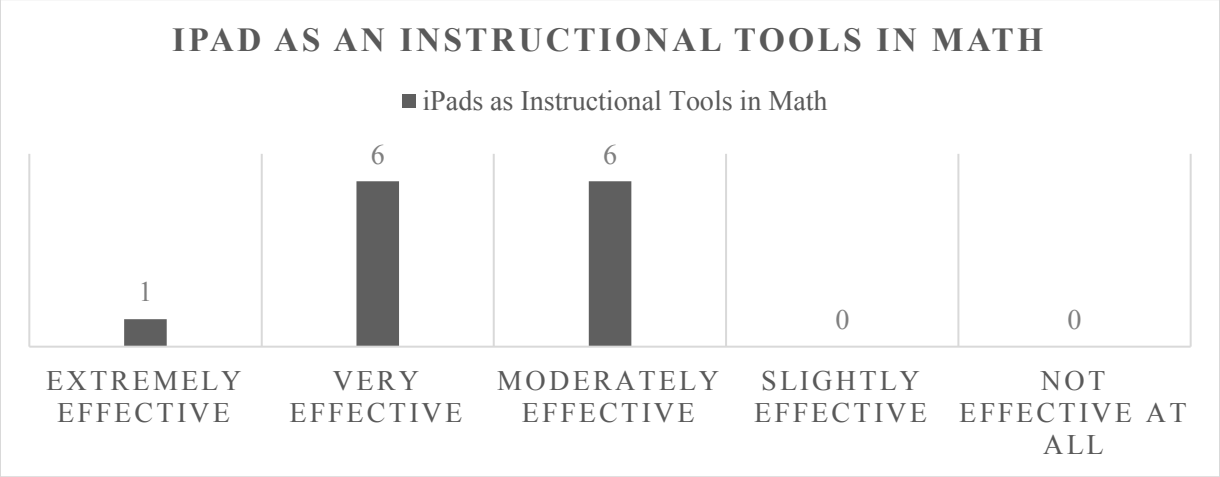


Figure 4.5

In Your Opinion, How Effective is the iPad as an Instructional Tool for Your Students During Math?



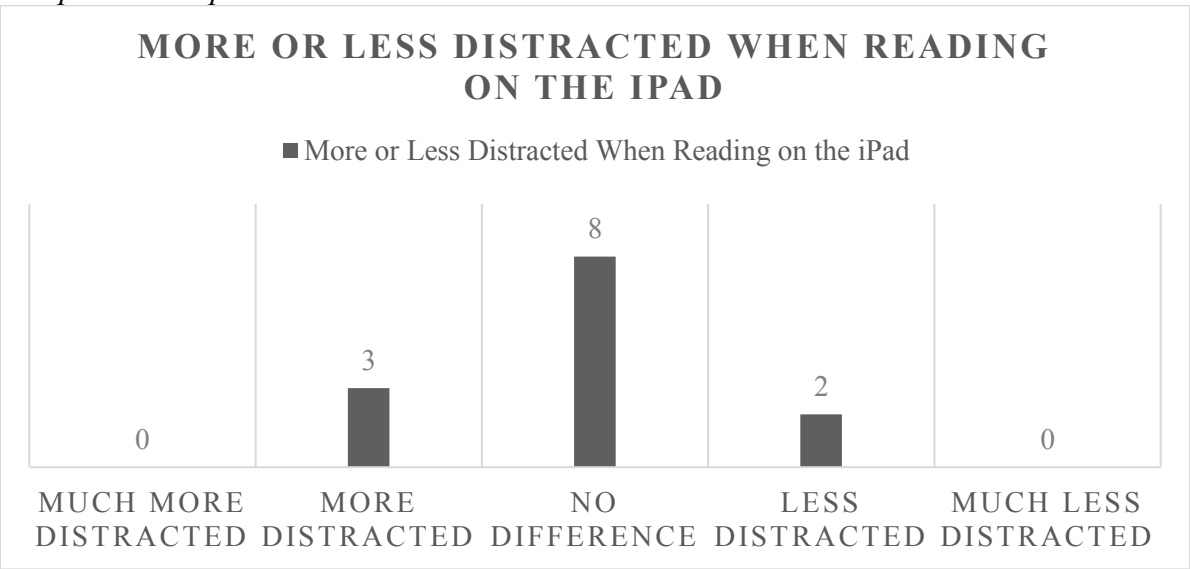
The results suggested that the intermediate educators believe that the iPad was an effective tool to use when helping students achieve higher academic success in math. It was surprising to the researcher in that 46.2% of educators found the iPad to be very effective while the same percentage found the iPad to be moderately effective instructional tool in math. Those results could be due to several factors; first, some educators that found the iPad to be a very effective tool might have had more time to incorporate the iPad into the math curriculum; secondly, educators could have found an app that helped to motivate their students achieve more in math; finally, some educators could have struggled to incorporate the iPad into the math curriculum.

The analysis of the figure 4.4 indicated that 76.9% found the iPad to be an extremely or very effective instructional tool to use. This finding could have resulted from more technology resources being embedded into the reading curriculum versus the math curriculum. Another reason that educators selected those choices could be that the reading curriculum was overhauled

the year one-to-one technology was introduced to the intermediate grade levels and that could have allowed for more effective technology integration into reading.

Figure 4.6

In Your Opinion, Are Your Students More or Less Distracted When Reading on the iPad Compared to Paper?



It was interesting to note that 76.9% of educators stated that they observed little to no difference with students being distracted compared to the 71.2% of students that stated the similar observation regarding when reading a digital or a paper copy. With that said, it was also interesting to note that 23% of educators believed that students were more distracted when reading on the iPad compared to 28.8% of students that stated similar observations. This suggested that the iPad virtually no impact on distraction when reading; distraction neither increased nor decreased in the opinion of the educators.

Figure 4.7

In Your Opinion, Does Having the iPad Motivate Your Students More or Less When it Comes to Completing Reading Work?

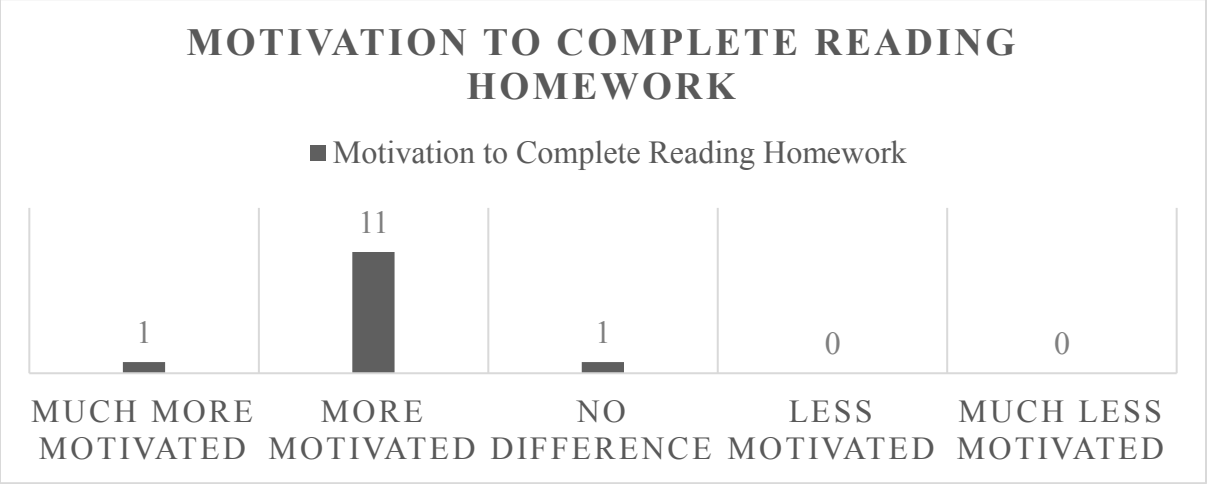
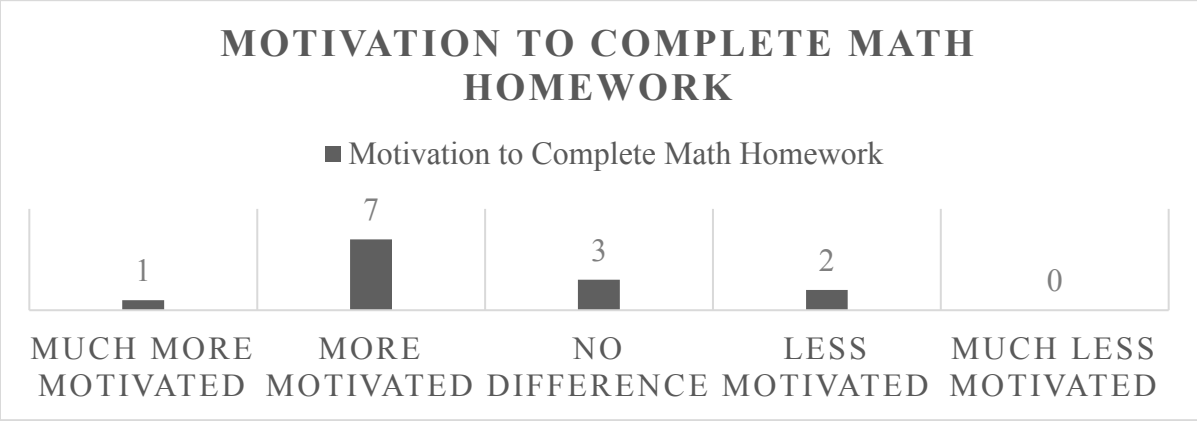


Figure 4.8

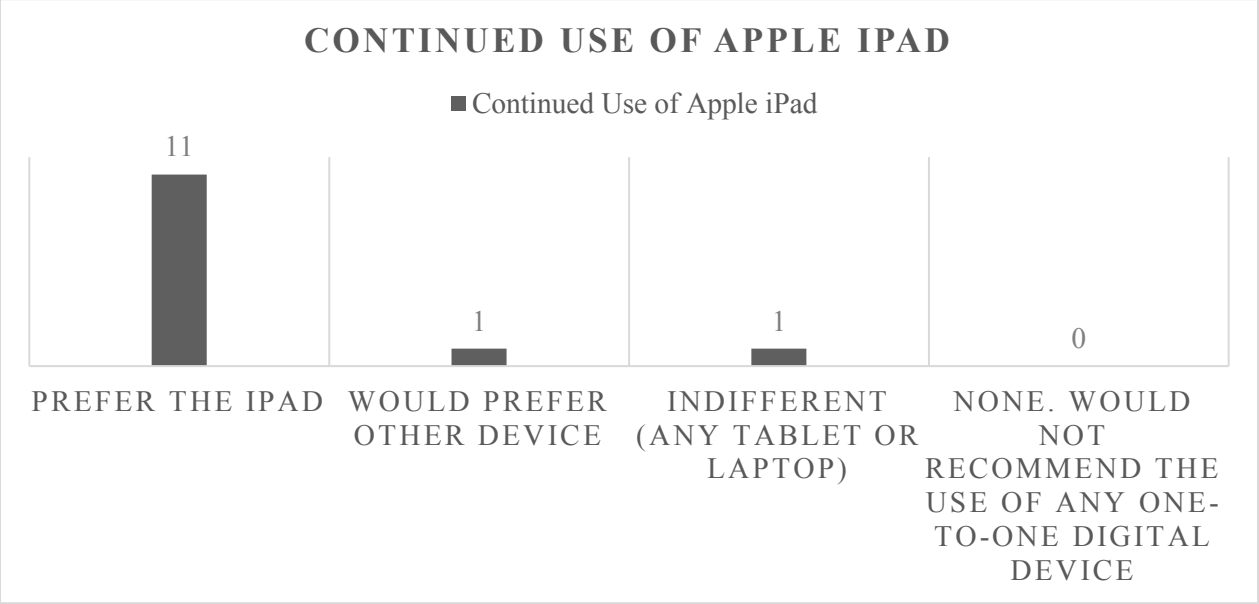
In Your Opinion, Does Having the iPad Motivate Your Students More or Less When it Comes to Completing Math Homework?



The results from figures 4.7 and 4.8 suggested that educators believed students are more motivated to complete their reading homework over math homework using the iPad. It was surprising that a 21% discrepancy occurred between the subjects; 92.3% reading compared to 61.3% for math. The findings suggested that the overhauled reading curriculum provided a higher amount of incorporated technology and motivation compared to the math curriculum.

Figure 4.9

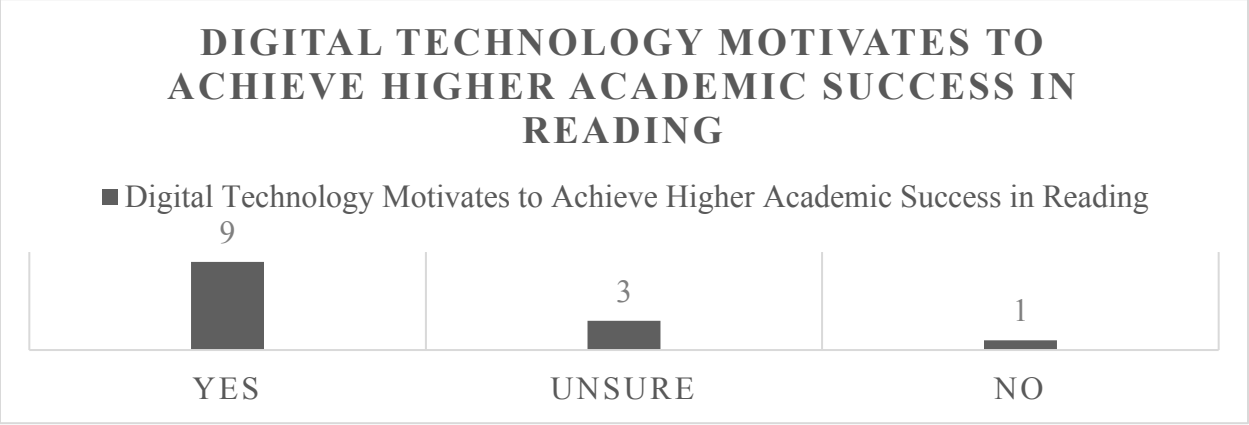
Would You Recommend That the District Continued Use of the Apple iPad For Future Students or Another Device?



This finding suggested that educators prefer the Apple iPad for the one-to-one intermediate technology program. The analysis further indicated that if the district was to change to a different device, educators would prefer the technology to have a dedicated keyboard.

Figure 4.10

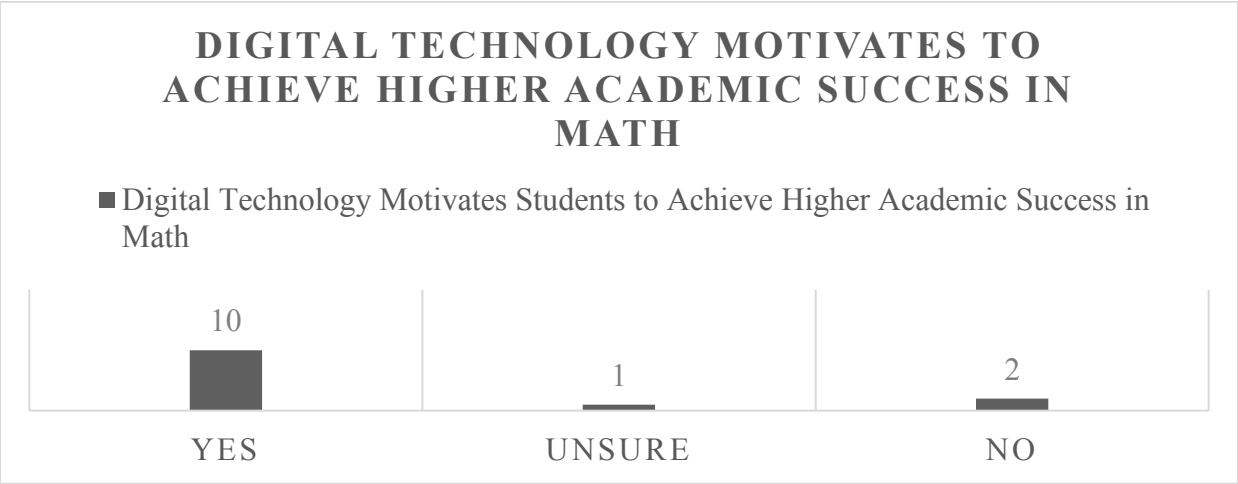
The Use of Digital Technology (i.e. iPad and Laptops) Motivates my Students to Achieve Higher Academic Success in Reading?



The findings suggested that intermediate educators believed that the use of digital technology did motivate students to achieve higher academic success in reading. The findings did correlate with question five from the educators' survey, "How frequently do you use the iPad as an instructional tool for language arts?" (see Appendix B). The results indicated that digital technology was found being used by educators 3/4 of the time during reading/word work (spelling) lessons.

Figure 4.11

The Use of Digital Technology (i.e. iPad and Laptops) Motivates my Students to Achieve Higher Academic Success in Math?



These finding were surprising because in table 4.11, only 61% of educators stated that the use of an iPad motivated students to turn in homework. The results suggested that 76.9% educators believed the use of digital technology mixed with current math curriculum possessed enough motivation for students to achieve higher academic success in math.

Educator Survey Discussion

Analysis of the responses revealed that educators believed that one-to-one technology did increase student motivation to achieve academic success in reading and math. However, it was interesting to note that only 38.5% of educators stated that they use the iPad as an instructional tool on a daily basis in math and reading.

Research Question Two

- Which technology apps provided the greatest motivation in the intermediate elementary classroom?

Student Survey Findings

Table 4.57

Outside of Using the iPad For Course-Work, Have You Found Yourself Using the iPad to Look up Supplementary Academic Materials?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	82	69.5	76.6	76.6
	Unsure	17	14.4	15.9	92.5
	No	8	6.8	7.5	100.0
	Total	107	90.7	100.0	
Missing	System	11	9.3		
Total		118	100.0		

Table 4.58

Descriptives - Outside of Using the iPad For Course-Work, Have You Found Yourself Using the iPad to Look up Supplementary Academic Materials?

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
MAP Reading Growth	Yes	79	6.2278	6.79923	.76497	4.7049	7.7508	-15.00	21.00
	Unsure	14	8.3571	6.73232	1.79929	4.4700	12.2443	-3.00	23.00
	No	7	11.4286	14.25783	5.38895	-1.7577	24.6149	-1.00	37.00
	Total	100	6.8900	7.53697	.75370	5.3945	8.3855	-15.00	37.00
MAP Math Growth	Yes	79	8.5190	8.46541	.95243	6.6228	10.4151	-13.00	22.00
	Unsure	14	9.3571	6.72089	1.79623	5.4766	13.2377	-1.00	21.00
	No	7	15.1429	11.26097	4.25625	4.7282	25.5575	4.00	37.00
	Total	100	9.1000	8.54046	.85405	7.4054	10.7946	-13.00	37.00

Table 4.59

ANOVA - Outside of Using the iPad For Course-Work, Have You Found Yourself Using the iPad to Look up Supplementary Academic Materials?

		Sum of Squares	df	Mean Square	F	Sig.
MAP Reading Growth	Between Groups	208.963	2	104.481	1.872	.159
	Within Groups	5414.827	97	55.823		
	Total	5623.790	99			
MAP Math Growth	Between Groups	283.207	2	141.604	1.980	.144
	Within Groups	6937.793	97	71.524		
	Total	7221.000	99			

Table 4.60

Post Hoc Tests - Outside of Using the iPad For Course-Work, Have You Found Yourself Using the iPad to Look up Supplementary Academic Materials?

Dependent Variable	(I) Outside of using the iPad for course-work, have you found yourself using the iPad to look up supplementary academic materials?	(J) Outside of using the iPad for course-work, have you found yourself using the iPad to look up supplementary academic materials?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
MAP Reading Growth	Yes	Unsure	-2.12929	2.16656	.589	-7.2862
		No	-5.20072	2.94641	.187	-12.2138
	Unsure	Yes	2.12929	2.16656	.589	-3.0276
		No	-3.07143	3.45862	.649	-11.3037
	No	Yes	5.20072	2.94641	.187	-1.8124
		Unsure	3.07143	3.45862	.649	-5.1609
MAP Math Growth	Yes	Unsure	-.83816	2.45239	.938	-6.6754
		No	-6.62387	3.33512	.121	-14.5622
	Unsure	Yes	.83816	2.45239	.938	-4.9991
		No	-5.78571	3.91491	.306	-15.1041
	No	Yes	6.62387	3.33512	.121	-1.3145
		Unsure	5.78571	3.91491	.306	-3.5326

The analysis indicated that 76.6% of students used their iPad to look up supplementary academic materials while 23.4% of students stated they were unsure or selected no. The results from table 4.58 suggested students who used the iPad to look up supplemental academic materials produced higher mean RIT scores in reading while students who did not look up

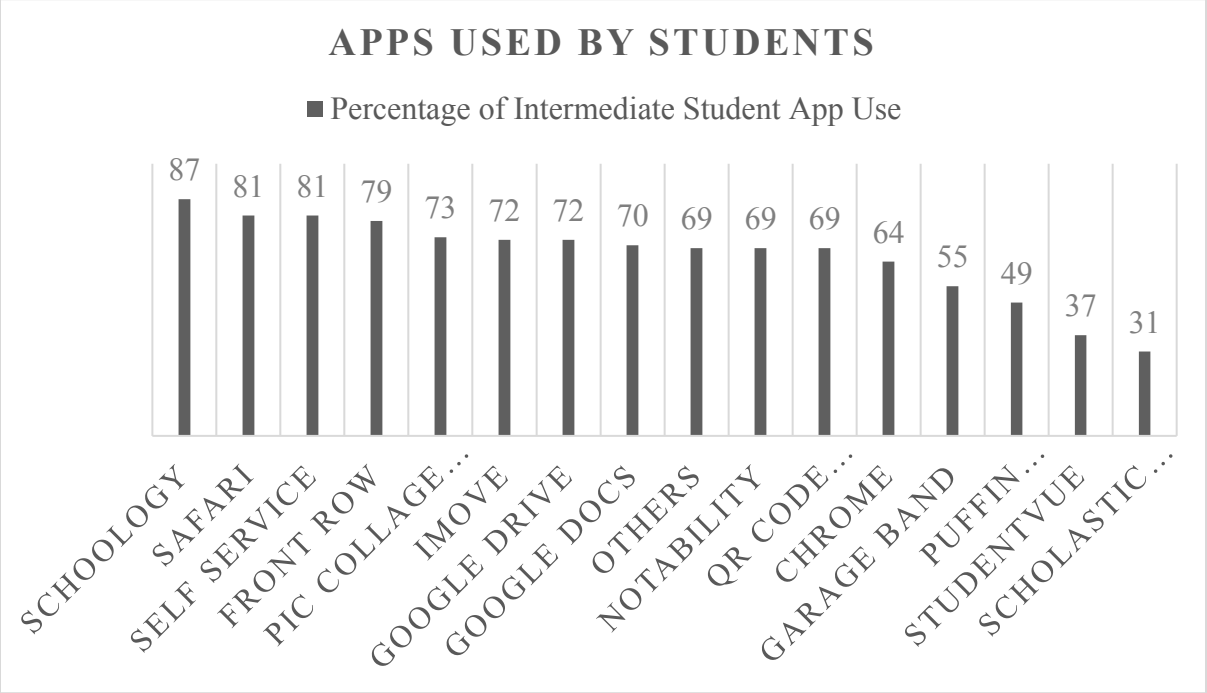
supplemental materials showed higher growth and mean RIT scores in math. These findings were surprising because all the intermediate educators used some form of supplemental academic material with their students.

For example, educators commonly used the Schoology app to house different links for supplementary materials. Educators would post hyperlinks to different websites such as YouTube, online practice assessments, and other educational websites. Because students did not have access to the YouTube app, educators would place hyperlinks to YouTube clips for students to access. Educators would also post anchor charts along with other PDF materials such as math homework. Students were given the choice to complete assignments online or on traditional paper and pencil. Students who completed math homework online used the Notability app. Assignments were turned in to Schoology from the Notability app while also being backed up in the Google Drive app. Educators could also place links to reading assignments that would open in Google Docs in a preview format. Students then moved their own copy of the assignment into Schoology.

The results could be due to several factors. First, not all intermediate students realized that they were working on supplementary academic materials daily. Secondly, students did not understand what the world supplementary truly meant. Lastly, students did not always participate in the supplementary work time due to the urban/suburban elementary PreK-5 school pullout schedule.

Figure 4.12

Apps Used by Students



Intermediate students participating in the one-to-one technology program do not have access to the Apple app or iTunes store. All students in the district were given their own email address. District staff were the only ones who have an Apple ID attached to their iPads. Instead, the school district created the Self Service app to house all of the approved apps that students in fourth through twelfth grade could download. Educators did have access to the Apple app store, iTunes store, and Self Service app. However, educators did not have access to place an app on a students' iPad that could not be found in the Self Service app. Apps that had been placed in Self Service were approved by a district-led committee of educators, technology specialists, and district-level supervisors. The Self Service app had multiple categories within it to make searching for a specific app easier. Due to the one-to-one iPads only having 16GB, the number of apps allowed on a students' iPad was limited and varied from educator to educator.

The analysis indicated that intermediate students were using a wide variety of apps within the intermediate classrooms. These findings were unexpected because some of the apps listed above were used by every student. For example, the 118 students who completed the survey used their iPads. To access the survey, students first had to use the Self Service app to search for and download the QR code reader app. This could suggest that students might have rushed through the question when answering.

It was fascinating to note that only 37.3% of students stated that they used the StudentVue app since this app allows students to view their grades and monitor assignment completion. The findings suggested that not every intermediate educator may have fully switched over to the online grading system, Synergy, that was implemented, but not fully mandated, during the academic year 2016-2017.

Since students voluntarily selected the apps they chose to use, the researcher made the assumption that students were more motivated to use those apps, or found those apps more motivating. The top eight apps used by students were: Schoology, Safari, Self Service, Front Row, Pic Collage for Kids, iMovie, Google Docs, and Google Drive. These apps, which were frequently selected for use, likely helped increase academic motivation with students to achieve higher academic success in math and reading.

Student Survey Discussion

The results presented for the second research question suggested that educators need to be very mindful regarding the apps that were chosen to assist in enhancing lessons or completing assignments. Future research could examine which specific apps used on the iPad provided the highest MAP RIT mean growth in math and/or reading.

In examining the data, the research indicated that only 87.3% of students stated that they have used the Schoology app. The results may be due to several factors: first, it was possible that some intermediate educators did not use the Schoology app due to this being their first year implementing one-to-one technology into their classrooms. Secondly, students may have rushed through the list of apps as 12.7% of students did not answer. Lastly, intermediate educators may have selected a different app for students to access their assignments.

Analysis of the responses revealed that a combination of apps likely were used to provide motivation for students to complete assignments and projects. For example, an educator combined the Schoology app for students to find their assignments, the Google Docs app to create and complete reading assignments, while using the Notability app to complete math assignments. Students then used the Google Drive app to store, organize, and back up assignments. Finally, students used the StudentVue and Schoology apps to communicate with students regarding grades and assignments. The educator would also use the ParentVue, Schoology, and email apps to communicate grades and assignments with parents/guardians. Other apps that educators would use in the combination would be the Pic Collage for Kids and iMovie apps to create and complete multiple projects for other subjects.

The findings also suggested that intermediate educators were not set on only using the same apps repeatedly. The 69.1% of students selecting "Other" may indicate that educators were continually in search of the next app that could be used to motivate students to achieve higher academic success in math and reading.

Educator Survey Findings

Figure 4.13

Apps Used by Educators

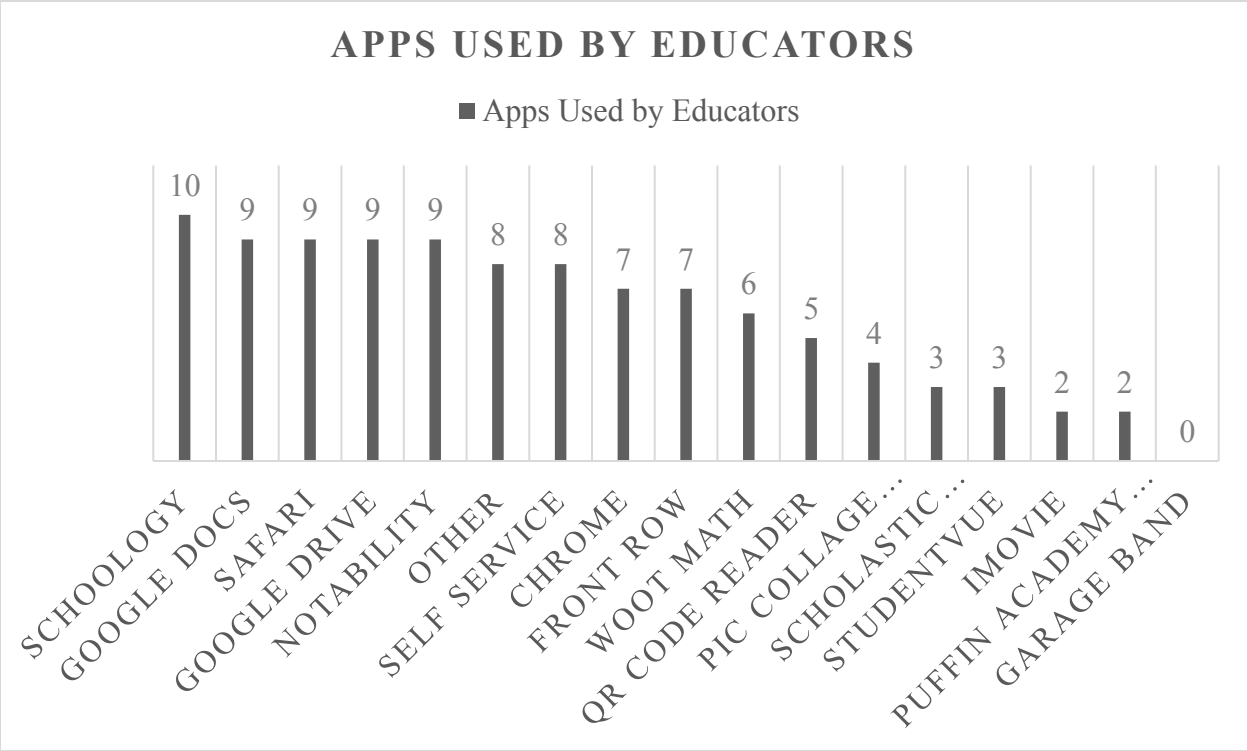
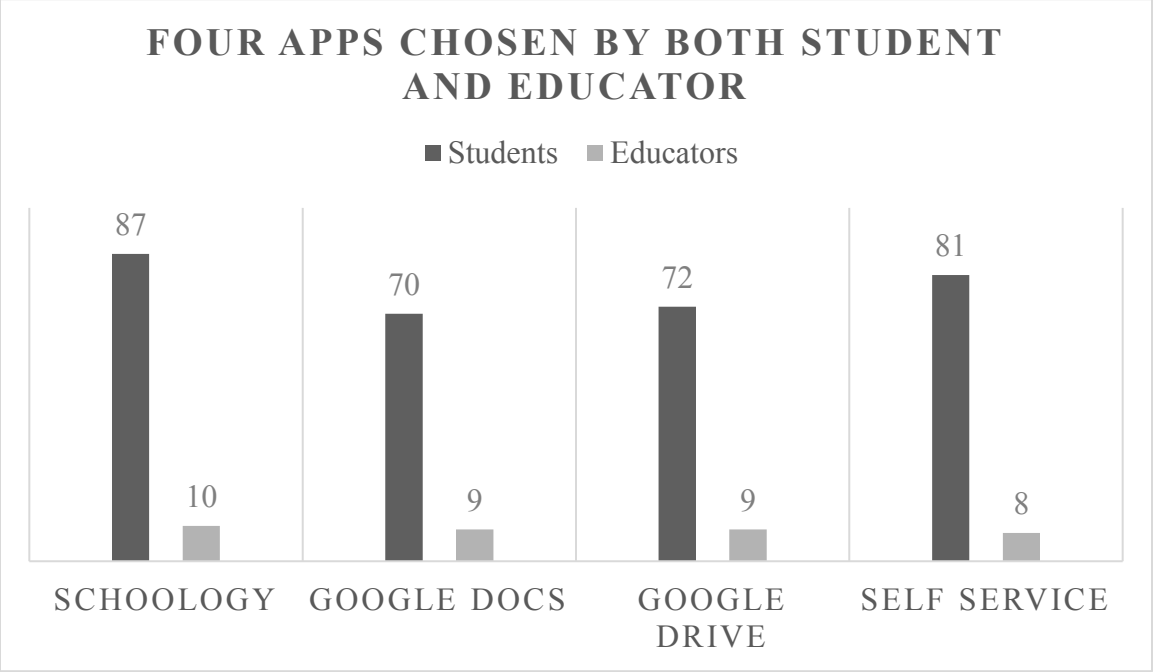


Figure 4.14

Apps Chosen by Both Student and Educator



Educator Survey Discussions

The apps used by educators themselves were used to communicate, create, deliver lessons, and design assignments and projects. An analysis of the responses from table 4.13 revealed comparable results to figure 4.12; educators responding very similarly to students. In determining the results for the second research question the researcher made the assumption that the top eight apps used the most were the most motivating. The top eight apps used by educators were: Schoology, Safari, Self Service, Front Row, Pic Collage for Kids, iMovie, Google Docs, and Google Drive. Four of the top eight apps in figure 4.11 were also selected by intermediate educators; Schoology, Google Docs, Google Drive, and Self Service.

The results suggested that there could be a variety of additional apps that could aid in motivating intermediate students to achieve higher academic success as shown by the selection

of, “Other.” An example of this would be the use of the Classroom app. The Classroom app turns the educator’s iPad into a, “…powerful teaching assistant, helping a teacher guide students through a lesson, see their progress, and keep them on track” (Apple Inc, 2017). Through a Bluetooth connection using the Classroom app, educators could see, in real time, the apps students were using, lock iPads and refocus students, and see what students see with the Screen View feature. The findings also suggested that intermediate educators were not set on only using the same apps repeatedly.

Summary

- Research Question one. The present study indicated that the use of one-to-one technology in the intermediate classrooms showed that both students and educators found the iPad motivating. However, the MAP data did not show a consistent positive impact on math and reading achievement. The findings that were significant were indicated in three separate ANOVA analysis of MAP math growth for questions eight (0.035), question 10 (0.014), and question 11 (0.023).
- Research Question two. The present study indicated that the most popular of apps for students were: Schoology, Safari, Self Service, Front Row, Pic Collage for Kids, iMovie, Google Docs, and Google Drive. The researcher interpreted this to mean they provided the greatest amount of motivation in the intermediate elementary classroom. The most popular apps for educators were: Schoology, Google Docs, Safari, Google Drive, Notability, Other, Self Service, and Chrome. The four apps that appeared in both lists were: Schoology, Google Docs, Google Drive, and Self Service. In determining the results for the second research question the researcher made the assumption that the top eight apps used the most were the most motivating.

Chapter V: Discussion, Implications, Recommendations

The purpose of Chapter V was to overview the study; state the two research questions, and discuss the final analysis, conclusions; implications; recommendations for practitioners; recommendations for academics, and concluding comments.

Overview of the Study

Over the past few decades, the arena of education has been transformed with the incorporation of technology. "Mobile devices are being integrated into the classroom at a rapid rate; however, teachers are finding it difficult to incorporate these devices into the classroom" (Kolarcik, 2013, p. 101). Technology has drastically changed the way educators prepare lessons, deliver instruction, share resources, communicate with all stakeholders, and motivate students to achieve higher academic success; one-to-one technology has changed the intermediate classroom. Hanlon (2015) believed that when students were engaged, listening, and experiencing positive lessons it could help to establish emotional bonds between the student and educator, further encouraging the educator to incorporate more motivational lessons. By establishing this link, deeper understanding of the topic could lead to higher academic success.

The purpose of this study was to dive deeper and explore the inner workings of how one-to-one technology was currently being used in the intermediate elementary classroom to help engage, motivate, build confidence, train students in the use of technology, and document the impact on academic achievement. The targeted population was fourth-grade and fifth-grade students from one PreK-5 elementary school. It was hoped that instructional strategies as well as classroom environment would be improved as a result of this study.

The further purpose of this study was to discover how the added value of one-to-one technology programs could motivate students in intermediate classrooms to higher academic achievement. Even with educational funding sometimes being cut dramatically across the board, technology continues to find a way into classrooms. Tablets and other digital technology became less expensive, more user-friendly, smaller, faster, more powerful and more abundant. The perceived purpose of technology in education did change, and so have the perceptions of what educators could be learning, doing, and teaching with technology (Bebell, Russell, & O'Dwyer, 2004; Mandinach, Honey, & Culp, 2005). Exceptional educators adapt to almost all learning environments. However, teaching in a one-to-one laptop or mobile tablet program demanded a few more skills and capabilities than the traditional classroom.

Students' spring-to-spring NWEA MAP math and reading RIT scores were used for the academic years 2015-2016 and 2016-2017. RIT scores were collected to measure if the use of one-to-one technology helped to motivate students to achieve higher academic success. A series of one-way ANOVAs were used with the four dependent variables (fourth-grade and fifth-grade students' motivation, MAP reading & math scores, students' motivation levels towards higher achievement in math and reading) to answer the research questions.

The results from the Statistical Package for the Social Sciences (SPSS) test through a series of one-way ANOVAs, independent two-tailed t-tests, and one-tail chi-square analyses with the four dependent variables (MAP reading & math scores from academic year 2016-2017) were used to determine if a significant difference was indicated. A chi-square and independent t-test were used to determine the relationship between gender and grade levels. A one-way ANOVA was used to determine the relationship between MAP reading and math growth and different sub-groups of students. A multiple regression analysis was used to measure the impact on math and

reading scores. A 95% confidence level was used for analysis. The level of statistical significance was set at 0.05.

Research Questions and Conclusions

Guiding the research and data collection of this study, were the following questions:

1. What are the reported impacts of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?
2. Which technology apps provided the greatest motivation in the intermediate elementary classroom?

Question One Findings

Figure 5.1

Summary Chart of Research Question One

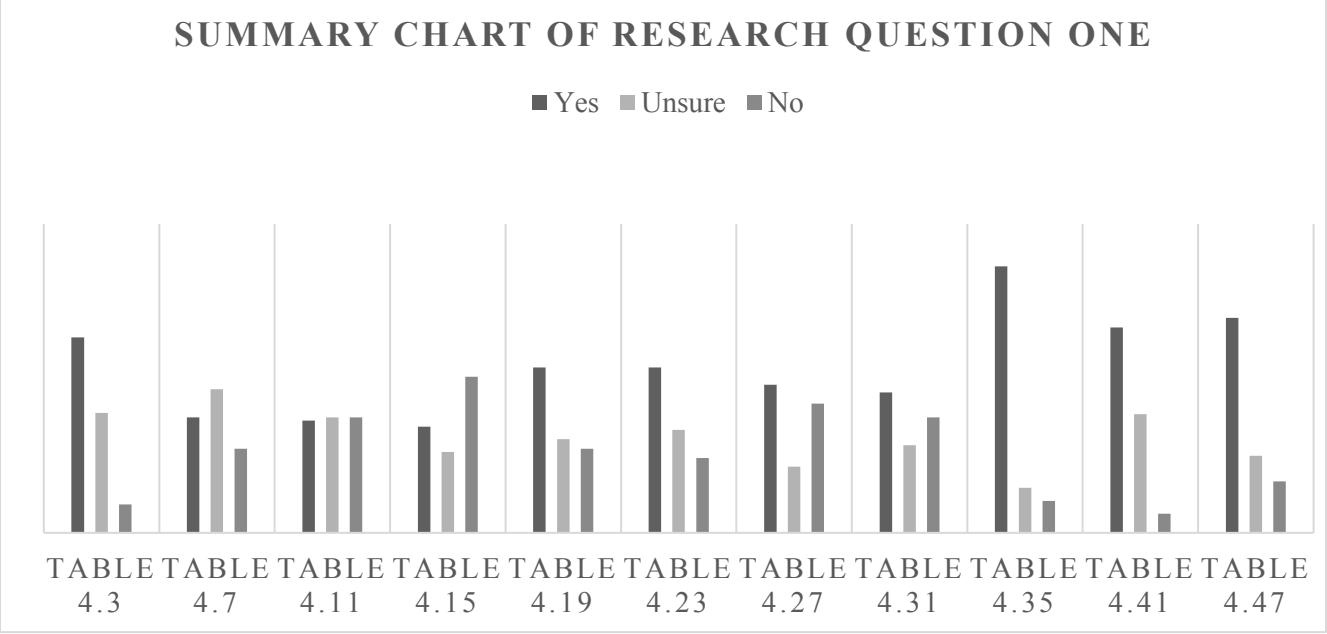


Table 4.3 – Are You More Motivated to Read Course-Work Using the iPad?

Table 4.7 – Do You Read More or Less Often When Using the iPad?

Table 4.11 – When Reading Course Materials in Any Format (Paper, iPad, or Other) Do You Find Yourself Easily Distracted?

Table 4.15 – Do You Find Yourself More Distracted When Reading on the iPad to Traditional Printed Papers?

Table 4.19 – Does Having the iPad Motivate you to Complete Reading Homework?

Table 4.23 – Does Having the iPad Motivate you to Complete Word Sort Work (Spelling) Homework?

Table 4.27 – Does Having the iPad Motivate you to Complete Math Homework?

Table 4.31 – Would you be More Motivated to Complete Your Math Bookwork on the iPad?

Table 4.35 – Would You Recommend That the District Continue Use of the Apple iPad For Future Students or Select Another Device?

Table 4.41 – The Use of Digital Technology (i.e. iPad and Laptops) Motivated me to Achieve Higher Academic Success in Reading?

Table 4.47 – The Use of Digital Technology (i.e. iPad and Laptops) Motivated me to Achieve Higher Academic Success in Math?

Question One Conclusion

The findings for the first research question found that students stated they were motivated to achieve higher academic success in math and reading. Student motivation was directly related to whether or not the time and effort invested was worthwhile, and most unmotivated students feel alienated from school. "Effective teaching transcends merely imparting knowledge and relies, to a considerable extent, on educators' ability to motivate students to learn. Any characterization of learning that disregards the role of motivation and interest was shortsighted at best and destructive at worst" (Jaongo, 2007, p. 395). However, the actual MAP results did not show gains in most cases. A significant difference in NWEA MAP assessments was measured with a one-way ANOVA (0.042) for question number six. However, the Tukey's post hoc test

did not reveal significant differences between any of the groups. These types of results could occur when the omnibus *F* test was just barely statistically significant. Further examination suggested that significant differences were indicated in three separate ANOVA analysis of MAP math growth for question eight (0.035), question 10 (0.014), and question 11 (0.023).

Fullan (2005) argued that to change the system, the context within the system must be changed. The use of one-to-one technology contributes to this by removing the fundamental control of learning from educators and placing it in the hands of every student within the classroom.

According to the 2016- 2017 NWEA MAP math and reading growth means, the results showed that intermediate student growth was above and below the 2015 NWEA student growth norms (see Appendix G).

The student growth norms for fourth-grade were 11.6 in math and 7.8 in reading. The 2016 MAP math RIT was 221.96 and decreased to 212.33. This was a reduction of 9.63 RIT points compared to the national student math growth norm of 11.6. Fourth-grade students' 2016 MAP reading RIT mean was 211.20 and decreased to 203.30 in 2017. Once again, this was a reduction of 7.90 RIT points compared to the national student reading growth norm of 7.8. This suggested that in the first year of one-to-one iPad implementation, fourth-grade students were below the math and reading norm scales. The decrease in RIT scores might be due to additional variables that could not be controlled such as turnover of educators that likely impacted academic performance.

The student growth norms for fifth-grade were 9.9 in math and 6.1 in reading. The 2016 MAP math RIT mean was 223.35 and increased to 230.16. This was a difference of 6.81 RIT points compared to the national math growth norm of 9.9. Fifth-grade students' 2016 MAP

reading RIT mean was 212.53 and increased to 218.85. This was a difference of 6.32 compared to the national student growth reading norm of 6.1. It was interesting to note that during the second year of one-to-one iPad technology, fifth-grade students were above the reading norm scale by +0.22 while showing 3.09 RIT points below the math norm scale.

An analysis of the responses revealed that students and educators surveyed in this study, strongly agreed that iPads were motivating however, the MAP scores did not demonstrate increased achievement. The hope was that with more time, when all curricula were adjusted to fully integrate the technologies, when the optimum apps were found and when staff turnover had stabilized, MAP scores would rise. Future studies could focus on those variables. It was also important to recognize that there were many reasons to consider one-to-one adoptions, other than increasing math and reading performance. Future studies could also focus on those reasons as well.

Question Two Findings

Figure 5.2

Apps Used by Students

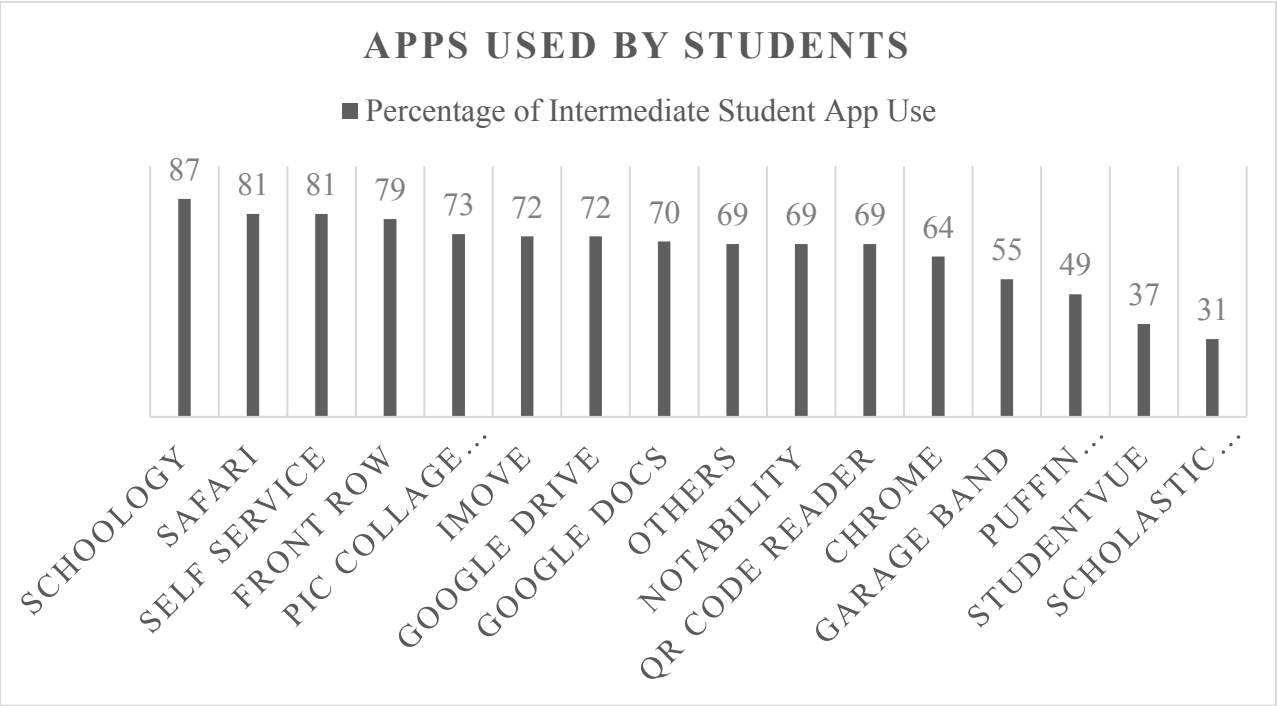


Figure 5.3

Apps Used by Educators

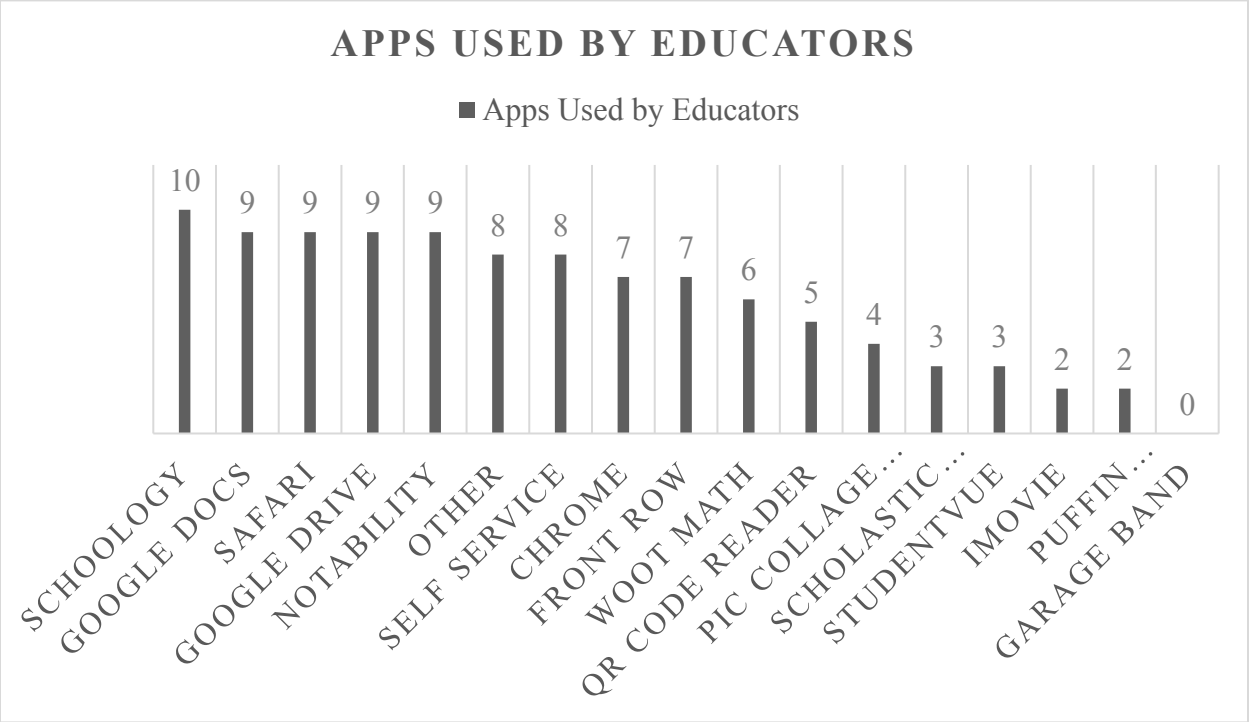
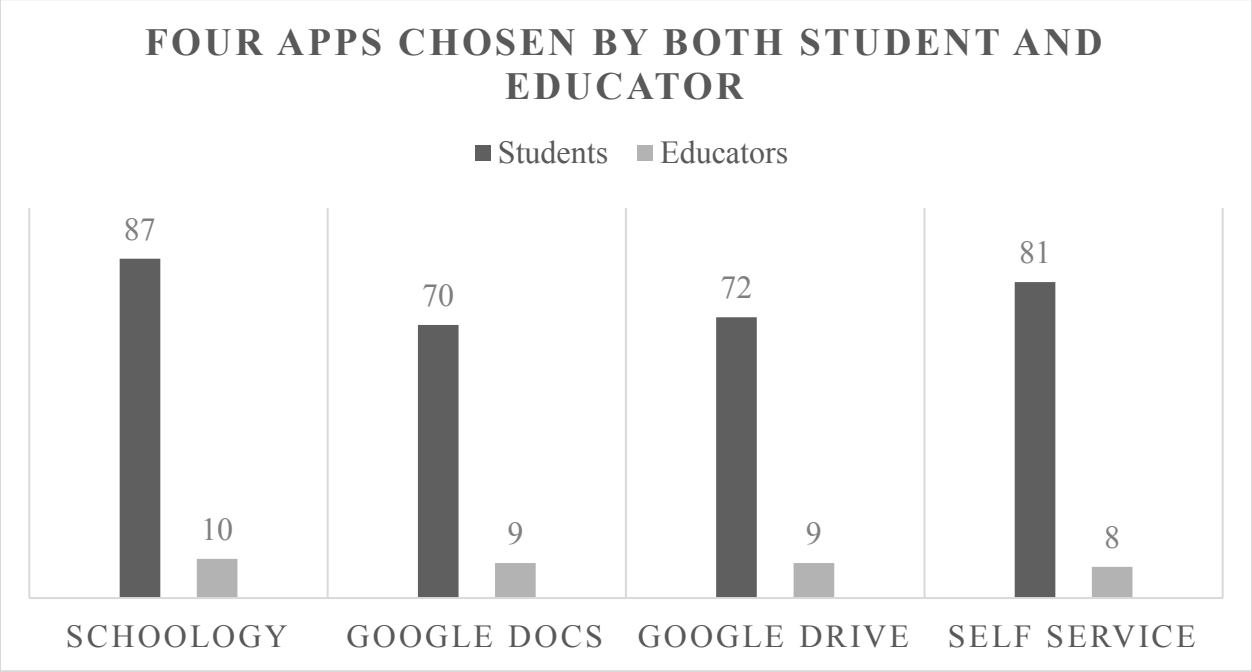


Figure 5.4

Apps Chosen by Both Students and Educators



Question Two Conclusion

An analysis of the results for the second research question suggested that educators need to be very mindful regarding which apps they were chosen to assist in enhancing lessons or completing assignments. Gullen and Zimmerman (2013) found that, "Teachers infuse technology into the classroom most successfully when they find new ways to enhance current practices, leveraging technology's ability to help them connect, collaborate, and enrich" (p. 66). Since students voluntarily selected the apps they chose to use, the researcher made the assumption that students were more motivated to use those apps, or found those apps more motivating. The results showed that the top eight student apps were: Schoology, Safari, Self Service, Front Row, Pic Collage for Kids, iMovie, Google Docs, and Google Drive. The top eight educator apps were Schoology, Google Docs, Safari, Google Drive, Notability, Other, Self

Service, and Chrome. Four of the top eight apps used, overlap between students and educators: Schoology, Google Docs, Google Drive, and Self Service. The present study indicated that intermediate educators were not set on only using the same apps repeatedly as shown by the choice of "Other" appearing in the top eight apps used by educators. The district's use of the Self Service app helped to regulate which apps students were able to download and helped to insure that only appropriate educational apps were used.

Shechtman (2002) stated that there was a correlation between student academic achievement and social performance. For academic achievement to improve the social and emotional aspects of a child need to be addressed. This development of the necessary skills that structure the fundamentals of academic success allowed them to concurrently develop personal knowledge and afford them the opportunity to express success in school and in the future. Moreover, learning that was relevant to the lives of students addresses both their personal and social concerns. Relevance was crucial to engagement in that students, as digital natives, could make a connection between knowledge and how it could realistically be applied to their everyday existence.

It was the researcher's intention that the knowledge gained from this study would produce new awareness on how intermediate educators utilized the iPad to successfully encourage students to achieve higher academic achievement in math and reading. Thus, the apps listed in this study appeared to provide the greatest motivation in the intermediate elementary classroom for this school.

Limitations

Limitations within the study and data include:

- Findings were specific to one Midwest PreK-5 elementary school with three fourth and three fifth-grade classrooms.
- This study was limited in that the NWEA MAP math and reading assessment was the only assessment used to determine two years of growth; other subjects were not measured and no other assessments were used.
- This study was limited by time, as only two years of data was analyzed.
- This study was limited as a quantitative approach was the only method used. This quantitative study focused only on spring-to-spring NWEA MAP math and reading assessment growth results and not qualitative factors that may also have an impact on students' growth and learning.
- This study was limited by not analyzing educators' effectiveness as this is beyond the scope of this study. Intermediate students may or may not have equal expected achievement levels based on assigned educators.
- This study was limited in that one-to-one iPad use did vary from educator to educator.
- This study was limited in that not all intermediate students who voluntarily completed the survey answered every question or added their 2016 and 2017 NWEA MAP math and reading RIT scores.
- The study was limited in that not all students used one-to-one technology outside of the PreK-5 elementary school.
- Finally, this study was limited because of the impact of not all students having access to WIFI technology outside of school to view supplementary academic materials, assignments, and projects.

Implications

Prior to one-to-one technology in the intermediate classrooms, educators were struggling to find a fair way to share two computer labs, two laptop carts, and one iPad cart. The struggle would intensify as the calendar moved closer to, "testing season" when everyone was attempting to get one more assignment that was technology based accomplished. However, once the one-to-one technology program was implemented, the struggle disappeared and the focus shifted to finding ways to enhance the curriculum to make all students technologically literate in an ever-changing digital world (Clarke & Zagarell, 2012).

Mobile learning technologies coupled with ubiquitous computer use, according to Shih and Mills (2007), were driving technology mediated teaching and learning because these innovations would "connect people in information-driven societies effectively and offer the opportunity for a spontaneous, personal, informal, and situated learning situation" (p. 2). While the use of one-to-one technology was reported by educators and students to be motivating, the MAP scores did not support the findings. Wang and Eccles (2013) found that when educators provided constant structure, set clear expectations, and adjust instructional strategies to the level of the student, their students demonstrated both motivation and increased student engagement. With time, adjusted curricula, optimal apps being found, and staff stabilization, MAP scores possess the potential to show positive growth. The reported increase in motivation could manifest itself in other content areas that were not measured in this study or perhaps in math and reading with more time.

The results also indicated that educators were not set in only using a set quantity of apps. Instead the findings suggest just the opposite. Knowing that technology changes at a very fast pace, educators need to be vigilant when it comes to incorporating technological tools. For

students to be academically successful they need to be engaged in active learning. Active learning takes place when adolescents were active participants in the discovery of knowledge (Bishop & Pflaum, 2005b). While traditional instruction often continues to be used in math and reading instruction, the addition of one-to-one technology showed an increase of students looking up supplemental academic materials, completing math and reading homework, and served as a motivating factor for students.

Recommendations for Practitioners

Through implementation of one-to-one technology, students indicated advantages, such as being more motivated to look up supplementary academic materials that helped them to complete and turn in assignments. The literature review also found the iPad to be a beneficial tool for learning and teaching (Hinrich, 2012; Melhuish & Falloon, 2010). The findings further revealed the importance of technology integration within the curricula. Educators in this study indicated that digital technology was being used 3/4 of the time during reading, word work (spelling), and math lessons.

Recommendations for classroom educators, administrators, and district personal were as followed:

- Educators, administration, and district personal would benefit from having an app similar to Self Service where district approved apps could be downloaded from a controlled environment.
- Educators, administration, and district personal should look beyond the first year of a one-to-one adoption to measure academic growth since scores dropped in both subjects at both grade levels in the first year. However, it appeared that in the second year of the fifth-grade adoption, scores rose to an all-time high.

- Educators, administration, and district personal would be wise to not assume that implementing one-to-one technology alone would improve student mathematics and reading achievement on district or state level assessments.
- Educators might set time aside to get comfortable with the one-to-one technology that could be used within their classroom to better prepare them for the type of questions that students and parents/guardians could ask. This would include having a list of apps that were and were not successful.
- Educators could research successful apps others have used in their classrooms to engage and motivate students.
- Educators should continuously be on the lookout for new apps to help engagement and motivation.
- Educators should be aware that having new apps was also valuable to provide options for students and that those apps could be novel and motivating.
- Schools might consider adopting the top eight app identified in this study – especially the top four that were used most by educators and students.
- Schools could find it advantageous to revise the curriculum as new technology was adopted to ensure better integration of that technology.
- Schools should seek assessments of other subject areas, since only math and reading were measured in this study and the impact of one-to-one iPads on other subjects was not known.
- iPads should be strongly considered for one-to-one intermediate classroom programs since both educators and students highly recommend the continued use of this one-to-one tool.

- Educators should keep an organized list of supplemental materials and have one dedicated place/app where students could access the resources. It should be noted that a number of the top places/apps found in this study to be preferred for housing supplemental materials were cloud-based.
- Educators would be wise to give intermediate students the option to turn in homework online versus requiring paper copies.
- Educators should keep paper copies of all supplemental materials and homework within their classroom for students that lack home Internet access.

Recommendations for Academics

The researcher recommends that further studies be conducted in an effort to increase the understanding of how one-to-one technology changed the dynamic of the traditional classroom to better enhance the learning experiences that could lead to higher engagement and therefore increased achievement among intermediate students. With this premise in mind, educators need to first study how technology could be incorporated to motivate students to want to explore the information from a unique perspective. "One clear indicator of successful 1:1 implementation is a strong commitment to the integration of technology that is communicated, understood, and promoted at all levels of administration" (Lancaster & Topper, 2013, p. 352). Educators who utilize varied teaching strategies make student understanding the center of their instruction (Chapman & Gregory, 2012).

The continued study of how one-to-one technology could be utilized and sustained within the intermediate classroom was essential to the continued growth of student achievement. Miners (2009) encouraged educators to not deceive their students into wanting to learn, instead to create a fun and interesting alternative learning opportunity to motivate the students to learn.

Because using one-to-one technology to motivate intermediate students to achieve higher academic success could still be considered relatively new to research, future quantitative and qualitative research was necessary to explore the following:

- How does parental participation affect students' achievement with one-to-one technology programs?
- How does the impact of individual teacher strategies or styles of teaching affect the effectiveness of an adopted one-to-one technology?
- Can the use of one-to-one technology have a significant impact on other academic areas of student achievement that are not state-assessed (social studies, health, physical education, art, music, 21st century Skills, etc.)?
- How can professional development focus on one-to-one technology motivating students to achieve higher academic success?
- Do specific apps provide more motivation to achieve higher academic success over others?
- Do students receiving free or reduced-priced lunch benefit more or less from one-to-one technology programs?
- Do one-to-one technology programs provide educators the necessary tools to differentiate instruction for everyone or just selective demographics?
- How much of an effect does a one-to-one program have over the traditionally taught classroom when measured by students' academic achievement?
- How much of an effect did a one-to-one program have on students during implementation of the one-to-one program? How many years are necessary to reach maximum impact?

- Would academic improvement increase over time as educators matured in their use of the one-to-one technology?
- Which subjects show the greatest student achievement results when a one-to-one technology program is implemented?
- Which mobile one-to-one device provides the best student achievement results?
- Do lower reading students have a preference between reading from a hard copy or an electronic copy?
- Are students with lower-than-average MAP RIT scores in math and/or reading more or less motivated by the use of technology than students who have higher-than-average MAP RIT scores?
- Finally, does the motivational effect of the iPad decrease over time as the "novelty" of the device wears off?

Figure 5.5

Seven Years of Fourth-grade MAP Data

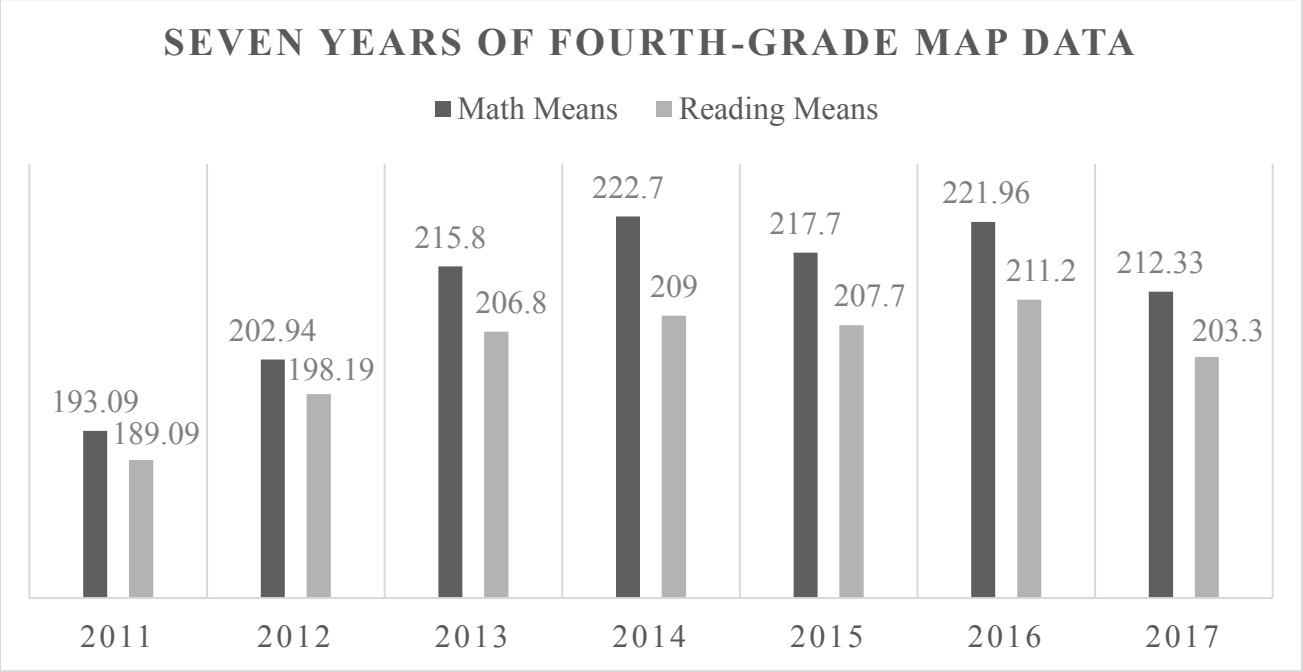
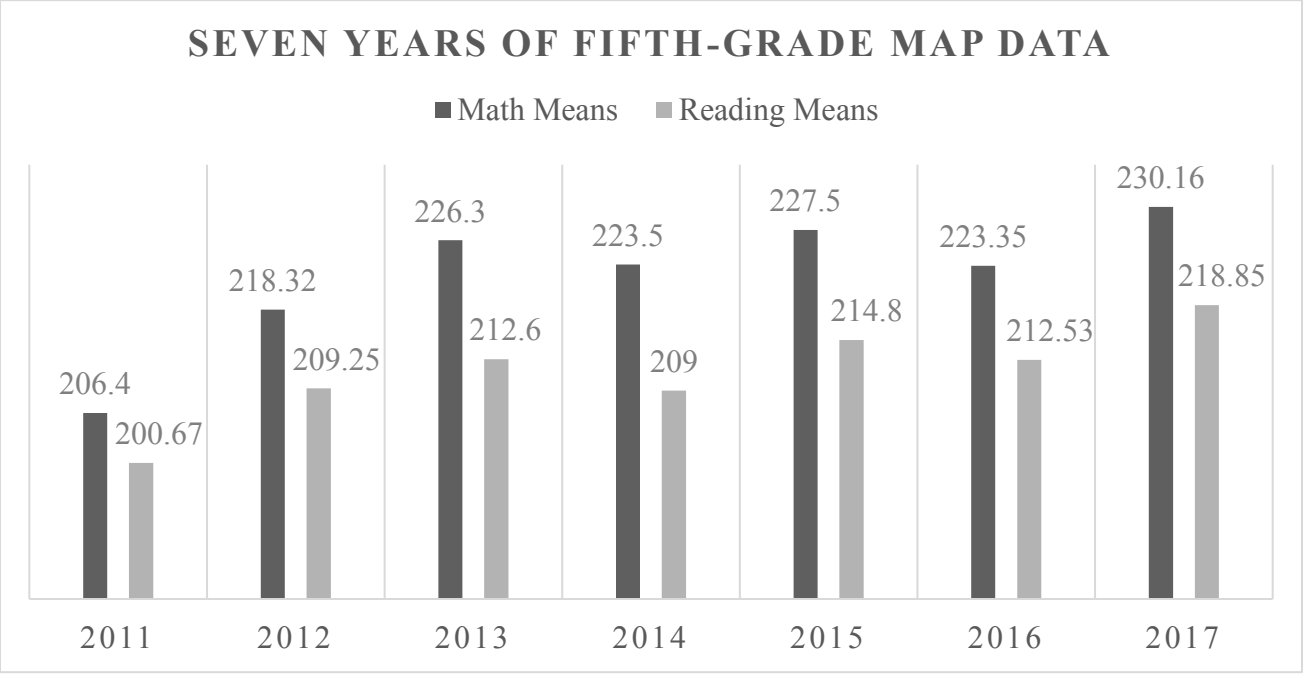


Figure 5.6

Seven Years of Fifth-grade MAP Data



Concluding Comments

In examining the past seven years of MAP math and reading data, figures 5.5 and 5.6, the intermediate students at the urban/suburban elementary PreK-5 school did not show a stable pattern of MAP growth in either subject. More data would be needed to fully document the adoption's impact. It could take four or more years for data to show a trend, and that would be three or more years for fourth-grade and two more years for fifth-grade students. Thus, while the data showed an increase in engagement with intermediate students, the quantitative data was shown to be inconclusive in demonstrating an increase in academic achievement in the subjects of math and reading. However, the second year of the adoption at grade five presents the possibility reading and math academic increases may appear over time.

The one-to-one technology program was first implemented during the academic year 2014-2015 for students in the sixth grade through twelfth grade and has since expanded to include fifth-grade students the following year, and fourth-grade students during the academic year 2016-2017 school year. Parrish reminds us that, "The underlying goal is to use technology to transform instruction, enhance learning, and increase student success" (Parrish, 2010, p. 22). The goal for implementing one-to-one technology was to help engage students with personal learning to accelerate student achievement. The first research question for this study was to determine if one-to-one technology in the intermediate elementary classroom motivated students academically as measured by NWEA MAP math and reading assessment growth over the course of two school years, beginning in the academic year 2015-2016. The second research question for this study was to determine the apps that provided the greatest motivation in the intermediate classroom.

The results for the first research question determined that the use of one-to-one technology was shown not to have a statistically significant impact on motivating intermediate students to achieve higher academic success in math and reading as measured by MAP math and reading academic achievement. The findings also suggested that during the first years of implementation the use of one-to-one technology failed to increase academic achievement instead showing a decrease in all four of MAP assessments completed by intermediate students (the first year of adoption for fourth-grade was the academic year of 2017 and for fifth-grade it was the academic year of 2016). However, the data showed an increase in student-reported engagement, and the second year of the adoption for grade five showed that both the math and reading MAP RIT scores rose to an all-time school high.

This study indicated that the use of one-to-one technology was shown to be statistically significant in favor of engaging students in math and reading. Roschelle (2001) explained that educators were able to engage students in their classrooms actively, encourage group participation, provide frequent interaction and feedback, and make real-world connections through the use of technology in an effort to influence how students learn. Students were more motivated to complete reading and word work (spelling) homework. Students that were more motivated to complete math homework using the iPad showed the highest RIT growth while also posting high RIT scores. Educators and students strongly recommended the continued use of the Apple iPad as the one-to-one technology. Students who recognized the iPad as a motivator to achieve higher academic success in math and reading were among the groups with higher RIT mean scores and growth.

The results for the second research question found the educators were committed to engage and motivate students to achieve higher academic success. The analysis indicated that

educators were using various apps for students to complete assignments and projects instead of the traditional paper and pencil approach. In addition to using technology to influence how students learn, educators also use technology to influence what students learn (Roschelle et al., 2001). The top four student apps were: Schoology, Safari, Self Service, and Front Row. For educators' the top four apps were Schoology, Google Docs, Safari, and Google Drive. Of the top eight apps used, educators and students matched four apps: Schoology, Google Docs, Google Drive, and Self Service. Since students voluntarily selected the apps they chose to use, the researcher made the assumption that students were more motivated to use those apps, or found those apps more motivating. The findings indicated that students who used the one-to-one technology to look up supplementary academic materials achieved high reading RIT mean scores.

In conclusion, the integration of one-to-one technology into intermediate classrooms continues to be on the rise as digital technology remains the direction of where education is headed.

> Technology, of course, doesn't replace a good teacher. It supplements and presents information in a way that allows teachers to move forward at a faster pace. While technology is a powerful tool, the emphasis has to be on content and skill – not tools. (Vail, 2006, p. 16)

The continued study of best practices for incorporating these devices into the various curricula is vital if one-to-one technology programs are to fully engage students with personal learning while continuing to accelerate student achievement.

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Appendix A

(2016/2017 Student Survey)

What is the effect of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?

Which technology application provides the greatest motivation in the intermediate elementary classroom?

Demographics:

1. Gender:
    - Female
    - Male

2. Grade:
    - 4th
    - 5th

Previous Technology Experience:

3. Prior to being in a one-to-one classroom, had you used any type of digital technology? (e.g. iPad, laptop, tablets, iPhone, Android)
    - Yes
    - No

4. If yes, which of the following have you used? (Mark all that apply)
    - Amazon Kindle
    - Apple iPad
    - Barnes & Noble Nook
    - Chromebook
    - Laptop (Apple)
    - Desktop (Apple)
    - Laptop (PC)
    - Desktop (PC)
    - Apple iPhone or iPod Touch
    - Android Phone
    - Others: Please list

Reading and completing of course material on one-to-one technology compared to traditional printed out materials

5. Are you more motivated to read course-work using the iPad? (1)
    - Yes
    - Unsure
    - No

6. Do you read more often or less often when using the iPad? (1)
    - More often
    - About the same
    - Less often
    - I don't read course materials on the iPad

7. When reading course materials in any format (paper, iPad or other) do you find yourself easily distracted?
    - Yes
    - Unsure
    - No

8. Do you find yourself distracted when reading on the iPad compared to traditional printed papers? (1)
    - Yes
    - Unsure
    - No

9. Please explain why you think that you are more or less distracted? (1)

10. Does having the iPad motivate you to complete reading homework? (1)
    - Yes
    - Unsure
    - No

11. Does having the iPad motivate you to complete word sort work (spelling) homework? (1)
    - Yes
    - Unsure
    - No

12. Please explain why you think that you are more or less motivated? (1)

13. Does having the iPad motivate you to complete math homework? (1)
    - Yes
    - Unsure
    - No

14. Please explain why you think that you are more or less motivated? (1)

15. Would you be more motivated to complete the math bookwork on the iPad? (1)
    - Yes
    - Not sure
    - No

16. Please explain why you think that you are more or less motivated? (1)

Using technology as an academic tool

17. Outside of using the iPad for course-work, have you found yourself using the iPad to look up supplementary academic materials (i.e. dictionary, Front Row, Puffin Academy, Scholastic Magazines, other reference type sources)? (2)
    - Yes
    - Unsure
    - No

18. Which of the following apps do you use on your iPad? Select all that apply. (2)
    - Schoology
    - Front Row
    - Puffin Academy (Think Central)
    - Scholastic Classroom Magazine
    - iMovie
    - Google Docs
    - Google Drive
    - Notability
    - StudentVue
    - Pic Collage for Kids
    - QR Code Reader
    - Self Service
    - Chrome
    - Safari
    - GarageBand
    - Others: Please list them

19. Please list any other education apps, not listed in question 18, that you use on your iPad.

20. Would you recommend that the district continue use of the Apple iPad for future students or select another device?(1) (2)
    - Yes
    - Unsure
    - No

Academic Motivation

21. The use of digital technology (i.e. iPad and laptops) motivated me to achieve higher academic success in reading? (1)
    - Yes
    - Unsure
    - No

22. The use of digital technology (i.e. iPad and laptops) motivated me to achieve higher academic success in math? (1)
    - Yes
    - Unsure
    - No

MAP Scores:

23. Please enter your 2016 MAP reading score.

24. Please enter your 2016 MAP math score.

25. Please enter your 2017 MAP reading score.

26. Please enter your 2017 MAP math score.

Free and Reduced Lunch:

27. I receive free or reduced lunch?
    - Yes
    - Unsure
    - No

Appendix B

(2016/2017 Educator Survey)

What is the effect of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement? (1)

Which technology application provides the greatest motivation in the intermediate elementary classroom? (2)

Demographics:

1. Gender:
    - Female
    - Male

2. I teach:
    - 4th Grade
    - 5th Grade
    - Support Staff

Use of one-to-one technology in the classroom:

3. In your opinion, how effective is the iPad as an instructional tool for your students during language arts? (1)
    - Very effective
    - Effective
    - Somewhat effective
    - Not effective at all
    - A distraction to students

4. In your opinion, how effective is the iPad as an instructional tool for your students during math? (1)
    - Very effective
    - Effective
    - Somewhat effective
    - Not effective at all
    - A distraction to students

5. How frequently do you use the iPad as an instructional tool for language arts? (1)
    - Daily
    - Multiple times a week but not daily
    - Weekly
    - Less than weekly
    - Not at all

6. How frequently do you use the iPad as an instructional tool for math? (1)
    - Daily
    - Multiple times a week but not daily
    - Weekly
    - Less than weekly
    - Not at all

7. Which of the following are **advantages** when using one-to-one technologies for instruction? (Select all that apply)
    - Online access to curriculum
    - Ability to save work and reuse
    - Ability to create engaging lessons
    - Ability to send students information quickly (Schoology or email)
    - Ability to receive students completed assignments (Schoology or email)
    - Ability to communicate with students (i.e. clarifications or help)

8. Which of the following are **disadvantages** when using one-to-one technologies for instruction? (Select all that apply)
    - Ability to print selected readings
    - Supplemental media linked to need to be supported for iPad
    - Lack of flash support
    - Technology issues (Broken iPad, Schoology issues, Online curriculum issues)
    - Amount of time needed to create engaging lessons
    - Lack of technology support
    - Not all students having Internet access outside of school
    - Lack of training
    - Student behavior

9. In your opinion, are your students more or less distracted when reading on the iPad compared to paper? (1)
    - Much more distracted
    - More distracted
    - No difference
    - Less distracted
    - Much less distracted

10. In your opinion, does having the iPad motivate your students more or less when it comes to completing reading homework? (1)
    - Much more motivated
    - More motivated
    - No difference
    - Less motivated
    - Much less motivated

11. In your opinion, does having the iPad motivate your students more or less when it comes to completing math homework? (1)
    - Much more motivated
    - More motivated
    - No difference
    - Less motivated
    - Much less motivated

12. Outside of using the iPad for course-work, how often have you observed your students using the iPad to look up supplementary academic materials (i.e. dictionary, Front Row, Puffin Academy, Scholastic Magazines, other reference type sources)? (1) (2)
    - Very frequently
    - Frequently
    - Occasionally
    - Rarely
    - Not at all

13. Would you recommend that the district continued use of the Apple iPad for future students or another device? (2)
    - Prefer the iPad
    - Would prefer other device
    - Indifferent (any tablet or laptop)
    - None. Would not recommend the use of any one-to-one digital device

14. If you selected "would prefer other device," what type of digital technology would you recommend for students to use?
    - Android tablet
    - Laptop Computer (Apple)
    - Laptop Computer (PC)
    - Chromebooks
    - Other types: Please list

15. Which of the following apps do you use on your iPad? Select all that apply (2)
    - Schoology
    - Front Row
    - Puffin Academy (Think Central)
    - Woot Math
    - Scholastic Classroom Magazine
    - iMovie
    - Google Docs
    - Google Drive
    - Notability
    - StudentVue
    - Pic Collage for Kids
    - QR Code Reader
    - Self Service
    - Chrome
    - Safari
    - GarageBand
    - QR Reader
    - Calculator
    - Others: Please list them

Academic Motivation

16. The use of digital technology (i.e. iPad and laptops) motivates my students to achieve higher academic success in reading? (1)
    - Yes
    - Unsure
    - No

17. The use of digital technology (i.e. iPad and laptops) motivates my students to achieve higher academic success in math? (1)
    - Yes
    - Unsure
    - No

Appendix C

Independent School District Research/Survey Request Form

Independent School District
Research/Survey Request Form

Name of Researcher: Derrick Davis **Date: February 18th, 2017**

Background Information

Title of Study: Increasing Academic Achievement and Motivation through the use of one-to-one Technology in the Intermediate Classroom.	Duration of Study: 5/25/17 - 6/7/17
Purpose of Study: The purpose of this study is to dive deeper and explore the inner workings of how one-to-one technology is currently being used in the intermediate elementary classroom to help engage, motivate, build confidence, train students in the use of technology, and document the impact on academic achievement.	
Affiliated Institution: Bethel University	
Your credentials as a researcher: I am currently a graduate student at Bethel University in the Ed.D in Leadership program. The information collected from these surveys will be used in my final dissertation project.	
Attach a formal research proposal that would be prepared for graduate level research or for a grant.	
Human Subjects Review: Human Subjects Review is currently underway at Bethel University for this dissertation project. Estimated date of approval is April of 2017.	

Conduct of Study

Who will be involved in the study (i.e. administrators, teachers, students, parents)? How many? From which buildings? From which areas of the District? How will the sample be drawn? An estimated 170 intermediate fourth-grade and fifth-grade students and 14 intermediate educators from the urban/suburban elementary PreK-5 school. An online Qualtrics survey will be used.
Attach copies of letters of introduction, parental permission slips for student participation, and consent forms.
What will be the nature of the student involvement (i.e., survey, interview, focus group, observation)? IMPORTANT: Attach copies of any instruments such as surveys or interview protocols you will be using. Students will be asked to fill out a 27-multiple choice question online Qualtrics survey. Educators will be asked to complete a 17-multiple choice question online Qualtrics survey.

Will any instructional time on the part of students and/or teachers be required? If so, indicate how much instructional time will be needed. Add any other relevant details. The survey will take approximately 15-20 minutes to complete. Fourth-grade and fifth-grade students, who return a permission slip, will use the QR code app to access the survey. Students will be using their one-to-one iPads to complete the online Qualtrics survey.
Will you need to use any District resources other than time and access to participants? Students will be using their one-to-one iPads to complete the online Qualtrics survey.
Have you already made informal contact with principals or teachers who will be involved in the study? What has been their response? Yes, I have spoken with the principal, assistant principal, and the intermediate educators. Everyone that I have spoken with have given positive feedback.
How would this research study benefit the school district? The results of the online Qualtrics survey would benefit the school district because all of the online survey questions focus on the use of one-to-one iPads and possible motivation they give students to achieve higher academic success in math and reading. The survey findings will be shared with school leaders, which may be helpful in informing future technology implementations.

Assurances

Assurance that participation in the study is voluntary. See appendix E.
Indication of how the data and research report will be used (i.e., as a master's thesis, doctoral dissertation, professional publication, program evaluation). The data will be used for my doctoral dissertation.
Assurance of the confidentiality/anonymity of all data and reports. See appendix A.

This research project has been approved

Appendix D

Request for Approval of Research with Human Participants
In Social and Behavioral Research

A. Identifying Information

1) **Date:** March 11th, 2017
2) **Principal Investigator**: Derrick Davis**,** Bethel University Doctor of Education Leadership in K12 Administration, 3900 Bethel Drive Arden Hills, MN 55112**,** 651-638-6400**,** dsd78933@bethel.edu
3) **Co-investigators**: N/A
4) **Project Title:** Increasing Academic Achievement and Motivation Through the use of One-To-One Technology in the Intermediate Classroom
5) **Key Words:** Technology, iPad, One-to-One, MAP Assessment, Student Motivation
6) **Inclusive Dates of Project**: May 25th - June 7th, 2017
7) **Research Advisor**: Michael Lindstrom, Ed. D.**,** 612-209-1739, m-lindstrom@bethel.edu or mike.r.lindstrom@gmail.com
8) **Funding Agency**: N/A
9) **Investigational Agents**: N/A

B. Participants

1) **Type of Participants:** 14 intermediate educators and minor children enrolled in grades 4-5.
2) **Institutional Affiliation:** Urban/suburban elementary PreK-5 school. Located outside of the Twin Cities of Minneapolis and St. Paul.
3) **Approximate Number of Participants:** 170 students.

4) **How Participants are Chosen**: All students in grades 4-5 who are able to read and take an online survey.
5) **How Participants are Contacted:** Participants will be contacted through letters that will go home with students from school.
6) **Inducements:** N/A
7) **Monetary Charges:** N/A

C. Informed Consent

Parental consent form can be found in Appendix F.

D. Abstract and Protocol

1) **Hypothesis and Research Design:**

The researcher plans to explore this project in the form of a quantitative study. The focus will be on determining if the use of technology does, in fact, motivate students to high academic achievement within the math and reading curricula used in the fourth-grade and fifth-grade intermediate elementary classrooms. The one-to-one technology that educators, fourth, and fifth-grade students will be using is the Apple iPad Air 16GB. Students and staff will also have access to Hewlett Packard PC laptop and desktop products.

There are approximately 170 students that comprise the fourth-grade and fifth-grade intermediate classrooms. Only students whom have received parental/guardian permission will be permitted to complete the survey. The online Qualtrics survey questions will ask questions that are geared towards finding out students' technology experience prior to participating in the one-to-one iPad technology program, if they believe the one-to-one iPad technology to be a motivational factor for them to complete higher level academic work in their math and reading courses, and to see if one-to-one iPad technology helps them achieve greater academic grades in

their math and reading courses. To connect the students' answers to academic growth using the iPad, the researcher will have the students input their May 2016 and May 2017 MAP reading and math scores. At the completion of the survey, the researcher will use statistical measures to explore the impact of technology on motivation and academic achievement.

Different apps provide educators the ability to improve productivity, creativity, and communication. The use of distinctive apps with one-to-one technology are pushing educators to rethink how instructional pedagogy is delivered, and how homework is completed. The survey will include questions to help the researcher understand which iPad apps are the best choice of one-to-one technology to motivate students to achieve higher academic success in math and reading.

Students who are participating in the fourth-grade and fifth-grade one-to-one iPad technology program at the urban/suburban elementary PreK-5 school will be asked to complete a 27-question survey towards the end of the third trimester. The survey would be live for approximately in mid-May 2017.

Intermediate educators from the urban/suburban elementary PreK-5 school will be asked to complete an online survey during the academic year 2016-2017. The educators' survey will include 18-questions. The 14 educators' technology experience and years of teaching will vary. The survey will ask how the educators perceive technology being used in their classrooms, if they believe the one-to-one technology has a motivational effect on student achievement, if they support the district in continuing to use the Apple iPad, what type of technology they would like to see in the hands of their students, and what type of technology they believe best motivates students to achieve higher academic grades.

The major aims of this research will be to ask and answer the following questions:

RQ1. What are the reported impacts of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement?

RQ2. Which technology apps provided the greatest motivation in the intermediate elementary classroom?

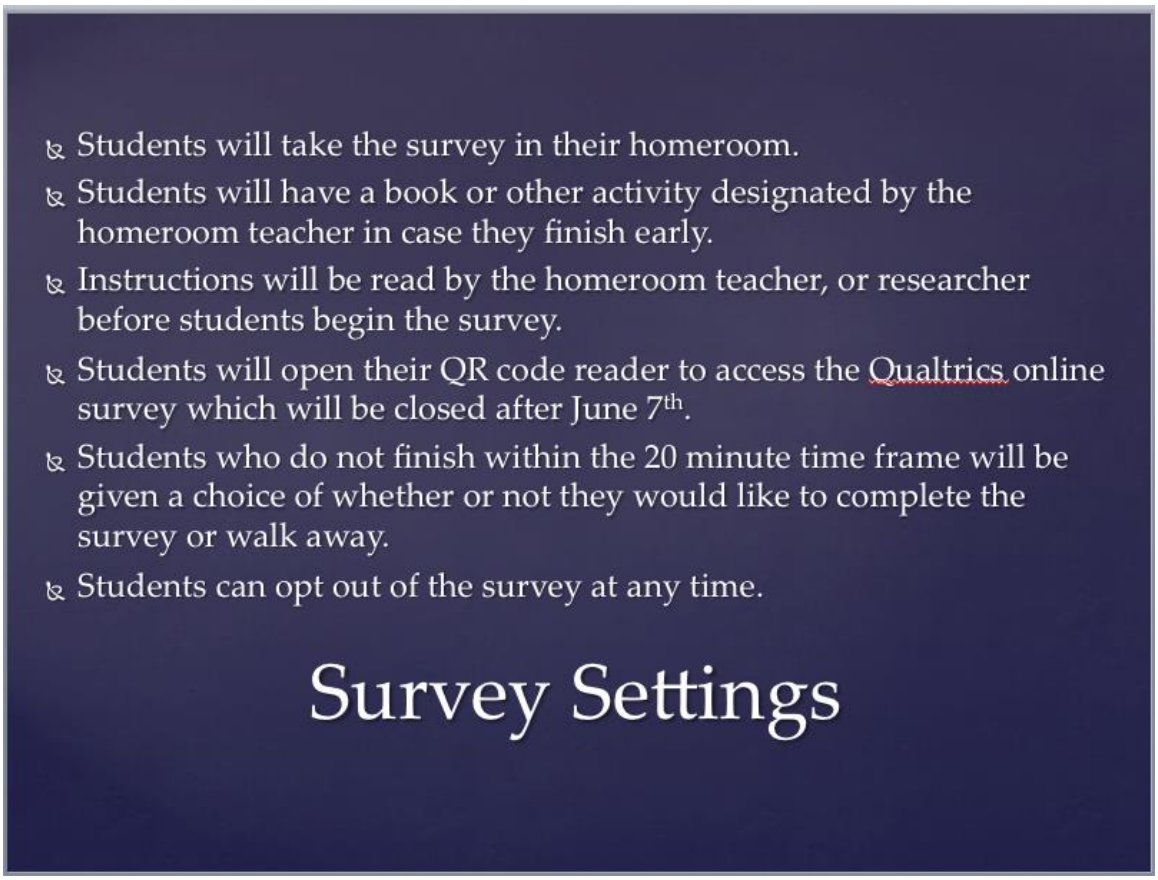
The study will add to the body of knowledge about one-to-one technology being used in intermediate classrooms. The results deemed useful to other classroom teachers, administrators, and stakeholders within the educational community interested in ways to integrate one-to-one technology will be shared.

2) Protocol: The sample of students providing aggregate data about increasing academic achievement and motivation through the use of one-to-one technology in the intermediate classroom will include 170 4^{th}-5^{th}-grade students during the academic year 2016-2017. Consent forms (Appendix F) will be sent home to parents and guardians provided by researcher. This consent form will inform parents and guardians of the survey procedure and inform them about how the information will help the school and future research. Parents and guardians will only return the consent form if they wish for their child to participate in the study. Students will have the option to "opt out" of the survey at any point while they are taking the survey. This will not only be written on the first page of the survey, it will also be read aloud to students by the survey administrator or the researcher before they take the survey.

Data will be collected from May 25^{th}, 2017 to June 7^{th}, 2017. Because the children will be recruited for this research, permission will first be obtained through the School District (Appendix C). Permission will then be obtained from the Bethel Internal Review Board (IRB) process. Once official permission is granted, participants will be recruited through the consent

letter home on Wednesday, May 10th, 2017. At school, and with their homeroom teacher, the students who received permission will be shown a QR code that will give the students access to the survey at their homeroom teachers time discretion. Students will be given a card with their MAP math and reading score from May 2016 and May 2017 to enter at the end of the online survey.

The link will be embedded into a QR code, which the students will access using the Quick QR code reader app to access the survey. The students will then listen to the researcher or their homeroom teacher who will read the first page of instructions aloud. At this point, the students who wish to continue may complete the survey (Appendix A). When students complete the survey, they will read quietly or follow the instructions their homeroom teacher has given them until 20 minutes have passed. At that time, researcher or the homeroom teacher will say, "Thank you for taking this survey. It will help us better understand how you think about how one-to-one iPad technology is used in the intermediate classroom. If you are not finished, you can either choose to finish now or at a later time today; your teacher will let you know when that is." Once they have finished, the student will return to the classroom activity.



Teachers will be sent a survey link through their school email. The 14 intermediate educators will be asked to complete the survey either during their prep period or on their own time. The instructions for educators will be in the email with the survey link. Once the educator has completed the survey, the final page will say, "Thank you for taking this survey. It will help us better understand how educators think about using one-to-one technology within the intermediate classroom and for future research."

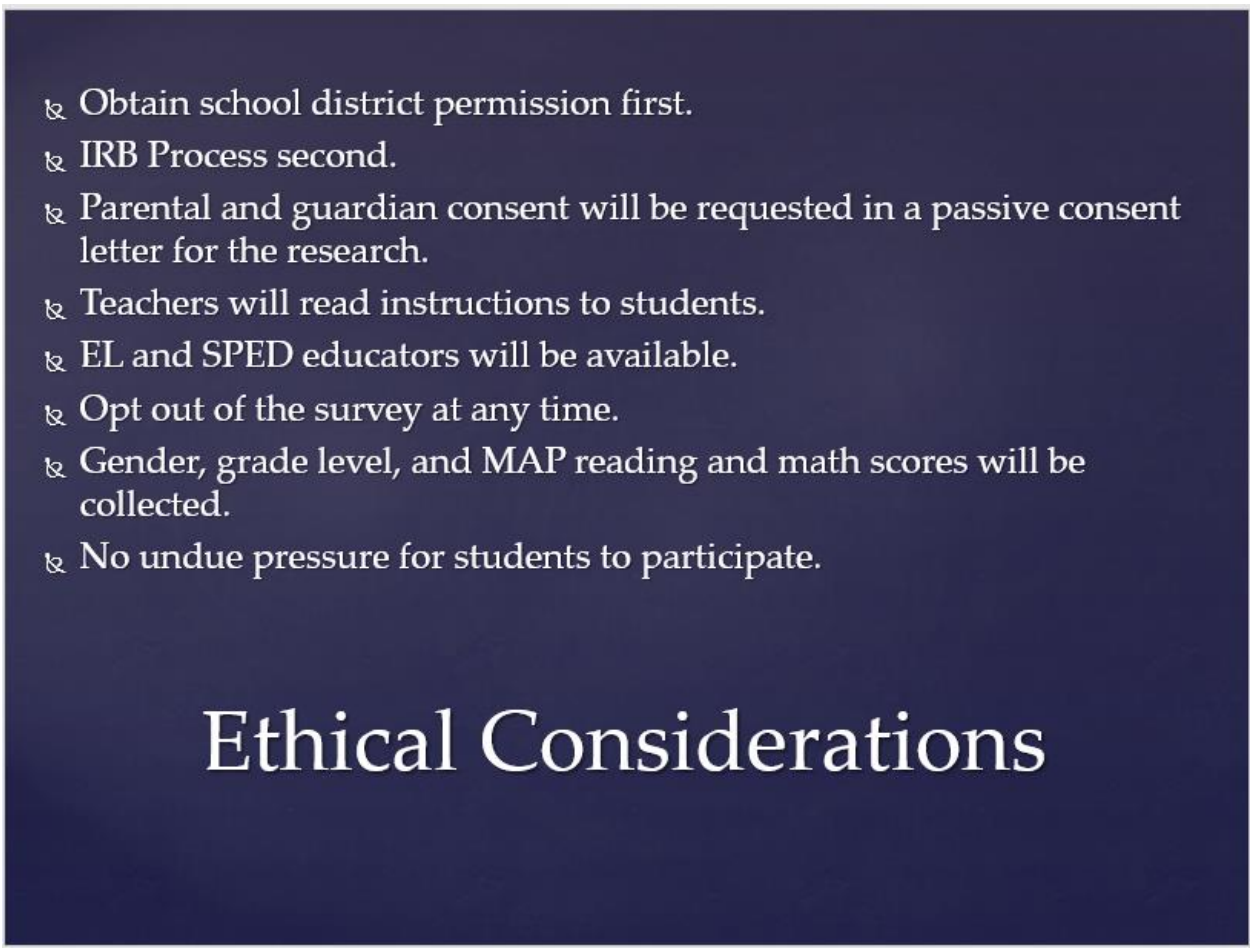
E. Risks

No research will be attempted until the Bethel IRB process has been completed. The Belmont Report, (1979) was established to create boundaries for researchers that would help them maintain respect for persons, beneficence, and justice for test subjects. Researchers must

be diligent about creating environments with minimal risk for all people involved or affected by the research focus. In order to do this, it is important to maintain first the IRB process, then informed consent, assessment of risk and benefits, and a proper selection of test subjects (Belmont, 1979).

Parental or guardian consent will be a necessary part of obtaining data. Young students who are asked to take a survey on their iPad are not old enough to give voluntary consent, and will naturally obey their teacher without giving this a thought (Hicks, 2014). It will be important to be sure parents and guardians have proper knowledge of this survey as well as the opportunity and procedure for their children to opt out. Arrangements will be made for EL and SPED students who need assistance to take the survey. An additional QR code will be available for these students if it is necessary.

A committee of teachers advised the writing of these survey questions in order to create appropriate reading level for students in 4^{th}- 5^{th} grade. The questions were written in such a way as to be as unimposing as possible to reduce the risk of causing stress to the students (Hicks, 2014). Participation will be voluntary and data will be held confidentially. The student's gender, grade level, and NWEA RIT MAP reading and math scores will be used to connect to the survey results. No student name or ID information will be gathered. The school counselor will work with the researcher to ensure that teachers do not place any unnecessary pressure on students to participate. Steps will be taken to make sure the survey is easy to access, read and navigate, so they have a positive experience.



1) Privacy: The survey will be anonymous and voluntary. There will be no identifying information on the survey. No grades or rewards will be given in exchange for participation. While it would be an unanticipated response, if any part of the survey is uncomfortable for a student, he/she can choose to skip any portion of the survey at any time and will not have to participate in a portion or all of the survey. At the beginning of the survey, students will be asked to provide gender, grade level. At the end of the survey, students will be asked to provide their May 2016 and May 2017 Spring NWEA RIT MAP math and reading scores. The NWEA RIT MAP math and reading score information will be kept confidential under the password protected survey. These questions can be found in Appendix A. The survey will provide

valuable information for data generalizations based on the students' gender, grade level, and NWEA RIT MAP math and reading scores.

2) **Physical stimuli:** N/A
3) **Deprivation**: N/A
4) **Deception:** N/A
5) **Sensitive information:** Students may consider the survey questions personal because they will be asked to share their NWEA RIT MAP reading and math scores. Students will be given a notecard that will be premade with their 2016 and 2017 spring NWEA RIT MAP reading and math scores. Questions, such as "Enter your spring 2016 MAP math score" might cause a student to think about what category their score falls into and "I receive free or reduced lunch" might cause students to feel uncomfortable, for example. (See Appendix A).
6) **Offensive materials:** N/A
7) **Physical exertion:** N/A

F. Confidentiality

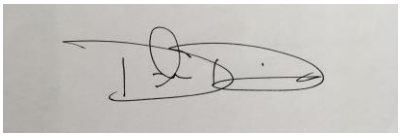
The School District in which this study is being conducted will never be identified by name, except on this IRB form. Participants will not record their names in any place, to help them remain anonymous. Only the researcher, the participants the parents/guardians of the participants, and the homeroom teacher of each class will know that these participants have been involved in this particular research project. The data obtained from this research will not become a part of any permanent record.

All of the records from this study will be kept private and held on the Qualtrics software database. The information may also be transferred into SPSS for data analysis. The researcher

will not include any information about this study in any published work or presentations that will make it possible to identify any of the participants.

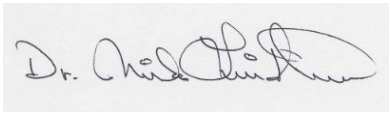
G. Signatures

"I certify that the information furnished concerning the procedures to be taken for the protection of human participants is correct. I will seek and obtain prior approval for any substantive modification in the proposal and will report promptly any unexpected or otherwise significant adverse effects in the course of this study."



DATE: 3/11/17

(Derrick S. Davis, Researcher)



DATE: 3/1/17

(Dr. Michael Lindstrom, Advisor)

Appendix E

Bethel IRB Approval Letter

BETHEL UNIVERSITY

Institutional Review Board
3900 Bethel Drive
PO2322
St. Paul, MN 55112

April 20, 2017

Derrick Davis
Bethel University
St. Paul, MN 55112

Re: Project SP-19-17 Increasing academic achievement and motivation through the use of one-to-one technology in the intermediate classroom

Dear Derrick,

On April 20, 2017, the Bethel University Institutional Review Board completed the review of your proposed study and approved the above referenced study.

Please note that this approval is limited to the project as described on the most recent Human Subjects Review Form, including email correspondence. Also, please be reminded that it is the responsibility of the investigator(s) to bring to the attention of the IRB any proposed changes in the project or activity plans, and to report to the IRB any unanticipated problems that may affect the welfare of human subjects. Last, the approval is valid until April 19, 2018.

Sincerely,

Peter Jankowski, Ph.D.
Chair, Bethel University IRB

Appendix F

Student Participation Notification Letter

May 10th, 2017

Dear Parent/Guardian,

I am a doctoral candidate in Education Leadership and Administration program at Bethel University in St. Paul, Minnesota. I am conducting dissertation research on the use of one-to-one technology may enhance a student's motivation to achieve higher academic achievement success. The two objectives of this study are to:

- Investigate what the reported impact of one-to-one technology in the intermediate elementary classroom on student motivation as measured by math and reading academic achievement
- Investigate which technology application provides the greatest motivation in the intermediate elementary classroom

The survey is anonymous and voluntary. Students will complete the survey during school hours using their one-to-one iPad. Your child's grade will not depend on answering the questions. If any part of the survey is uncomfortable for your child he/she can choose to skip any portion of the survey at any time and will not have to participate. Also, be assured that your child's responses will be held strictly confidential.

This research project has been reviewed and approved in accordance with Bethel's Levels of Review for Research with Humans and the School District. If you have any questions, or need more information, please email me or call:

Derrick Davis, Researcher
dsd78933@bethel.edu
651-638-6400

Dr. Michael Linstrom, Advisor
m-lindstrom@bethel.edu
(612) 209-1739

I give my child permission to participate in the online survey about the effects of one-to-one technology in the intermediate classroom on student motivation as measured by math and reading academic achievement and identifying which technology application provides the greatest motivation during the weeks of May 25th – June 7th, 2017.

Student's Name (please print): _____

Student's Homeroom Teacher/Grade: _____

Date: _____ Parent/Guardian Signature: _____

Appendix G

2015 NWEA Student Growth Norms

The norms in the tables below have a very straightforward interpretation. For example, in the status norms for Reading, grade 2 students in the middle of the "begin-year" period had a mean score of 174.7 and a standard deviation of 15.5. To get a sense of how much dispersion there was, the SD 15.5 can be subtracted from the mean and added to the mean to produce a range of about 159–190. Since the norms are based on the bell curve, we know that 68% of all scores are expected to fall between in this range.

2015 READING Student Status Norms

	Begin-Year		Mid-Year		End-Year	
Grade	Mean	SD	Mean	SD	Mean	SD
K	141.0	13.54	151.3	12.73	158.1	12.85
1	160.7	13.08	171.5	13.54	177.5	14.54
2	174.7	15.52	184.2	14.98	188.7	15.21
3	188.3	15.85	195.6	15.14	198.6	15.10
4	198.2	15.53	203.6	14.96	205.9	14.92
5	205.7	15.13	209.8	14.65	211.8	14.72
6	211.0	14.94	214.2	14.53	215.8	14.66
7	214.4	15.31	216.9	14.98	218.2	15.14
8	217.2	15.72	219.1	15.37	220.1	15.73
9	220.2	15.68	221.3	15.54	221.9	16.21
10	220.4	16.85	221.0	16.70	221.2	17.48
11	222.6	16.75	222.7	16.53	222.3	17.68

2015 MATHEMATICS Student Status Norms

	Begin-Year		Mid-Year		End-Year	
Grade	Mean	SD	Mean	SD	Mean	SD
K	140.0	15.06	151.5	13.95	159.1	13.69
1	162.4	12.87	173.8	12.96	180.8	13.63
2	176.9	13.22	186.4	13.11	192.1	13.54
3	190.4	13.10	198.2	13.29	203.4	13.81
4	201.9	13.76	208.7	14.27	213.5	14.97
5	211.4	14.68	217.2	15.33	221.4	16.18
6	217.6	15.53	222.1	16.00	225.3	16.71
7	222.6	16.59	226.1	17.07	228.6	17.72
8	226.3	17.85	229.1	18.31	230.9	19.11
9	230.3	18.13	232.2	18.62	233.4	19.52
10	230.1	19.60	231.5	20.01	232.4	20.96
11	233.3	19.95	234.4	20.18	235.0	21.30

2015 LANGUAGE USAGE Student Status Norms

	Begin-Year		Mid-Year		End-Year	
Grade	Mean	SD	Mean	SD	Mean	SD
2	174.5	16.58	184.9	15.34	189.7	15.47
3	189.4	15.20	196.8	14.24	200.0	14.11
4	198.8	14.66	204.4	13.83	206.7	13.64
5	205.6	13.87	209.7	13.23	211.5	13.19
6	210.7	13.79	213.9	13.30	215.3	13.38
7	214.0	13.82	216.5	13.52	217.6	13.70
8	216.2	14.17	218.1	13.92	219.0	14.26
9	218.4	14.15	219.7	13.98	220.4	14.50
10	218.9	15.04	219.7	14.99	220.1	15.74
11	221.5	14.96	222.1	14.85	222.1	15.80

2015 GENERAL SCIENCE Student Status Norms

	Begin-Year		Mid-Year		End-Year	
Grade	Mean	SD	Mean	SD	Mean	SD
3	187.5	11.74	192.6	10.92	195.4	11.01
4	194.6	11.16	198.7	10.75	201.0	10.92
5	200.2	11.06	203.7	10.80	205.7	11.07
6	204.3	11.54	207.1	11.40	208.6	11.73
7	207.2	11.92	209.5	11.87	210.9	12.23
8	210.3	12.28	212.3	12.19	213.5	12.63

Appendix H

Typical MAP Math Growth Spring to Spring

Typical MAP MATH Growth Spring to Spring

These tables are based on 2015 MAP Norms for a standard 36 weeks of instruction as reported by NWEA and by TIES in iCue. Within the NWEA MAP reporting system, it is possible to obtain growth norms specific to the number of weeks of instruction for each student, which may be different from these norms. Growth for grade 10 to 11 is based only on data in iCue.

Grade		Start Score		Norm
Start	*End*	*From*	*To*	*Growth*
2	3	120	120	20
2	3	121	130	19
2	3	131	139	18
2	3	140	148	17
2	3	149	157	16
2	3	158	166	15
2	3	167	176	14
2	3	177	185	13
2	3	186	194	12
2	3	195	203	11
2	3	204	212	10
2	3	213	221	9
2	3	222	231	8
2	3	232	240	7
2	3	241	249	6
2	3	250	258	5
2	3	259	267	4
2	3	268	276	3
2	3	277	280	2
3	4	120	129	14
3	4	130	150	13
3	4	151	171	12
3	4	172	192	11
3	4	193	212	10
3	4	213	233	9
3	4	234	254	8
3	4	255	275	7
3	4	276	280	6
4	5	120	131	15
4	5	132	145	14
4	5	146	159	13
4	5	160	172	12
4	5	173	186	11
4	5	187	200	10
4	5	201	214	9
4	5	215	228	8
4	5	229	242	7
4	5	243	255	6
4	5	256	269	5
4	5	270	280	4

Grade		Start Score		Norm
Start	*End*	*From*	*To*	*Growth*
5	6	120	124	17
5	6	125	132	16
5	6	133	141	15
5	6	142	149	14
5	6	150	157	13
5	6	158	165	12
5	6	166	174	11
5	6	175	182	10
5	6	183	190	9
5	6	191	198	8
5	6	199	207	7
5	6	208	215	6
5	6	216	223	5
5	6	224	231	4
5	6	232	240	3
5	6	241	280	2
6	7	120	132	12
6	7	133	146	11
6	7	147	160	10
6	7	161	173	9
6	7	174	187	8
6	7	188	201	7
6	7	202	215	6
6	7	216	229	5
6	7	230	243	4
6	7	244	257	3
6	7	258	280	2
7	8	120	131	10
7	8	132	148	9
7	8	149	165	8
7	8	166	183	7
7	8	184	200	6
7	8	201	218	5
7	8	219	235	4
7	8	236	253	3
7	8	254	280	2

Grade		Start Score		Norm
Start	*End*	*From*	*To*	*Growth*
8	9	120	122	16
8	9	123	130	15
8	9	131	139	14
8	9	140	147	13
8	9	148	156	12
8	9	157	164	11
8	9	165	172	10
8	9	173	181	9
8	9	182	189	8
8	9	190	197	7
8	9	198	206	6
8	9	207	214	5
8	9	215	222	4
8	9	223	231	3
8	9	232	280	2
9	10	120	126	11
9	10	127	138	10
9	10	139	151	9
9	10	152	163	8
9	10	164	175	7
9	10	176	188	6
9	10	189	200	5
9	10	201	213	4
9	10	214	225	3
9	10	226	280	2
10	11	166	166	7
10	11	186	186	6
10	11	190	200	5
10	11	201	213	4
10	11	214	225	3
10	11	226	265	2

RAA Dept - REVISED 5/4/17

Appendix I

Typical MAP Reading Growth Spring to Spring

Typical MAP READING Growth Spring to Spring

These tables are based on 2015 MAP Norms for a standard 36 weeks of instruction as reported by NWEA and by TIES in iCue. Within the NWEA MAP reporting system, it is possible to obtain growth norms specific to the number of weeks of instruction for each student, which may be different from these norms. Growth for grade 10 to 11 is based only on data in iCue.

Grade		Start Score			Norm
Start	End	From		To	Growth
2	3	120	-	122	22
2	3	123	-	128	21
2	3	129	-	134	20
2	3	135	-	140	19
2	3	141	-	146	18
2	3	147	-	152	17
2	3	153	-	158	16
2	3	159	-	164	15
2	3	165	-	170	14
2	3	171	-	176	13
2	3	177	-	182	12
2	3	183	-	187	11
2	3	188	-	193	10
2	3	194	-	199	9
2	3	200	-	205	8
2	3	206	-	211	7
2	3	212	-	217	6
2	3	218	-	223	5
2	3	224	-	229	4
2	3	230	-	235	3
2	3	236	-	280	2
3	4	120	-	121	20
3	4	122	-	127	19
3	4	128	-	134	18
3	4	135	-	140	17
3	4	141	-	147	16
3	4	148	-	153	15
3	4	154	-	159	14
3	4	160	-	166	13
3	4	167	-	172	12
3	4	173	-	179	11
3	4	180	-	185	10
3	4	186	-	192	9
3	4	193	-	198	8
3	4	199	-	205	7
3	4	206	-	211	6
3	4	212	-	217	5
3	4	218	-	224	4
3	4	225	-	230	3
3	4	231	-	280	2

Grade		Start Score			Norm
Start	End	From		To	Growth
4	5	120	-	120	20
4	5	121	-	127	19
4	5	128	-	133	18
4	5	134	-	139	17
4	5	140	-	146	16
4	5	147	-	152	15
4	5	153	-	158	14
4	5	159	-	164	13
4	5	165	-	171	12
4	5	172	-	177	11
4	5	178	-	183	10
4	5	184	-	189	9
4	5	190	-	196	8
4	5	197	-	202	7
4	5	203	-	208	6
4	5	209	-	214	5
4	5	215	-	221	4
4	5	222	-	227	3
4	5	228	-	280	2
5	6	120	-	124	21
5	6	125	-	129	20
5	6	130	-	134	19
5	6	135	-	140	18
5	6	141	-	145	17
5	6	146	-	151	16
5	6	152	-	156	15
5	6	157	-	161	14
5	6	162	-	167	13
5	6	168	-	172	12
5	6	173	-	177	11
5	6	178	-	183	10
5	6	184	-	188	9
5	6	189	-	193	8
5	6	194	-	199	7
5	6	200	-	204	6
5	6	205	-	209	5
5	6	210	-	215	4
5	6	216	-	220	3
5	6	221	-	280	2
6	7	120	-	121	19
6	7	122	-	127	18
6	7	128	-	133	17
6	7	134	-	140	16
6	7	141	-	146	15
6	7	147	-	152	14
6	7	153	-	159	13
6	7	160	-	165	12
6	7	166	-	171	11
6	7	172	-	178	10
6	7	179	-	184	9
6	7	185	-	191	8
6	7	192	-	197	7
6	7	198	-	203	6
6	7	204	-	210	5
6	7	211	-	216	4
6	7	217	-	222	3
6	7	223	-	280	2

Grade		Start Score			Norm
Start	End	From		To	Growth
7	8	120	-	125	17
7	8	126	-	132	16
7	8	133	-	139	15
7	8	140	-	146	14
7	8	147	-	152	13
7	8	153	-	159	12
7	8	160	-	166	11
7	8	167	-	173	10
7	8	174	-	180	9
7	8	181	-	186	8
7	8	187	-	193	7
7	8	194	-	200	6
7	8	201	-	207	5
7	8	208	-	214	4
7	8	215	-	220	3
7	8	221	-	280	2
8	9	120	-	122	18
8	9	123	-	128	17
8	9	129	-	134	16
8	9	135	-	140	15
8	9	141	-	146	14
8	9	147	-	152	13
8	9	153	-	158	12
8	9	159	-	165	11
8	9	166	-	171	10
8	9	172	-	177	9
8	9	178	-	183	8
8	9	184	-	189	7
8	9	190	-	195	6
8	9	196	-	201	5
8	9	202	-	207	4
8	9	208	-	214	3
8	9	215	-	280	2
9	10	120	-	123	18
9	10	124	-	129	17
9	10	130	-	135	16
9	10	136	-	141	15
9	10	142	-	147	14
9	10	148	-	153	13
9	10	154	-	159	12
9	10	160	-	165	11
9	10	166	-	172	10
9	10	173	-	178	9
9	10	179	-	184	8
9	10	185	-	190	7
9	10	191	-	196	6
9	10	197	-	202	5
9	10	203	-	208	4
9	10	209	-	214	3
9	10	215	-	280	2
10	11	168	-	172	10
10	11	173	-	178	9
10	11	179	-	188	8
10	11	189	-	190	7
10	11	191	-	197	6
10	11	198	-	202	5
10	11	203	-	208	4
10	11	209	-	214	3
10	11	215	-	238	2

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