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Effects of a One-to-One iPad Initiative Program on 11th Grade Standardized Test Scores

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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2017

Abstract

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MA, The University of Scranton, 2012

BS, Western Michigan University, 2005

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The iPad and other mobile devices have become so popular over the past few years that many school districts are purchasing these devices and implementing them in the classroom with little to no research. Because there has been no previous research at one rural school district in Michigan, the primary purpose of this quantitative causal-comparative study was to investigate the effects that a 1-to-1 iPad initiative program has had on only 11th grade student achievement and determine if 11th grade students' test scores on the Michigan Merit Exam in the areas of mathematics, science, and social studies for each school year from 2007 to 2016 have improved, declined, or stayed the same. The framework for this study was rooted in Kearsley and Shneiderman's engagement theory, which specifically applies to technology-based learning environments. A repeated measures analysis of variance was used to compare the standardized test scores from 2007 to 2016, with the scores as the dependent variables and the introduction of the iPad technology as the independent variable. Student characteristics of gender, ethnicity, and socioeconomic status were covariates. The findings from this study indicated that the iPad has improved standardized test scores at this local high school and therefore this school district should continue the promotion and investment in mobile learning devices and other technologies. The resulting policy recommendation from this study prompts the local school district to pursue the expansion of a 1-to-1 iPad program or other mobile learning device in the current curriculum to help increase student achievement on standardized tests. The incorporation of Apple's iPad in the classroom has potentially created a solution to help students increase academic performance and achieve higher levels on standardized and state tests.

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Dedication

This doctoral project study is dedicated to my amazing family who was so patient and understanding during my entire doctoral journey. My wife, Rachel, who has spent many hours listening to my ideas, sharing my frustrations, reading through my work, and providing feedback and insight to keep me engaged during this work. You have been my rock. To my children, Natalie, Gavin, Vivienne, and the one on the way, thank you for your love, affection, and encouragement. It is my prayer that you will understand how important education is in life and that you will be life-long learners as well. I love you and am thankful that we were able to grow together through this opportunity. To my parents, Ron and June, who spent hours teaching me the value of a quality education. Mom, thank you for being one of my high school teachers and for the influence you have been in my life. Your 30 years of teaching taught me that heroes do not always wear capes. To my brother and sister, Micah and Ronelle, thank you for your love and support. May you also be examples to your own families of life-long learners.

Finally, to all of the wonderful administrators, teachers, and staff that I have the pleasure of calling colleagues, thank you for all of the time and energy you have spent in helping me to achieve my goals. It is my prayer that this study will benefit our community and help other communities around us grow. Without you, this study would not have been able to take place. Go Blue Devils!

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Introduction

Shortly after the iPad was released in 2010, Steve Jobs predicted that the tablet would eventually over take the personal computer (PC) in sales (Anthony, 2014). Since the introduction of the iPad, educational institutions across the United States have become more aware of this new mobile technology and have started purchasing iPads and other tablets for use in the classroom. Tablets have become so popular that Gartner and Gartner (2014) predicted that tablet sales for 2015 would overtake the sales of laptops and PCs for the first time. Also, Gartner and Gartner suggested that one of the reasons that tablet sales would surpass PC sales was because more school districts were purchasing tablets for students and staff. In 2014, approximately $9.94 billion was spent on educational technology for K-12 schools in the United States with an approximate overage of a third of that being spent on computer hardware (Murphy, 2014). Also, Murphy (2014) pointed out that, with the cost of equipment going down, the improvement of software, and state policies that are requiring higher expectations for technology access, some school districts are selling off their iPads and switching to other mobile devices such as Chromebooks, laptops, or other types of tablets.

The use of educational digital tools in the classroom is not a new trend. In fact, it has been over 40 years since digital tools were first introduced into the classroom when Apple started to donate computers to schools in 1975 (Murdock, 2007). Being mobile is one of the biggest trends in education today in and outside of the classroom (Holland & Holland, 2014). Also, Holland and Holland (2014) noted that some individuals believe

that if a mobile device is placed in a student's hand, there will be an improvement in student achievement and the student will be better prepared for the jobs of tomorrow. Willingham (2010) noted that the average American student between the ages of 8 and 18 spends more than 7.5 hours per day using a phone, computer, television, or another type of electronic device. There is a perception that because students are already spending 7.5 or more hours a day using and looking at a screen, schools should be tapping into this screen time and providing educational opportunities for students. However, just because a student has been given a new mobile device, there is no guarantee of any advancement in student learning or achievement. Falloon (2013) noted that new educational innovations are often surmounted by "hype" and schools then adopt new technologies hastily only to abandon these innovations when they fail to meet the "overinflated" expectations. History has shown that education leaders have taken different types of devices that were not originally intended for educational purposes and have attempted to appropriate them for use in education and for the advancement of student achievement (Hemmi, Bayne, & Land, 2009).

At the beginning of the 2012-2013 school year, all students and staff at a rural high school in Michigan were given an iPad with the belief that iPads would help increase student achievement. The assumption was that with improved technology, the quality of teaching would improve, which would in turn help increase student achievement. A 2012 news article about the local district stated that, to pay for this new technology, voters passed a $7.29 million technology bond. According to another local news story from 2014, the high price tag had raised questions among stakeholders and

other community members as to whether it was worth the investment for the school district to purchase the iPads. At the time of data collection, the school district was now in its 4th year of this one-to-one iPad initiative. Even though there have been studies and researchers who believe that iPads are helping to improve student achievement (Carr, 2012; Conn, 2012; Cumming, Strnadová, & Singh, 2014; Friedman & Garcia, 2013; Haydon et al., 2012; Retter, Anderson, & Kieran, 2012; Simpson, Walsh, & Rowsell, 2013; Ward, Finley, Keil, & Clay, 2013), there has been very little research about the direct impact that iPads have had on student learning and student achievement at this school, in particular when it comes to the results of the Michigan Merit Exam (MME) and the Michigan Student Test of Educational Progress (MSTEP).

Now that the iPad initiative had been in place for 4 years at this school district, enough data were collected to be able to determine the effects that the iPad has had on student achievement and student learning on the State of Michigan's standardized tests. This study examined the benefits that iPads have brought to only 11th grade high school students at a rural high school in Michigan and their performance on the MME and MSTEP for each year from 2007 to 2016.

Definition of the Problem

The iPad and other mobile devices have become so popular over the past few years that many school districts are purchasing these devices and implementing them in the classroom with little to no research. Because no research had been conducted about the iPad at one rural school district in Michigan, the primary purpose of this proposed study was to investigate the effects that a one-to-one iPad initiative program has had on

only 11th grade student achievement and determine if 11th grade students' test scores on the State of Michigan's MME and MSTEP in the areas of mathematics, science, and social studies for each school year from 2007 to 2016 have improved, declined, or stayed the same.

Over the past few decades, one of the major priorities of schools has been to increase student achievement levels for all students. In 2001, the No Child Left Behind Act (NCLB) mandated that there be an increased focus on accountability and assessments in schools (Blankenship & Mararella, 2014). Specifically, schools must now prepare students for the future as digitally literate adults (Blankenship & Mararella, 2014). To meet the mandates of NCLB, schools are required to create an environment for students to develop new technological skills and incorporate technology into the classroom. NCLB emphasizes the importance that the integration of technology and technology literacy must be provided for all public-school students (Learning Point Associates, 2007). Under NCLB, schools now receive a grade determined in part by adequate yearly progress (AYP). Discussing how standardized test scores can be impacted by AYP, The Michigan Department of Education (2007) noted,

> The process for determining the Adequate Yearly Progress status under the federal No Child Left Behind Act for a school or district is very complex, involving data from many sources. Results from the MME are included in the calculation. AYP status will be reported separately by the State when all elements of the process have been assembled. (p. 4)

With the expectations that have been placed on school districts by NCLB, standardized testing has catapulted into becoming the bar at which student achievement levels are currently being measured. Although there is a big debate as to the pros and cons of standardized tests from both supporters and critics, one area that has not been debated is the importance of improving student achievement levels for all students on standardized tests (Dietel, 2012).

In Michigan, standardized testing has changed over the years. In 1969, the Michigan Education Assessment Program (MEAP) was first introduced to measure student achievement (Michigan Department of Education, 2015a). The purpose of the MEAP was to assess student performance at different grade levels. Initially, the MEAP was administered to students' in Grades 3 through 9 evaluating proficiency levels in math, reading, science, writing, and English language arts different years. The MEAP was not instituted as a high school test until the 1995-1996 school year and was only administered to 11th grade students (Department of Education and Department of Treasury, 2001). The State of Michigan (2016) said this about why the MEAP was created:

> The MEAP tests were developed to measure what Michigan educators believe all students should know and be able to achieve in five content areas: mathematics, reading, science, social studies, and writing. The test results paint a picture of how well Michigan students and Michigan schools are doing when compared to standards established by the State Board of education. The MEAP test is the only common measure given statewide to all students. It serves as a measure of

> accountability for Michigan schools. Results of MEAP tests can be used by schools for school improvement purposes. The results indicate overall strengths and weaknesses of a school district's curriculum, and can be used to modify instructional practice. Results have been used for the Michigan Accreditation Program, and will continue to be used as one piece of this program as it evolves into accountability model. (para. 1)

Starting with the class of 2000, students who performed well on the MEAP could be eligible to receive the Michigan Merit Award (MMA), upwards of a $2,500 scholarship that was accepted at any approved secondary educational institution. The MMA Scholarship ended in 2007 when the State of Michigan decided it was time to change how high school students would be assessed (Michigan Department of Education, 2008).

A new test, the MME, was a combination of several tests to help save families' and students money and time. The MME required 11th grade students to continue to be tested over the areas of mathematics reading, science, social studies, and writing, just like the MEAP, but it also required students to take the ACT college entrance exam, a free WorkKeys assessment and a Michigan assessment that measured what educators, employers, and parents believed to be important in core subject areas and that were not covered by the ACT or WorkKeys (Michigan Department of Education, 2008). Students who performed well on the MME became eligible to receive the Michigan Promise Scholarship, which would provide up to $4,000 to students who received a 2 (*proficient*) or 1 (*advanced*) on all areas of the test. Both scholarships gave a great incentive for students to do well on the MEAP and the MME. However, in 2009, the Promise

scholarship program was cut due to a lack of funding and budget problems for the state. The scholarship was helping some 96,000 in-state students who were receiving up to $4,000 for college (Keeping, 2009). With the loss of this scholarship, it not only made it harder for students to pay for higher education, but there was also little to no incentive for students to perform well on the MME. This lack of incentive has made it harder for teachers to help prepare students for their tests.

These tests were completed using paper and pencil and required machines and assessors/evaluators to grade these tests. This has not only been costly but also inefficient compared to being able to take a test online where tests can be scored and the results can be accessed almost instantaneously. With all the advancements in technology that have taken place in public school classrooms over the past 5 years, questions have risen about using computers or tablets to take standardized tests in Michigan.

The Michigan Legislature mandated in June of 2014 that the Michigan Department of Education create a new state student test for the spring of 2015. This new student assessment system was called the MSTEP. The MSTEP tests 11th grade high school students through the inclusion of the MME, which consists of a college entrance exam for 11th grade students, a work skills assessment, and the MSTEP summative assessments in science, English language arts, social studies, and mathematics. (Michigan Department of Education, 2015b). The primary difference between the MSTEP and the previous MME is that the reading assessment and the writing assessment of the MME have now been combined into just one assessment, English language arts, on the MSTEP. The other major difference is that this standardized test can be taken online instead of

using traditional pencil and paper. Students who have already been provided an iPad from their school can complete the test through an App that can be downloaded onto their tablet. Students who do not have an iPad can take the test in computer labs (Michigan Department of Education, 2015c). Now that students can take a standardized test on an iPad, according to local news sources, community members have questioned as to whether the iPad can help improve student performance on standardized tests or is it just an expensive device to be able to use to take a test.

Apple Inc. (2014b) has boldly made the claim that using the iPad improves academic performance, specifically on standardized tests and other key student outcomes. However, many researchers have stated that there is a lack of research and evidence to determine if the iPad is actually improving student achievement and student learning (Banister, 2010; Crichton, Pegler, & White, 2012; Haydon et al., 2012; Huang, Liang, Su, & Chen, 2012; Lucking, AL-Hazza, & Christmann, 2012; Murray & Olcese, 2011; Pegrum, Oakley, & Faulkner, 2013; Simpson et al., 2013; Thoermer & Williams, 2012;). Daccord (2012) noted that many school administrators have failed to communicate and emphasize the importance of these devices to their constituents the reasons why they have purchased iPads. This has created resistance from teachers, parents, and even students to using these devices in the classroom.

There was a genuine need for this project study to fill in the research gap that existed to help determine if the iPad actually has helped students improve student achievement levels on standardized tests and to help administrators make decisions about technology implementation in the classroom.

Rationale

Evidence of the Problem at the Local Level

Before this study, no study had been conducted to determine if the iPad has had either a positive or negative impact on student achievement at this rural school district in Michigan. In order to provide iPads and other devices, the school district held two community forums in January of 2012 to provide residents with the chance to ask questions and get answers from the school district about how the devices would be paid for and the main purpose of the devices. Residents of the school district who attended the forum had a few concerns, including if the school district was really ready to use the new technology, how the district would maintain new technology that changes so often, and if teachers were prepared enough to teach their classes with this new technology. In January of 2014, the principal of this high school and I sat down and discussed some of the education issues that existed in the high school. The principal (personal communication, January 21, 2014) had concerns about how students were using iPads and if these devices really were helping with student achievement or if they were just a distraction in the classroom. One of the focuses at this high school has been to help increase test scores for all students on the Michigan's standardized tests. The school district curriculum director (personal communication, November 7, 2016) noted that with the change from NCLB to Every Student Succeeds Act, the bar has been adjusted from 100% of students being proficient to 85% of students being proficient by 2022. Student standardized test scores in the areas of mathematics, science, and social studies have been below the proficiency

goals of all students. The low proficiency of students in mathematics, science, and social studies in this high school are indicated in Figures 1, 2, and 3:

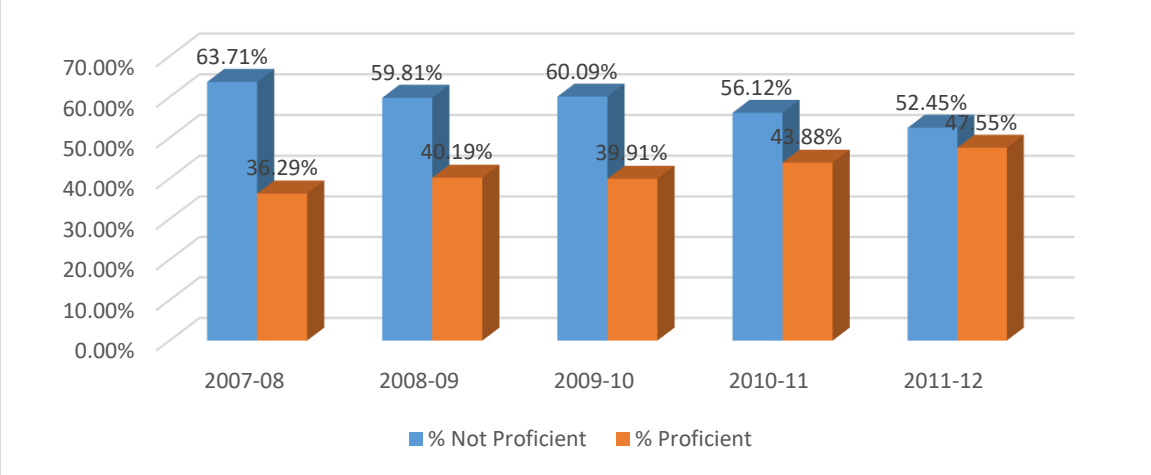

Figure 1. MME math scores from 2007-2008 to 2011-2012 academic years. Adapted from the MI School Data: Student Assessment: MME: 11th Grade Content: Mathematics test.

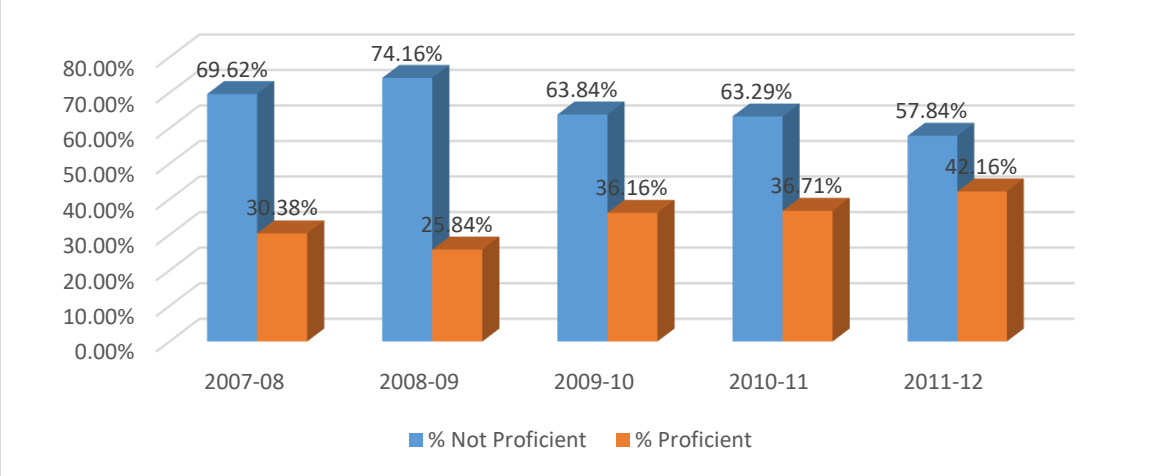

Figure 2. MME science scores between 2007-2008 to 2011-2012 academic years. Retrieved from the MI School Data: Student Assessment: MME: 11th Grade Content: Science test.

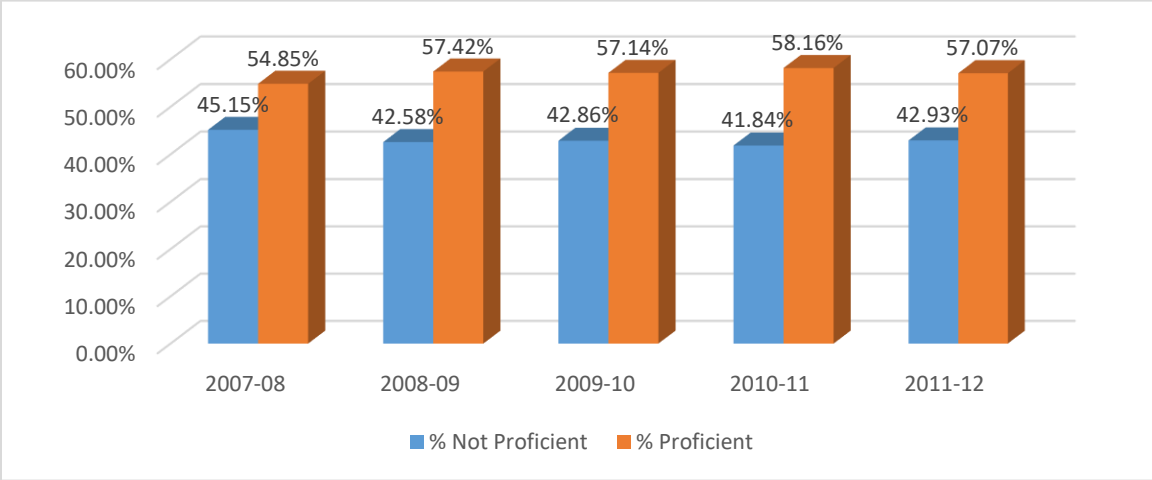

Figure 3. MME social studies scores between 2007-2008 to 2011-2012 academic years. Retrieved from the MI School Data: Student Assessment: MME: 11th Grade Content: Social Studies test.

At this research site, the school board administrators decided to purchase iPads for every high school student in Grades 9 through 12 before the start of the 2012-2013 school year in order to help these students increase their proficiency in the classroom, including standardized tests. The iPads were given in order to help them develop 21st-century skills that are essential for all students to be able to be successful in today's educational world.

Now that the school district was in its 4th year of the one-to-one iPad initiative program, residents and other stake holders wanted to know if the iPads helped improve student achievement or not. The primary purpose of this project study was to determine if the iPad has helped increase student achievement on the standardized tests given in Michigan for 11th grade students in the areas of mathematics, science, and social studies.

Evidence of the Problem from the Professional Literature

The primary issue was the existence of a gap in research. There have been several research studies that were conducted at the elementary level to determine if iPads help improve students test scores. One study in Auburn, Maine, found that kindergarten students who were in classes that were assigned iPads outperformed the students who were not given an iPad on every literacy standard for which they had been tested (Dalrymple, 2012). Another study of fourth grade students found that student achievement in regards to meeting literacy goals improved when iPads were used (Hutchinson, Beschorner, & Schmidt-Crawford, 2012). There are several other studies that I have referenced in this project study. However, the primary issue is that many of these authors came to their conclusions about the effectiveness of the iPad based on observations, interviews, participation, and small sample sizes of individual classes. The biggest gap in research is the lack of quantitative studies that provide evidence that the iPad has actually improved student achievement measured by standardized test scores. There is even less evidence available that documented how the iPad has contributed to higher standardized test scores of high school students. Most quantitative research that currently exists primarily has dealt with students who were in the elementary and middle school levels.

Today there are a multitude of mobile device choices, with more than 20 companies that are manufacturing tablets. However, McLester (2012) noted that some schools are buying iPads not because of what research has said, but because of the safety in numbers. Also, McLester explained that due to Apple's claims that it has more than

20,000 education apps and the volume of its sales, some schools have purchased iPads only because that is what other school districts are doing instead of looking at academic results.

Too many schools today that have integrated different mobile learning devices into daily routines and practice are not using these devices to maximize the potential of their students (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010). This study was needed to help provide research at the secondary level and provide research dealing with standardized test scores of high school students.

Definitions

ACT: The ACT test started in 1959 and was known as the American College Testing Program. This test was created to serve as a standardized college entrance test. Today the test is known as the ACT (StudyPoint, 2016). The ACT has expanded their services and they now offer trainings and assessments that are outside of the college entrance process. More than 1.8 million students take the ACT each year, which makes the ACT the leading United States college admissions exam (ACT, 2016).

Digital native: This phrase, coined by Marc Prensky in 2001, refers to an individual who was born after the widespread of digital technology. This term does not refer to a specific generation, although it is a catchall phrase for children who have grown up using technology, like computers, the Internet, tablets, and other mobile devices, on a regular basis (Prensky, 2001).

Digital immigrant: This phrase is the opposite of a digital native; someone who was born before the widespread of digital technology. It also does not refer to a specific

generation, but it is also a catchall phrase for those who grew up not using technology, like computers, the Internet, tablets, and other mobile devices, on a regular basis (Prensky, 2001).

iPad: Currently the iPad is the most popular tablet to date. It was created and manufactured by Apple Inc. Like a computer, it has an operating system, iOS, but unlike a computer it uses a touch screen to operate programs known as *apps* (Apple Inc., 2014a).

Mobile device: A mobile device is a type of portable computing device such as a tablet, smart phone, or other hand-held devices. Mobile devices are generally small enough to be hand held and can operate wirelessly (Friedman & Garcia, 2013).

Mobile learning: Mobile learning has been defined as learning that is delivered or supported by the use of a handheld or portable device (Traxler, 2009).

Michigan Educational Assessment Program (MEAP): The MEAP was originally funded through Public Act 307 of 1969. The MEAP has changed over the years going away from comparing students to each other to meeting specific standards. Although high school students stopped taking the MEAP in 2007, elementary and middle school students kept taking the MEAP until 2015 (Michigan Department of Education, 2008).

Michigan Merit Exam (MME): The MME was implemented in March of 2007 for 11th grade high school students in Michigan. The MME replaced the MEAP as the state standardized test for all high schools in Michigan. The MME included taking the ACT, the WorkKeys assessment, and a Michigan assessment about other core subjects not covered by the ACT and WorkKeys (Michigan Department of Education, 2008).

Michigan Student Test of Educational Progress (MSTEP): The MSTEP was implemented as the new state standardized test in Michigan starting in the spring of 2015. The MSTEP has replaced both the MEAP and the MME. Elementary schools, middle schools, and high schools now take the MSTEP. For 11th grade students, the test consists of a college entrance exam, a work skills assessment, an English language arts assessment, a mathematics assessment, a science assessment, and a social studies assessment (Michigan Department of Education, 2015c).

No Child Left Behind Act (NCLB): The NCLB of 2001 emphasized that all public schools that receive federal funding are required to administer a statewide standardized test to all students annually. The primary goal of the Act was to raise student achievement to the proficient level by administering state standardized testing by the 2013-2014 school year. The goal was to hold school districts, and states that oversee these tests, more accountable for the results. Schools that fail to meet AYP for 2 or more years in a row become classified as *in need of improvement* and then face consequences (Blankenship & Mararella, 2014).

Standardized test: A standardized test is any assessment that has all test takers answer the same question in the same fashion and is scored in a consistent or standard manner, making it possible to compare and contrast the performance of the test takers. Simply put, standardized tests are assessments that are administered and scored in a predetermined and standard manner (Popham, 1999).

Significance

The students in today's world of education have been referred to as *digital natives* (Prensky, 2001). "Our students have changed radically. Today's students are no longer the people our educational system was designed for" (Prensky, 2001, p. 1). Yesterday's students have been called *digital immigrants.* The term refers to those "who were not born into the digital work, but have become fascinated by and adopted many or most aspects of the new technology" (Prensky, 2001, pp. 1-2). Students today are growing up in a world that is full of computers, laptops, smart phones, tablets, and now, smart watches. Because students have grown up with these different mobile devices, many of them know how to use these devices better than educators do. For years, it has been the goal for schools to have more computers in the classroom. "Equipping students with computers has long been the holy grail for classrooms around the world, but it just hasn't happened" (Hill, 2012, para. 1). The cost of tablets has dropped, making it more affordable for schools to have these devices. Companies that manufacture mobile learning devices have decided to launch a "full scale assault on education" (Hill, 2012, para. 1)

The iPad, created by Apple Inc., has presented schools, teachers, parents, and all stakeholders with the possibility of devising new approaches to student learning, learning outcomes, and student achievement. Apple has sold more than 8 million iPads directly into educational institutions worldwide, including over 4.5 million iPads to U.S. schools and educational institutions (Etherington, 2013). The iPad can be adapted to be used in any subject, at any grade level, and for any learner (Apple Inc., 2014b). Apple Inc.

(2014b) claimed that the iPad has changed the way that teachers teach and the way that students learn. Improved academic performance, increased student engagement and motivation, and a higher focus on content quality and design are some of the examples of how the iPad has improved education (Apple Inc., 2014a). Because the iPad is able to adapt to any subject, grade level, and learner, teachers are able to tailor learning to every student's individual learning styles and needs to help keep them engaged throughout the learning process.

According to Bidwell (2014), the cost of school supplies in some states has increased by 20% since 2013. The iPad has the potential to offset some of the financial burden by eliminating the need for paper-bound textbooks in classrooms. Each student is able to carry all of his or her textbooks on a simple device, thus reducing storage needs, eliminating the need to repair damaged textbooks, and many more possibilities. Jesse (2014) noted that e-books save money, advance literacy, and enhance education, if individuals are able to embrace the use of iPads and tablets. With digital text books, teachers no longer have to keep track of how many text books they have and what shape they are in. Staiger (2012) pointed out that students do not have to print out as much paper when using an iPad or tablet for research. Students are able to save PDFs and other digital books right onto their tablet for later use.

Research has also shown that the iPad has become useful for special needs students, making inclusion not only more possible but more likely to be effective and successful. Flewitt, Kucikova, and Messer (2014) found that the iPad made it possible for

special education students to use kinesthetic and sensory to enhance motivation and engage students in higher levels of achievement in literacy.

Bruhn, Vogelgesang, Schabilion, Waller, and Fernando (2015) indicated that the iPad can help with some student behaviors. Also, Bruhn et al. found that students who had a history of behavior problems were able to make improvements with their behavior through technology-based self-monitoring using the iPad. This study concluded that when students demonstrated persistent behavior problems, technology-based self-monitoring was an efficient and an effective way to intervene.

Even though the iPad can be used in numerous ways in schools and in the classroom, it is important for the community at this local school to understand the effect that the iPad can have on student achievement. The findings of this research will help administrators and other stakeholders better understand the impact that the iPad has had and will continue to have on student achievement on standardized tests in Michigan. The data from this study were used to examine the impact the iPad has had on 11th grade standardized test scores. The findings of this study could also be used by the school district's administrative team to help make future decisions about continuing the purchase of iPads and future upgrades.

Research Questions

The purpose of this study was to compare standardized test scores of 11th grade students from a rural high school in Michigan since the implementation of their one-to-one iPad initiative program to the standardized test scores of 11th grade students from before the implementation of the iPad program and determine if the test scores have

significantly improved. If the students' scores had significantly improved on the standardized test scores in Michigan due to iPad use, then the school administrators and teachers would need to continue to provide iPads for every student and teacher and potentially look at having iPads for all students at every level, not just the high school students.

There are three research questions for this project study:

RQ1: To what extent, if any, have standardized test scores on the mathematics portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status?

Hypothesis: H_a1

> Standardized test scores for mathematics have improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

Null hypothesis: H_01

> Standardized test scores for mathematics have not improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

RQ2: To what extent, if any, have standardized test scores on the science portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status?

Hypothesis: H_a2

Standardized test scores for science have improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

Null hypothesis: H_02

Standardized test scores for science have not improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

RQ3: To what extent, if any, have standardized test scores on the social studies portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status?

Hypothesis: H_a3

Standardized test scores for social studies have improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

Null hypothesis: H_03

Standardized test scores for social studies have not improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program.

A quantitative approach with a causal-comparative design was used for this project study. The causal-comparative design was the most appropriate design for this

project study due to the use of ex post facto data (MME and MSTEP scores from the testing years 2007 through 2016) and due to the fact that the independent variable was not manipulated because it has already occurred (Creswell, 2012). The dependent variable for RQ1 in this study was the student standardized test scores in mathematics for Grade 11 students on the MME and MSTEP from the testing years 2007 through 2016. The independent variable for this study was the introduction of the iPad technology, with student characteristics of gender, ethnicity, and socioeconomic status (free/reduced lunch enrollment) as covariates.

The dependent variable for RQ2 in this study was the student standardized test scores in science for Grade 11 students on the MME and MSTEP from the testing years 2007 to 2016. The independent variable for this study was the introduction of the iPad technology, with student characteristics of gender, ethnicity, and socioeconomic status (free/reduced lunch enrollment) as covariates.

The dependent variable for RQ3 in this study was the student standardized test scores in social studies for Grade 11 students on the MME and MSTEP from the testing years 2007 to 2016. The independent variable for this study was the introduction of the iPad technology, with student characteristics of gender, ethnicity, and socioeconomic status (free/reduced lunch enrollment) as covariates.

Prior to this research, there was a gap in research. There had not been a study conducted at this school district in Michigan to help determine if the iPad has been helping to improve student test scores on standardized tests. This study examined three different areas on the MME and MSTEP: Mathematics, Science, and Social Studies. By

examining these different assessment areas, this study has helped determine if the iPad has helped increase these scores on the MME. There was a genuine need for this study at this school district in order to help provide the administrative team with more information about the iPad initiative and to help provide data for future upgrades and decisions.

Review of the Literature

Introduction

This review of literature provides an overview of the engagement theory, which is the theoretical framework that was used for this project study, a review of the broader problem, a review of students' different learning styles, a review of tablets in schools, a history about technology in the classroom, a discussion about some legislation that has affected technology in the classroom, a brief discussion about current research about technology in today's classrooms, and some of the different costs of technology and what it means to schools.

In order to gain access to current and relevant research, Walden University's online library was used to gain access to current research articles. Under Walden's library, educational databases were selected to find different peer reviewed articles. The databases ERIC, SAGE Premier, Thoreau multiple databases, and Google Scholar were the primarily used databases. Key word searches included *mobile learning, iPad and student achievement, iPad and standardized test, 1-to-1 iPad, one-to-one iPad, technology and improving student achievement, mobile device and student achievement, mobile device and standardized test, iPad and secondary schools, iPad and High Schools, engagement theory,* and *Michigan Merit Exam*.

The review of various studies related to the incorporation of technology in various grade levels, with a specific focus on the use of iPads and other tablets, demonstrated that today's students have been exposed to technology at an early age and have grown up using various devices almost on a daily basis. These students have been referenced as *digital natives* because they speak the language of technology (Prensky, 2001). There has been little to no contention that education today is different from education in past due to the incorporation of technological devices and their popularity. Currently, there is a lack in available research when it comes to the implementation of iPads and other mobile learning devices for the purpose of demonstrating student academic growth and student achievement. There are even fewer research studies that have focused on standardized test scores and even fewer that focused on standardized test scores of high school students. Qualitative research is the methodology that scholars have primarily used for the topic of technology in the classroom. Small sample groups, observations, and a focus on elementary students seems to have been the primary purpose of many current studies. However, this literature review demonstrates that there has been a trend of implementing mobile devices into the classroom at all levels and the trend will continue to grow as these devices become more affordable and more accessible.

The United States has been striving for the past several decades to be a major contender in the academic world. Legislation has been passed, initiatives by schools have be undertaken by different states, standardized tests have been developed, and additional funding has been provided by state and federal governments, all for one purpose: to raise tests scores. However, a recent Pew Research Center report presented findings that

roughly 29% of Americans rated the K-12 education in the United States for science, technology, engineering, and mathematics (sometimes referred to as STEM) as either above average or as the best in the world (Desilver, 2015). In addition, Desilver (2015) suggested that American scientists were even more critical when only 16% believed that the U.S. K-12 STEM education was either the best or above average compared to other countries. The results of standardized testing appear to reflect these characterizations. Per the results of the 2012 Program for International Assessment, also known as PISA, 15-year-old students in the United States ranked a mere 24th in reading, 27th in science, and 36th in mathematics (Organization for Economic Co-operation and Development, 2014). There have been many debates about the effectiveness of standardized testing and the merits or lack thereof for these tests (Dietel, 2012). In addition, Dietel (2012) noted that one thing that educators do agree upon is that standardized tests scores need to be improved. One way of improving these test scores is through the incorporation of technology into the classroom.

Theoretical Framework: Engagement Theory

Engagement theory is a framework for learning that specifically applies to technology-based environments. The underlying principle behind the engagement theory is that students have to be engaged in meaningful learning actives through the use of technology, with interaction with worthwhile tasks and others (Kearsley & Shneiderman, 1998). Although engagement theory is not derived from any specific or other theoretical frameworks for learning, it does have common elements that can be found with other frameworks. Also, Kearsley and Shneiderman (1998) noted that engagement theory is

consistent with various constructivist approaches because it places an emphasis on meaningful learning.

Engaged learning can take place without the use of a technological device; however, Kearsley and Shneiderman (1998) pointed out that "technology can facilitate engagement in ways which are difficult to achieve otherwise. So, engagement theory is intended to be a conceptual framework for technology-based learning and teaching" (p. 1). Engagement theory was used to examine and help explain the interconnection between the dependent variables of student standardized test scores in mathematics, science, and social studies for 11th grade students on the MME and the independent variable of the use of iPad technology with student characteristics of gender, ethnicity, and socioeconomic status as covariates.

Engagement theory involves approaching instruction from a student-centered view point. Traditionally, learning has taken place in the classroom with a teacher-centered approach, where students are required to focus on the lecture that the teacher gives or direct instruction from a teacher. Engagement theory proponents have advocated a student-centered approach, using various technological devices, where collaboration and dialogue among students and professors is needed if the goal is student learning (Knowlton, 2000). The traditional top-down approach in education is replaced with a bottom-up approach when engagement theory is properly used (Marcum, 2000). Also, Marcum (2000) suggested that one of the emerging principles behind engagement theory is that "people choose to be engaged, they are not assigned engagement" (p. 59).

As of 2005, engagement theory, or *engaged learning* as it is sometimes called, was not readily found in the literature of instructional design (Dickey, 2005). However, Marshall (2007) demonstrated the relevance of engagement theory through a study of WebCT courses. Also, Marshall indicated that engagement theory was not only used as the theoretical framework for the study but also used the theory for the development and implementation of the WebCT courses. Engagement theory was also used by Davies (2002) as a theoretical framework in his case study about student engagement with simulation. For this doctoral project study, I have attempted to contact both Dr. Kearsley and Dr. Shneiderman to find out more information about their engagement theory, but to date, there has been no reply to the requests for more information.

Review of the Broader Problem

Incorporating technology into the classroom to help increase student achievement is not a new concept. This project study presents 36 different peer-reviewed studies that include a variety of grade levels, methodologies, and differing variables. However, the vast majority did not focus on high school level students, nor did they focus on standardized testing.

One of the main purposes for purchasing mobile devices for students and educators for classroom use is to help support educators' instruction and to give the opportunity for students to become better problem-solvers, develop better critical thinking skills, and not only adapt but also contribute to the ever growing and changing world of technology. For the most part, over the past century the education system has not been dramatically altered. Reformers have made attempts to make modifications in

various ways (national standards, state standards, school of choice, charter schools, private schools and teacher evaluations), but to date, nothing has actually transformed learning until now (Finn & Fairchild, 2012).

> Today, American education has the potential to be completely rerouted and accelerated by digital learning. Indeed, truly boosting student achievement – as well as individualizing instruction and crating high-quality options for children and families among, within, and beyond schools – will depend to considerable extent on how deftly our K-12 system can exploit this potential, both in its pure form (full-time online instruction) and in various "blended" combinations of digital and brick-and-mortar-based instructions. (Finn & Fairchild, 2012, p.1)

One of the biggest benefits to incorporating technology into the classroom and the use of engagement theory is that instruction and education activities can be created on an individual basis for all students and can be adapted for each student learning style.

Student Learning Styles

Many researchers have noted that each student is a unique individual who has unique educational needs (Huang et al., 2012; Kee & Samsudin, 2014; Larson, 2010; Narayanansamy & Ismail, 2011; Weasmer & Woods, 2010). Because each student is a unique individual who has unique educational needs, it stands to reason that every student learns differently. If every student learns differently, educators must understand that there are seven styles of learning: (a) visual (spatial), (b) aural (auditory-musical), (c) verbal (linguistic), (d) physical (kinesthetic), (e) logical (mathematical), (f) social (interpersonal), and (g) solitary (intrapersonal) (Lepi, 2012).

There are many students who learn best visually (spatially). This type of student might prefer to work with diagrams, charts, a video, or possibly a handout (Lepi, 2012). Some students are aural (auditory-musical) learners. This type of student prefers the use of sound, rhyme, or music while learning. Sound recordings help give background and assist in visualizing (Lepi, 2012). Other students might be verbal (linguistic) learners. These are the types of learners who will repeat information or record it to play back later. Verbal learners prefer lectures or recordings to learn best (Lepi, 2012). A fourth type of learner is the physical or kinesthetic learner. These learners prefer a hands-on approach which means they prefer to do work through motion, action or using their hands (Lepi, 2012). The logical (mathematical) learner prefers to learn through reasoning that is behind the content and skill. This type of student prefers to learn in the form of a system and use logic to make sense of it all (Lepi, 2012). The sixth type of learner is the social (interpersonal) learner who prefers to work with others as much as possible. These types of students learn best through collaboration or having a community around them (Lepi, 2012). The final style of learner, solitary (intrapersonal), prefers to work along using independent study. This type of learner is driven by intrinsic motivation when it comes to learning goals (Lepi, 2012). Apple Inc. (2014a) has claimed that the iPad can be adapted for all different types of learners and claimed that all types of learners can improve on standardized test scores just by giving students an iPad.

However, some researchers have argued that there are no data or documentation that prove that learning styles even exist for students (Dembo & Howard, 2007; Olson, 2006; Riener & Williams, 2010). Riener and Williams (2010) indicated that students may

vary in their comprehension, background knowledge and interests, and even have a preference about how they want to learn, but there is no evidence that their preference in how they want to learn will actually lead to better learning. Dembo and Howard (2007) pointed out that it is the "best practices" approach, which includes using multiple learning strategies in the classroom, to instruction that has the best outcome to have more successful learners. Olson (2006) found that catering to students; preferred learning styles might actually lead to a decrease in performance and effort from students. If there is conflicting research about learning styles, one might ask in what ways do students learn? Many teachers do believe that students learn differently. For years, education has been shifting from teaching a room all at once to having a one-to-one learning environment.

Tablets in Schools

A one-to-one learning environment is not a new idea. Towards the end of the 18th century, students were using individual pieces of slate to use to write and solve problems on (Dunn, 2011). Although this was a great way to have one-on-one learning, it was very inefficient because each teacher had to go around to each student's slate and write the assignment or problem. There was no way for a teacher to present a lesson to an entire class in an efficient manner. In the 19th century with the use of a blackboard in front of a classroom, there began a shift away from one-on-one learning to "teaching to the masses" (Cuban, 1994). With the creation and development of technology in the 21st century that is new, mobile and now affordable in price, education has shifted back to the idea of creating individualized learning in the classroom (Grant & Basye, 2014). Individualized learning has also been referred to as differentiated teaching (Morgan, 2014), multiple

intelligences (Snyder, 1999), or, learning strategies (Schroeder, 2012). However, there are researchers like Kearsley and Shneiderman (1998) who are promoting the belief that with the use of technology in education to help motivate and engage students, best teaching practices can occur. On the contrary, one researcher concluded that the amount of money that has been spent on technology for public schools (billions) has not justified the little increases that have happened (Richardson, 2013). However, several researchers have found strong, positive relationships between the introduction and use of iPads in classrooms and student achievement (Conn, 2012; Cumming et al., 2014; Haydon et al., 2012; Larson, 2010; Simpson et al., 2013; Thoermer & Williams, 2012; Ward et al., 2013).

Although the iPad can display different content in a variety of formats making learning fun, schools and educators should approach the device with a certain amount of caution. Hu (2011) noted that for the iPad to be a practical, effective, and compelling tool in the classroom, a significant amount of research must be conducted to be able to understand the iPads effectiveness when it comes to student achievement. While some researchers (Murphy, 2014; Walker, 2015) have cautioned schools about purchasing the latest devices, there are companies that actively promote that schools should invest into technological devices and purchase the most recent and advanced equipment to help promote learning in the classroom.

Apple Inc. (2016a) noted that there are an overwhelming number of reports that show students' motivation to learn and demonstrate engagement in learning have increased due to the iPad. Also, Apple claimed that there has even been a decrease in

discipline problems and dropout rates due to the use of the iPad. In addition, Apple promulgated that just by giving a student an iPad, test scores will go up. Further, Apple indicated that when the iPad is in students' hands, they can learn at their own pace, individual learning can take place, and they have a better chance of being successful.

Moreover, Apple Inc. (2016a) has been actively involved in supplying classrooms with different technological devices since 1984. Although Apple has cited the academic benefits associated with the inclusion of the iPad into classroom instruction, an impartial, objective examination of the relationship between iPad and student achievement is warranted. As such, the theoretical framework for this study will be rooted in Kearsley and Shneiderman's (1998) engagement theory.

History of Technology in the Classroom

Previous work and research related to the implementation of tablets and other mobile devices in the classroom have changed overtime just as how the technology of mobile devices has changed. It has been more than 50 years since computer scientists and teachers began to incorporate computers into the classroom for instructional purposes (Sözcü, İpek, & Taşkın, 2013). It was in 1940 when the Complex Number Calculator (CNC) was completed by George Stibitz for the Bell Telephone Laboratories. While performing a demonstration at Dartmouth College, Stibitz executed calculations remotely on the CNC from New Your City. This demonstration is the first known use of remote access computing (Computer History Museum, 2008). Through the 1950s and 1960s, computer-based instruction emerged through the use of teaching machines and programmed instruction (Sözcü, İpek, & Taşkın, 2013).

By the 1970s, computer companies and software companies were on the rise. In 1971, Intel's first microprocessor was developed which ushered in a wave of mainframe and minicomputer use in business and education. The Apple I PC also commenced its sales being sold in a kit form in 1974. In order to help the Apple I PC to become more popular, Apple donated some of its PCs to schools. However, many schools were already using mainframes and minicomputers and refused to consider that the PC was a better replacement. Regardless of what schools thought about PCs, the Apple I became a popular computer for small business. By 1979, more than 15 million PCs were estimated to be in use worldwide (Murdock, 2007).

The 1980s ushered in many new changes in regards to computers and education. In 1980, the TI 99 was the world's most popular PC, which used a television screen as the monitor. IBM became the first mainframe computer manufacture to develop its own PC in 1981. Nineteen eighty-three saw the Apple II PC make big strides in education. Schools determined the acceptance of the Apple II because it was a better fit to help support teaching practices in a classroom. This led to the creating of the Apple Macintosh computer in 1984. Throughout the mid-1980s, most K-8 schools purchased Apple II and Macintosh computers. High schools, on the other hand, were predominantly buying DOS-based computers. Nineteen hundred and eighty-eight saw not only the development of laptop computers but also their creation becoming more popular. Alan Kays is noted as the first person to come up with the idea of a personal, "lightweight portable computing device" (Maxwell, 2006, p. 109)

In 1991, vast changes in the world of computers occurred that completely affected the way that people learn and find information. The World Wide Web, launched on August 6, 1991, has made it possible for vast amounts of information to be uploaded and accessed by billions of people. In August of 1991, Linux was also introduced as another major operating system. July of 1991 also saw the creation of the first cybercafé in San Francisco (Computer Hope, 2015a). The early 1990s saw less than 100 cybercafés around the world; that number rapidly grew to an estimated 1,500 worldwide by 1997. It was also estimated that there were 3,400 cybercafés operating in 160 different countries by the year 2001 (McHoes & McHoes, 2002).

Microsoft released Windows 3.1 in 1992 and within the first 2 months of its release, it sold more than 1 million copies. Before the release of Windows 3.1 computer operating systems were primarily controlled through MS-DOS where users had to memorize and enter different commands for the computer to run different programs. One of the new features of Windows was that it gave the user the ability to use a mouse to navigate on a computer screen and also manipulate the data with one hand. Windows also provided users with the ability to multitask, which meant it was possible to run more than one application or program at a time without having to close another out. Thanks to Microsoft Windows operating system, computers became easier to use and their popularity spread (Computer Hope, 2015c).

In 1993 that Apple launched the Newton MessagePad. The MessagePad was the first flat screen device that used a stylus in combination with handwriting-recognition software that also connected to the Internet (McLester, 2012). Also in 1993, the fist

webcam was connected to the Internet. In 1994, the company Yahoo! was founded along with Netscape and the Amazon.com domain name was registered. However, with the release of the first Netscape browser, cookies were introduced to the Internet. In 1995, many changes in the development of technology occurred. The “dot-com” boom started in 1995 where many domain names began to be purchased and more and more companies were creating websites. The Internet browser war also began with the creation of Opera, Internet Explorer 1.0 and 2.0, and Netscape.

Throughout 1996, the craze of the Internet for schools and educators alike continued. The Internet began to be very popular for businesses and advertising started to happen using different web pages. New graphics and multimedia tools kept on being developed. As soon as one was developed and hit the shelves it would be out of date as new chips, processors and different ways to create web pages on the Internet began to evolve. School districts began to rewire to provide Internet access for classrooms. Some schools began to purchase web servers so that teachers could create web page and begin to create their own sites for online learning (Computer Hope, 2015b).

For the next 10 years, the growth and expansion of the Internet has materialized faster than anyone has predicted. It has become the greatest database of knowledge, information, video streaming, multi-media, graphics and learning. The Internet has become a priceless tool for all educators. The most popular search engines, such as Google and Yahoo, have continued to develop new ways for information to get to users even faster. Information searches now pull up millions of results making it impossible for a user to take everything in. It was in September of 2014 that the September 2014 web

server survey (Netcraft, 2016) confirmed that there were more than 1 billion websites. The number of websites has gone down since then due to inactive websites and is currently roughly 993,700,000 (Netcraft, 2016). Schools have been tasked with having to provide access for students to all of information that is on the Internet. For 40 years now, schools have been purchasing computers to help provide access for them to learn. However, the difficulty with desktop computers is that it is not possible for schools to equip every classroom with a computer. It is important to note that it is not the cost of purchasing the actual desktop computer that makes it difficult for schools when it comes to the amount of money it spends, it is all of the other extra expenses that occur: furniture, electrical upgrades, cable upgrades, computer screens, and paying a contractor to do the work. The cost of laptop computers has been too much money and not as practical due to how easily they can break, battery life, how long they take to boot up. The world of touch input tablet computers really began to take off in the year 2000 (Bort, 2013).

Many have attributed Apple's iPad as being one of the most revolutionary products to be created in the PC industry; however, many do not know that Apple did not create the first tablet. Almost decade before Apple put into motion the release of the iPad in 2010, Microsoft presented the touch input tablet computer in 2001 (Bort, 2013). Even though Microsoft launched their tablets well before Apple, some have wondered why Microsoft did not do so well. Bill Gates said in July of 2012, that Steve Jobs "did some things better than I did. His timing in terms of when it came out, the engineering work, just the package that was put together. The tablets we had done before, weren't as thin,

they weren't as attractive" (as cited in Bort, 2013, para. 6). The iPad does seem to be a very popular choice of tablet for users and for schools. It has been reported that more than 8 million iPads have been sold around the world to different school districts with roughly 4.5 million of them being sold to school districts in the United States (Haselton, 2013). Apple Inc. (2016a) promoted the reason why so many teachers and students love the iPad is because of the "endless opportunities to create hands-on customizable learning experiences" (para. 1). Teachers are able to reach more of their students using apps and books that can be tailored to any grade level or subject. Tablets and other mobile devices are more practical for schools to use than desktops or even laptops. Tablets, like the iPad, are lighter, boot faster, have an 8- to 10-hour battery life, connect to the Internet wirelessly and have touch screen technology. Although schools have been purchasing the latest technological advances to be used in the classroom since the 1940s, over the past 15 years, schools are spending more and more money on technology related expenses all due to the different policies and legislation that have been passed.

Legislation and Technology in Schools

As researchers and companies began to build computers, it became evident that schools should be the place where students could take advantage of using this new technology to help benefit student learning and achievement. At the time when computer companies were growing, schools however lacked the necessary funding to purchase these devices. It was in 1958 when the United States Congress approved the National Defense Education Act (NDEA). The goal of this act was to provide more funding to help improve American schools and to promote postsecondary education (Hunt, 2015). It was

this act that not only helped provide more funds for schools, it also took a look at how technology could be incorporated into schools.

As schools began to realize the benefits of having computers in their schools, more schools wanted to have them but still lacked funding. In 1963, the Vocational Education Act was passed that supplied schools with more money to support the use of technology in schools and in the classroom. The difficult part of this act was that mainframe and minicomputers at the time did not fit well with teacher/learning methods that were being used at the time in most schools (Rich, 2010). A mere 2 years later in 1965, the Elementary and Secondary Education Act was sanctioned to provide even more funds towards incorporating technology into schools. Mainframe and mini computers were put into some schools, but their primary purpose was for administration use of for creating databases about students to be used for school counseling. However, schools that did receive computers and were able to use them in the classroom reported that they did very little to impact achievement of students (Jamison, Suppes, & Butler, 1970).

The argument has been made that the biggest policy changes to public education in the United States was the implementation of the No Child Left Behind Act in 2001 (Hayes, 2015; Neely, 2015; Dee & Jacob, 2011). This act has challenged school districts to improve public education. Individual school districts have attempted to implement new programs, new initiatives, and more professional development sometimes with little to no empirical research to back the effectiveness of these programs (Dee & Jacob, 2011). To meet the mandates of NCLB, technology initiatives have led to an infusion of different forms of technology into the classroom. Title II Part D of NCLB is referred to as the

Enhancing Education Through Technology Act of 2001. The Enhancing Education Through Technology Act is focused on improving student academic achievement through the use of technology in elementary and secondary schools. In addition, regardless of the student's race, ethnicity, gender, family income, geographic location or disability, the Enhancing Education Through Technology Act was created to help every student become technologically literate by the time they finished the eighth grade (U.S. Department of Education, 2004). To help meet this goal, schools are purchasing mobile learning devices for students; others have created a "Bring-Your-Own Device" (BYOD) program where students are allowed to use devices from home, while others are not too sure what to do. Project Tomorrow (2014) estimated that 33% of students nationwide are using a mobile learning device that was purchased by a school. It has also been estimated that 89% of high school students have a smart phone (Project Tomorrow, 2014). Meanwhile, nearly 56% of school districts have experimented with some form of BYOD (Schaffhauser, 2014). All of these different technology initiatives have one goal in mind: improve educational outcomes of all students.

Technology in Today's Classrooms

Since the 20th century, arguments have been made that more technology should be implemented into the classroom (Amin, 2010). It was in the 1940s that the superior audio-visual device was the overhead projector (Carr, 2012). Once the television became more popular, it was video home system (VHS) tapes, then the use of compact discs (CD's), then the advancement of digital video discs (DVD's), and now Blu-ray discs and online streaming websites, like YouTube and Daily Motion, that provide more

technological resources for teachers in the classroom. Due technological advances, today's classrooms look very different from classrooms that were 15 or even 10 years ago. With the recent advancements of technology becoming more portable, teachers have also incorporated these devices into their everyday instruction (Amin, 2010; Carr, 2012; Friedman & Garcia, 2013; Simpson et al., 2013). With the progress of technology and the prices are becoming more affordable, many students already personally own and operate portable music players, smart phones, tablets and other handheld devices. In many instances, families own devices that are more up to date than the ones that schools are purchasing for students. What makes things even more complicated is that with the advancements of portable handheld technology in many ways are second nature for today's youth where teachers and administrators are now asking for assistance from students to learn how to operate and use these new devices. Today's students truly are *digital natives* while their parents, educators and role models are *digital immigrants* (Prensky, 2001). School districts are relying more and more on their students for their opinions and assistance when it comes to purchasing technology and implementing devices into the classroom.

Computer-assisted instruction, or CAI, is one classroom instructional strategy that has influenced student engagement particularly when it comes to doing independent seatwork (Haydon et al., 2012). Also, Haydon et al. conducted a study about comparing students' work that did a work sheet on an iPad versus doing the worksheet by hand with high school students who had emotional disturbances. They found that students were able to complete more problems on the iPad per minute correctly than under the condition of

using a traditional pencil and paper worksheet. One of the possible explanations for why students were able to complete more math problems correctly is because the iPad provided instant feedback (Haydon. et al., 2012). When a student made an error on a problem, the iPad told the student that there was a mistake and gave a prompt to solve the problem again. The iPad also gave immediate responses to the students when they got an answer correct. This provided positive feedback to each student and reinforced the learning skills. The worksheets where students had to write out answers by hand provided no sort of instant feedback and students had to wait for the teacher to grade the paper and give it back the next day. Although this study worked with only students who had emotional disturbances, these researchers believe that the iPad could potentially help all students due to the immediate feedback and positive reinforcement that the iPad can provide (Haydon. et al., 2012).

Through action research, Cummings et al. (2014) found that high school students who had disabilities were able to become more independent learners with the iPad. Students were able to demonstrate what they learned by using the camera and other presentation Apps on the iPad to create different presentations. The findings from this study showed that there was a positive impact on these students' academic achievement. On the contrary, many general education teachers were reluctant to use the iPad in their teaching. Part of this reluctance was due to the fact that some teachers received their iPads at the conclusion of the study and did not feel prepared to implement the iPad. Based on the results of the study, the researchers recommended that teachers receive iPads well in advance of the students allowing teachers to have the necessary time that is

needed to become proficient with the iPad. The study also concluded that general education students would benefit from using the iPad in their classes just as special education students had benefited (Cumming et al., 2014).

Conn (2012) conducted a study about project-based learning using cutting-edge inventions that was completed by using the iPad, which she notes is a cutting-edge device in itself. The purpose of this study was to determine how students were motivated and engaged during project-based learning. It was found that many teachers had experience only with desktop or laptop computers. The difficulty for the teachers in this study was for teachers to figure out the benefits of working with individual devices and how students would be able to retrieve work. Although it was considered tedious and time consuming, the teachers shared that daily access to iPads has proved to help full integrate technology into all aspects of fifth grade core curricula over computer labs (Conn, 2012). This study also concluded that students were engaged through the project-based learning experience due to the iPad.

Hutchinson et al. (2012) conducted a case study about the use of iPads in a fourth grade classroom for literacy instruction. These researchers believe that mobile learning in education has completely changed how students learn. Simply put, mobile learning is learning that occurs due to the use of a mobile device. These “mobile devices encourage ubiquitous learning through their ease of portability and access to information that can allow learning to occur” (Hutchinson et al., 2012, p. 15). The results of the study indicated that student achievement in literacy increased. Students were able to access work anywhere in a classroom, throughout the school, and at home and did not

necessarily need an Internet connection to be able to do the work. It was also found that students were “highly” engaged and able to respond to text using new and creative ways. However, Hutchinson et al. did caution that it is imperative to remember that the point of digital technology and digital devices to access digital media, should be used to enhance curricular standards and support learning with new and transformative ways. In other words, introducing a mobile learning device should not be used as a part of technological integration but be used for curricular integration.

Simpson et al. (2013) posed a question in their study about literacy and iPads: What is the importance of touch play and how does it play a role in the way that students come to understand a concept from reading a digital text? The authors pointed out that today’s learners really rely upon active touch versus passive touch while not only reading but doing other learning activities. With the “growing uptake of tablets by schools and the lack of research in the area, the proposed relationship between the materiality of touch technologies, reading paths and cognitive processes needs detailed examination” (Simpson et al., 2013, p. 124). Also, Simpson et al. pointed out that there is a gap in research when it comes to how iPads are used in schools because there are not many schools that are providing one-to-one access. Their study found that touch-based learning is changing with tablets and iPads. In addition, Simpson et al. provided evidence that student who are using touch-based learning on tablets are interacting, collaborating and participating with students who have mixed reading abilities and that they were more inclined to work collaboratively with tablets than with printed texts.

With all of the advances in technology and the Internet, it has become necessary to adapt student learning. Digital texts via the Internet are becoming more and more popular via the Internet to help complement reading and instruction. “Reading instruction that incorporates digital texts can serve to motivate students to want to read and help increase students’ reading fluency in the classroom today” (Thoermer & Williams, 2012, p. 441). Today’s world continues to become more and more digitalized. With so much information now being in a digitalized form, educators must reconsider all of the nontraditional ways of teaching reading to students and providing students the opportunity to read. Also, Thoermer and Williams (2012) suggested that students can be more engaged and motivated to want to read using a digital text that can be accessed through tablets like the iPad. Students are able to practice reading from the iPad and then they can record themselves reading using the camera function. These reading sessions can be reviewed by students before they send the reading sessions to their teachers to demonstrate reading fluency. Tablets have many advantages over computers when it comes to reading digital texts. Due to tablet size, portability and how quickly they can be turned on, digital texts can be accessed easier than on a laptop or desk top (Thoermer & Williams, 2012).

However, Mangen, Walgermo, and Bronnicks (2013) study found that students who read from text on paper demonstrated greater reading comprehension than students who read from a digital text. Niccoli (2015) believed that students perform worse in reading comprehension from digital texts when compared to paper texts because digital texts actually use a different part of the brain due to a backlit screen. In addition, Niccoli

(2015) explained that research has yielded conflicting results when it comes to learning from digital or paper reading in particular due to the fact that technological devices are changing so rapidly.

As educators have been seeking to find and use alternative text sources such as digital texts and eBooks, it has become necessary to redefine the word *text.* In a traditional sense, texts have been perceived as any form of a written-down message often in the form of a book, magazine or newspaper (Larson, 2010). Today, texts have transformed into being much more than just recorded words or images. Bearne (2005) postulated that since the early 2000s, children began to be immersed in multimodal experiences and since then have become aware of the possibility of combining modes and media in order to create messages or texts. Reading texts on tablets and particularly the iPad have become a multi-media experience that embraces many different senses for readers. With the creation of such experiences, it has become imperative for teachers and researchers to "address the discrepancy between the types of literacy experiences students encounter at school and those they practice in their daily lives outside the school environment" (Larson, 2010, p. 16.) Students are no longer required to simply just read from a text book; eBooks and digital texts have the ability to make reading interactive with the learner. Also, Larson explained that students are able to customize their reading experience by changing font size, taking notes and using audio-enhanced dictionaries while using an eBook on a tablet. IPads and tablets have changed the way that a student reads and how they take notes about what they have read. With all of the possible ways to

customize text, it is easy to see that eBooks are the wave of the future for reading in schools (Gershon, 2013; Larson, 2010; McClanahan et al., 2012).

Retter et al. (2012) examined the results of using iPads to advance reading skills of secondary students with learning disabilities. This study focused on ninth grade students who were receiving special education and examined the effects the iPad had on reading comprehension, vocabulary, and reading fluency. The study found that there were only small gains in the total number of vocabulary words that were acquired, and for the class there was no parallel to be found between the use of the iPad and the development of vocabulary words that had been acquired. However, the researchers did observe that there was a significantly higher rate of engagement during study time for the learners. The researchers did conclude that there was an increase in both reading comprehension skills and acquired vocabulary but no certain correlation between using the iPad and an increase in reading fluency. Instead, due to higher levels of student engagement, there was a significant reduction in off-task behavior, noise level, and improper behaviors.

Ward et al. (2013) noted that when it comes to the use of personal electronics and mobile learning devices, the technology of these devices are primarily driven by the desires and wants of the consumers and not by the needs of educators. That being said, mobile devices do allow educators to reach learners in new and exciting ways and to use these devices as tools to help educators connect and communicate with students. In fact, the current generation of K-12 students in the United States has had mobile devices available to them since birth. Devices with touch screen capability, Wi-Fi, cellular data

connectivity, and even longer battery life, have become so prevalent in today's society that it is no longer considered new and exciting; they have become commonplace.

Ward et al. (2013) found that when using science tablet-based lessons, like the iPad, high school student engagement was higher, particularly from students who struggled to participate in regular classroom activities. However, it should be noted that the biggest limitation to the study was the lack of available content and free applications for use in the lessons. But with applications and content being created continually for the iPad, with proper wireless Internet connectivity, useful software packages, and educators who are willing to use mobile devices, a classroom set of iPads can replace a desktop computer lab and create more classroom space for teachers (Ward et al., 2013).

Friedman and Garcia (2013) examined how iPads and other mobile devices can be used in high school social studies classes. They observed that as soon as students were given an iPad, they became extremely enthusiastic and were highly engaged with the learning material that they had. Additional, although no student indicated that they had previous experience with using an iPad, after a brief amount of instructional time, no student had any technical difficulty with following the instructions for the course. Also, Freidman and Garcia's (2013) findings demonstrated that students who used iPads were more engaged, were impacted more directly due to the interaction of primary source historical narratives than compared to the classes that did not use the iPads for the same instructional lesson. History was no longer about reading from a print-based text book or resource. History came to life for students who used the iPad. In addition, Friedman and Garcia noted that there is a large gap in research when it comes to the iPad and classroom

use, particularly in social studies. Further, Friedman and Garcia (2013) suggested that when it comes to determining the potential positive impact on social studies through the use of mobile devices "further scrutiny" is needed.

McClanhan et al. (2012) noted that school districts across the U.S. have been adapting the iPad in different educational capacities, specifically for the ability to access interactive textbooks. How students read has been investigated for decades but it has not been until recent that mobile learning devices, such as the iPad, have helped establish more access to digital texts and media. Even though the iPad has the ability to be used as an eBook reader, there has not been a sufficient amount of research evaluating eBooks on iPads in the class room and even less research for struggling readers (McClanhan. et al., 2012). In addition, McClanhan et al. (2012) indicated that more teachers need to be not afraid to use tablets and other mobile devices to help support students in all aspects of education. With more teachers using devices, more research is able to be conducted and more evidence can be provided to draw important conclusions about how technology can be incorporated into the classroom.

With the idea of using eBooks in the classroom and the surge in their popularity, Wojcicki (2010) questioned the different reasons for making the switch to E-textbooks verses traditional textbooks. Also, Wojcicki (2010) explained that at one high school, students could present their opinions about making the switch to e-books from text books. Some students believed that they could add value to their education by being able to show videos or being interactive. A straw poll was conducted with the choices of having a free Kindle with all of their text books loaded or their old textbooks. Wojcicki (2010)

found that 100% of the students voted for their heavy text-books even though 20% of the students agreed that e-books are the future and should be. Further, Wojcicki (2010) suggested that with these types of results, there are researchers who are questioning if teenagers even prefer to use eBooks over traditional textbooks.

Carr (2012) conducted a study that primarily looked at the impact of a one-to-one iPad program on math achievement for students at the elementary level using iPads. The goal was to determine if using iPads and game-based learning with fifth grade mathematics instruction would increase student achievement. Also, Carr (2012) posited that from 2002-2012 elementary math scores of only marginally improved. This study made the attempt to help fill some of the void in research on the impact of one-to-one programs and student achievement at the elementary level. Students from two different school districts were used. One school district used iPads and the other did not. The students were given a pretest before instruction was given to determine math skills. When the quarter ended, all students were given a post-test test to determine gains in math. Both groups of students increased their math scores. Although the students enjoyed using the iPads and playing mathematical games on them, the findings demonstrated that there was no significant contrast between the groups that used the iPad versus the groups that did not use the iPad. Further, Carr (2012) concluded that because of the short duration of the study, a similar study should be conducted over a greater period of time.

The Cost of Technology

Schools have the obligation to think not only about the potential educational gains that can happen in the classroom, they must also consider the financial cost of the iPad.

With a price tag starting at roughly $400 per device, school districts that have thousands of students can expect to spend in the millions of dollars to not only purchase these mobile devices, but also update Wi-Fi and Internet band width. The San Diego Unified School District committed more than $15 million dollars to their iPad initiative (U-T: SD Unified, 2012) while a district in Tennessee committed more than $5 million dollars for their iPad program (Fagan, 2013). One of the largest school districts in the U.S., the Los Angeles Unified School District, had planned to purchase about 700,000 iPads for students and teachers with an expected price tag of $1.3 billion after all upgrades and other equipment purchases. However, the school Superintendent issued an announcement in August of 2014 announcing that they would be canceling the contract with Apple and restarting the bidding process after a number of investigations stemmed from the discovery of potentially unfair bidding practices (Gilbertson, 2014). The Fort Bend Independent School District in Texas made the decision to "shelve" its iPad program after spending $16 million on integrating some 6,300 iPads into 14 different schools. Fort Bends program initiative, known as iAchieve, found that the use of the iPads was limited, the managers had inadequate skills to use them and the vendor that was hired to help develop the learning platform was a startup company that had no relevant experience. Many members of the community and school board believed the programs failure was due to the over aggressiveness for the time table and having unrealistic expectations (Lee, 2013). The school district where this study was conducted purchased approximately 2,700 iPads and MacBook Airs after voters supported a $7.29 million technology bond that was passed in May of 2012.

Financial cost is not the only cost that must be considered by schools when making decisions to purchase mobile devices. One charter school had to lay off a few teachers in order to have enough funds to be able to purchase iPads for their students (Zouves, 2012). Another financial cost is having adequate Internet bandwidth for the devices to be able to work properly. However, if a student has Internet access at school, they may not have it home. Roughly 30% of American school children have no access to the Internet at home. The inadequate access to the Internet at home for school children is such a common problem that the FCC has referred to it as "the homework gap" (Lapowsky, 2015).

Even though the iPad comes with certain costs, there is potential that the iPad could actually save school districts money. In some school districts, monies that were earmarked for the purchasing of traditional textbooks are now being used for the purchasing of iPads and eBooks (Bernier, 2013). Another school district in Texas is currently encouraging teachers to write their own textbooks in order to save money and use more technology in the classroom (Findell, 2013). A school district in North Carolina is not only saving money by purchasing eBooks instead of text books, their entire library is now available via e-book as well. Books that used to cost $230 from book stores are now available for $99 (Kurwicki, 2012). There is evidence that suggests that a school could potentially save money over time while using iPads or other mobile devices. However, just because a school is able to save some money with the iPad and meet mandates stipulated by the No Child Left Behind Act of 2001, it does not mean that students will increase their test scores or that achievement levels will increase.

Researchers referenced in this literature review, have demonstrated through their works that more research is needed to help determine if iPads are in students' best interest to help them improve test scores.

Summary of the Literature Review

This review of literature has provided an overview of the engagement theory, which is the theoretical framework that was used for this project study; a review of the broader problem; a review of students different learning styles; a review of tablets in schools; a history about technology in the classroom; a discussion about some legislation that has affected technology in the classroom; a brief discussion about current research about technology in today's classrooms and some of the different costs of technology and what it means to schools. The review of various studies related to technology in the classroom and specifically the use of iPads and other tablets demonstrated that today's students have been exposed to technology at an early age and have grown up using technological devices almost on a daily basis. Some studies have also revealed that students became more engaged with the use of technology in the classroom and also that student achievement increased. There is very little doubt that the world of education is changing and will continue to change as technological devices become more popular, more affordable and more accessible. Today's student is growing up in a digital world and schools need to be expected to teach students how to properly use technology in order for students to be able to demonstrate proper digital citizenship and to be able to enhance critical thinking skills for not only the enhancement of student achievement on standardized tests, but to also enhance students' future outlook on education. The studies

that have been mentioned in this literature review have also shown that students become more engaged and motivated to explore different concepts that they may not have not examined if it were not for the use of technology.

The iPad is considered to be an exciting product that can display different content in a verity of formats making learning fun, exciting and helping to engage students in their work. However, schools and educators should approach the device with a certain amount of caution. For the iPad to be an effective educational tool in the classroom, a significant amount of research must be conducted to be able to understand the iPads effectiveness when it comes to student achievement (Hu, 2011). Research at all levels of education is needed to help determine different successes, failures and how we, as educators, can help students be more successful in all endeavors.

Implications

The purpose of this quantitative project study was to investigate the effects of a one-to-one iPad initiative program on 11th grade standardized test scores at a rural high school in Michigan. The school board at this school district made the decision to implement a one-to-one iPad program for all high school students in Grades 9 through 12 in 2012. Currently, there has not been a study conducted to determine if the iPad has had a positive or negative effect on student standardized test scores at this school district.

This project study gathered and analyzed data of 11th grade students on the MME and the MSTEP to determine how scores have changed since the implementation of the one-to-one iPad program. The data from this study will help the administrative team to

make decisions about this iPad initiative program and any future decisions that may contribute to the purchasing of newer iPads or looking at other mobile devices.

With all of the possible uses of the iPad, it is also important for this community to understand how the iPad is having on the costs of learning materials as well as student achievement. The findings of this research could help administrators explain to stakeholders the impact that the iPad has had on students and student achievement. Specifically, the data from this study was used to demonstrate the impact the iPad has had on 11th grade standardized test scores. This study could also be used to help make future decisions about renewing bonds or other mileages for the purchase of iPads and future upgrades.

This school district is currently questioning if they should be continuing this one-to-one iPad initiative. As more and more mobile devices are becoming available, more and more school districts are looking at the different purchasing options. In 2014, more than 146,915 devices were sold to school districts across Michigan. 68,513 of those devices were Chromebooks, 29,388 of those devices were iPads and 4,194 of those devices sold were other tablets (Technology Readiness Infrastructure Grant, 2016a). In 2015, more than 174,763 devices were sold to school districts across Michigan. 106,136 of those devices were Chromebooks, 25,449 of those devices were iPads and 1,035 devices sold were other tablets (Technology Readiness Infrastructure Grant, 2016b). Initially, the school district for this study purchased approximately 2700 iPads in 2012. Roughly 1,000 of those went to high school students to be able to take home where the middle school and elementary students were given access to technology carts with iPads.

Based off the findings from this project study, the administrative team now has the necessary data demonstrating how students have performed on standardized tests since the implementation of the iPad program and it was compared with the scores before the iPad program began. The administrative team can now make data based decisions about the continuation of this program or if other mobile devices should be considered.

Other implications have emerged from this study that could have an impact on educational theory, in particular, engagement theory. This project study has demonstrated if 11th grade students have benefited from having the use of iPads to help improve standardized test scores over students who did not have the iPad in previous years. In addition, scores have been compared based off of gender, ethnicity and socioeconomic status. Given that there are growing concerns not only in this school district, but across the United States, about how well the education system is catering to special education students and students who come from low income households, and their performance on standardized tests, this project study is very valuable for the administrative team and all stake holders in this district.

Summary

The literature review has revealed a common consensus has not been reached amongst researchers, educators, administrators and teachers about the impact of technology, nor about mobile learning devices. Previous research has indicated that there have been gains when it comes to student achievement thanks to the iPad, but some research has also proclaimed that there has been no benefit and in some cases, they have only been a distraction. Previous research has indicated that there is a rising trend as far

as technology being infused into the classroom. Recent sales of mobile devices in Michigan to school districts also support the notion that mobile technology is not going away, but becoming even more popular. Researchers have proposed several different factors and ways that iPads and other mobile devices have affected schools as far as a financial cost and some gains in student achievement in the classroom. However, there is a major gap in research when it comes to student success on standardized tests in particular at the high school level when an iPad program has been implemented. Implications have been expressed that there is not only a cost when it comes to purchasing an iPad or other mobile devices, but there are other implications to consider such as gender, socioeconomic status, and overall purpose for purchasing a mobile device.

Section 2 addresses the research methodology that has framed this quantitative study and provided guides to the research procedures. A description of the research method and design will also be discussed including data collection procedures. The setting and a description of the sample will also be included. The instruments that were used in this study will be discussed along with the data collection and analysis procedures. The assumptions, limitation, scope and delimitations will also be discussed to present some of the facts that are assumed and the potential weaknesses of the study. Section 2 will conclude with a discussion about the protection of participants' rights and summarize the measures that were taken for the protection and confidentiality of participants, and that no rights were violated.

Section 3, the Project, will include a description of the project and goals that were addressed and identified in Section 1. A rational will also be included to why this particular project was chosen to address the problems identified in Section 1. A discussion will also be included to address how the project fits in with the data analysis that was completed in Section 2 and if this project was a solution to the overall problem. Another review of literature will be included containing the criteria that was used to develop the project based off of research and engagement theory. A section about implementation will also be included discussing: (a) the potential resources and existing supports, (b) the potential barriers, (c) a proposal for implementation and a time table and roles and (d) responsibilities of students and others. Section 3 will conclude with a section about implications at the local community level and social change on a larger context. Section 4, reflections and conclusions, will include a section about the strengths of the project, a section about recommendations and remediation of the limitations. A discussion about how the problem could have been addressed differently and what other alternatives might have been considered to address the problem will also be included.

Section 4 will also include the following areas: (a) what was learned about scholarship, (b) what was learned about project development, (c) what was learned about leadership and change, (d) what was learned about oneself as a practitioner, (e) what was learned about oneself as a scholar, and (f) what was learned about oneself as a project developer. Next, Section 4 will include a discussion about the overall potential impact of this project and social change at the local level and beyond. Finally, Section 4 will conclude with a reflection on the importance of the work that was completed and what

was learned. A discussion will be included about the potential applications that can be used in the field of education based off of this project study. A reflection will also be included about future research and what direction could be taken based off of this project study.

Section 2: The Methodology

Introduction

This section addresses the research methodology that framed this quantitative study and provided guides to the research procedures. A description of the research method and design are also discussed, including data collection procedures. The setting and a description of the sample are also included. I discuss the instruments that were used in this study along with the data collection and analysis procedures. The assumptions, limitation, scope, and delimitations are discussed to present some of the facts that are assumed and the potential weaknesses of the study. Finally, this section concludes with a discussion about the protection of participants' rights and a summary of the measures that were taken for the protection and confidentiality of participants, and that no rights were violated.

Research Design and Approach

This project study used a quantitative approach with a causal-comparative design, also known as an ex post facto design. Causal-comparative designs usually involve preexisting groups to explore differences on outcomes or dependent variables between those groups (Schenker & Rumrill, 2004). Because the primary purpose of this study was to determine the extent to which the use of the iPad may have improved student achievement on a standardized test, a posttest only methodology was used, comparing current and archival data. This study used two different groups of people, 11th grade students' archived data before iPads were issued to students and 11th grade student current data and archived data since iPads were issued to students. Data from the MME

and MSTEP were used in the areas of mathematics, social studies, and science. It should be noted that using a quasi-experimental approach creates the possibility of more internal threats than a true experiment. Schenker and Rumrill (2004) noted that internal validity of causal-comparative designs cannot be guaranteed because the independent variables are not manipulated. Because participants are exposed to other variables that exist prior to a study, it is not possible for a researcher to be 100% positive that the independent variable has caused a change in the dependent variable. For this study, there were many validity threats that existed with a causal-comparative design that compares the outcomes of current student achievement with past student achievement. Some of the validity issues that existed are changes in the teaching staff, changes in administration, pedagogy, curriculum changes, issues with student behavior, how the test was administered, test preparation, and even disruptions due to weather or other unanticipated events. A repeated measures analysis of variance (ANOVA) was used to compare the standardized test scores from 2007 to 2016 on the MME and MSTEP in the areas of mathematics, socials studies, and science.

Setting and Sample

This project study, for which I used a quantitative approach with a causal-comparative design, took place at a rural high school in Michigan that covers 107 square miles over three counties in nine different townships. The school district is comprised of two elementary schools that have levels kindergarten through Grade 2, one intermediate school that has Grades 3 through 5, one middle school that has Grades 6 through 8, and one high school that has Grades 9 through 12. Within the school district, there is a 10-

year average of approximately 2,940 students. Over the past 10 years, the high school has averaged approximately 970 students. Within the 11th grade from this high school, there has been a 10-year average of approximately 245 students. Roughly 51% of these 11th grade students are female over the past 10 years. Nearly 91% of these 11th grade students are White. Finally, only 15% of these students are considered to be economically disadvantaged. At the time of data collection, the high school currently had a total of 50 teachers with a few who were part time. There is one high school principal and one assistant principal.

For this project study, convenience sampling was chosen as the best form of sampling to help answer the research questions. Convenience sampling was chosen because I worked for this school district and this school district had given iPads to all of its students. Researchers who use convenience sampling are able to select participants due to their willingness and availability to be studied (Creswell, 2012). However, one of the downsides of using convenience sampling is that a researcher cannot say with complete confidence that the participants used in the study are a representative of the population. Archival data of the students were used, which means that students were actively involved in this project study.

Instrumentation and Materials

There are three options that can be used to obtain a data collection instrument: the researcher (a) develops one, (b) locates one and modifies it, or (c) locates one and uses it in its entirety (Creswell, 2012). For this project study, I obtained 5 years of archived student standardized state test data from before the iPads were issued. The data were

compared with the past 4 years of archived student standardized state test data since the iPads have been issued. The results of all standardized test scores are public data and can be accessed by anyone. For this project study, the Michigan Department of Education website and the school district's Smart Data Warehouse, also known as the "Golden Package," were used to obtain data from the past 9 years for this school district. The MME and MSTEP include the areas of mathematics, science, and social studies. The State of Michigan uses a 4-point number, ordinal scale to determine student achievement rates: 1 (*advanced*), 2 (*proficient*), 3 (*partially proficient*), 4 (*not proficient*). Because the high value, *advanced*, is coded as a 1, the scores were reverse coded so that the high value was coded as a 4 instead of a 1. A repeated measures ANOVA was used to compare the standardized test scores.

Data Collection and Analysis

Prior to conducting this project study, I submitted a letter to the superintendent of the school district, the principal of the high school, and the director of curriculum and instructional technology explaining the topic of the project study and asking for permission for the study to take place. An Institutional Review Board (IRB) request was also submitted to Walden University and I gathered no data until approval was received.

After I received approval from the school district and Walden IRB, I collected data with the assistance of the school's director of curriculum and instructional technology concerning how students have performed on the standardized tests given in Michigan for all 11th grade students. Test scores were collected for 11th grade students and comparisons were made in regards to previous years that the standardized tests have

been taken before the one-to-one iPad initiative and since the iPad initiative. Comparisons were also made based on the following categories: (a) gender: male and female; (b) race: American Indian or Alaska Native, Black, Asian, Hispanic/Latino, two or more races, and White; and (c) economically disadvantaged and not economically disadvantaged. A repeated measures ANOVA was used to compare the standardized test scores and to see if there have been any significant changes in student achievement across all categories of mathematics, science, and social studies. Descriptive statistics were also used to describe and summarize the archived data.

Because the State of Michigan uses a number scale from 1 to 4 to determine student achievement rates where 1 is the highest score and 4 is the lowest score, the achievement rates had to be recoded to where 4 was the highest score and 1 is the lowest score. This is known as reverse coding. Reverse coding was used in this situation so that the higher scores reflect the high attribute levels being associated on the MME and the MSTEP. With lower scores indicating low achievement attributes and high scores indicating high achievement attributes, there were fewer problems with running the ANOVA and when comparing the MME and MSTEP test scores. Currently the MME and MSTEP indicate that a 1 is a student who is advanced, a 2 indicates a student who is proficient, a 3 indicates a student who is partially proficient, and a 4 signifies a student who is not proficient. The reverse recoding process was a Likert-type scaled with 1 (*not proficient*), 2 (*partially proficient*), 3 (*proficient*), and 4 (*advanced*).

Assumptions, Limitations, Scope, and Delimitations

At the beginning of this project study, several things were assumed to be true. This study was conducted based on the following assumptions: (a) all 11th grade students took the standardized tests that are given by the State of Michigan because the State of Michigan requires public schools to give these standardized test to 11th grade students; (b) all 11th grade students tried their best to demonstrate what they have learned in schools by performing to the best of their abilities on the State of Michigan standardized tests because these tests are used by colleges and universities as a part of the admissions process; (c) all 11th grade teachers were teaching the same curriculum for more than the past 9 years because the curriculum is based on the State of Michigan's mandated curriculum requirements and teachers have been using common assessments; (d) the standardized tests that are given are valid and reliable due to the fact that they are approved by the State of Michigan as standardized test questions; and (e) all test data have been collected accurately because the data were collected by the State of Michigan.

There were several limitations that existed for this project study and that I could not control as the researcher. These limitations must be considered when drawing any final conclusion based on this project study. I had no control over how students were placed in classes in preparation for the standardized tests and no control over students who were placed in a test prep course over students who were not placed in a test prep course. I also had no control over the curriculum that was taught in each class for 11th grade students and no control over the various skill level that teachers may have had with

the iPads; however, it is important to note that I was not looking at this aspect for this study.

There were several delimitations for this project study. The main reason why only 11th grade students were chosen as a certain group to examine was because this was the only high school grade level that takes a standardized test in the State of Michigan. The reasons behind examining the effects of the iPad on standardized testing came about through several conversations that I had with the high school principal at the site of this project study. One of the primary concerns that the administrator had was the effects of the iPad on the 11th grade students' tests scores. In addition, one of the goals of the school improvement committee has been to help improve standardized test scores for all students and to reduce the achievement gap. The primary delimitating factor for this project study was the fact that there has not been any research at this district about the effects that iPads have had on standardized test scores.

Due to the existing relationships that I had with the administrative team at this public school, it was possible for me to have access to not only the public data but also examine other sets of archived data that were available to the school district administrative team. This made it feasible to draw specific conclusions about the iPad and the influence it has had on the MME and MSTEP scores. However, using public schools did not allow me to be able to state the opinions of teachers and students at charter or private schools in Michigan who also use other mobile devices. Furthermore, the use of iPads was only explored at one rural high school where certain standardized tests are used by the State of Michigan; therefore, it did not allow me to gain the

viewpoints from other states, school districts, teachers, or students who used different standardized tests.

Protection of Participants' Rights

The safety and wellbeing of all participants and the protection of each individual's human rights was of the utmost importance and was safeguarded throughout this project study. Measures were taken to assure that all human rights were protected from harm in compliance with the National Institute of Health (NIH) guidelines and as stipulated by Walden University policy and procedures. As part of the policy and procedures, the principal of the high school signed a data use agreement, which included confidentiality, anonymity, and protection from harm. Furthermore, approval was also obtained through the IRB process at Walden University (Walden University IRB approval # 10-14-16-0397136). Because only deidentified archival student data were used and analyzed and no interactions occurred with students for this project study, it was not necessary to obtain permission from the students or parents to conduct this project study. As a result of adhering to these safety measures, participants' identities were confidential. I also took measures to ensure that all participants did not suffer any harm as a result of their participation in taking the MME and MSTEP. All possible forms of identification were removed.

All of the data that were collected for this study were public data that can be found by anyone using the Michigan Department of Education website. All information that came from this website did not include any identifying markers for students. I was the primary data collection instrument. The purpose of this study was to compare

standardized test scores of 11th grade students from a rural high school in Michigan since the implementation of their one-to-one iPad initiative program to the standardized test scores of 11th grade students from before the implementation of the iPad program and determine if the test scores have significantly improved. This project study was not designed to have any reflection on teacher practices and how they used iPads in the classroom. It is designed to find out if iPads actually helped to improve student achievement. This study was also designed to have no adverse effect on students or to reveal any identifying markers.

Data Analysis Mathematics Test Scores

Before data could be gathered, the first item completed was gaining the approval from the Superintendent of the school district, the Principal of the High school and the Director of Curriculum and Instructional Technology. After approval from the school district and approval from the IRB at Walden University, archived Mathematic test score data from the school district was gathered with the assistance of the High School Principal and the assistance of the Director of Curriculum and Instructional Technology. The Mathematics test score data was accessed through the school districts "golden package," which is a data analysis report that the school district receives yearly from the Michigan Department of Education. The data were then entered into an Excel spreadsheet and then uploaded to SPSS. Each archived Mathematics test score was given a unique number in order to replace the student ID to ensure the identities of the students were protected. There were nine repeated measures in this study for the testing years of 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016.

Descriptive Statistics

The sample was n = 225 students. The overall mean scores and general descriptive statistics are shown in Table 1.

Table 1

Combined Descriptive Statistics for Mathematics Test Scores Across 9 Years

Year	Minimum	Maximum	*M*	*SD*
2008	200	504	332.55	72.80
2009	200	504	332.55	72.80
2010	200	504	332.55	72.80
2011	228	730	373.84	107.87
2012	246	742	430.84	142.81
2013	254	751	512.62	165.27
2014	278	762	601.79	145.08
2015	411	768	680.73	86.86
2016	411	768	680.73	86.86

The data were also analyzed for skewness and kurtosis. In SPSS, skewness and kurtosis are considered acceptable between -2 and +2 for normal distribution. Mathematics test scores for 2008-2012 were positively skewed and Mathematics test scores for 2013-2016 were negatively skewed (Table 2). Next, the data were then averaged between before the testing years of 2008-2012 and after the testing years of 2013-2016 (Table 2).

Table 2

Mean Mathematics Test Scores of Matched Students for the Testing Years of 2008-2016

	N	Minimum	Maximum	*M*	*SD*	Skewness	Kurtosis
2008-2012	225	232.67	643.00	379.08	103.53	0.89	-0.54
2013-2016	225	328.67	755.00	598.38	120.41	-0.70	-0.78

The mean of Mathematics test scores prior to the implementation of the iPad program for the testing years of 2008–2012 was *M* = 379.08. The mean of Mathematics test scores after the implementation of the iPad program for the testing years of 2013–2016 was *M* = 598.38. Thus, Mathematics test scores increased after the implementation of the iPad program by 219.30 points. To further show that there was a significant difference in the Mathematics test scores, a paired-samples *t* test with its statistics and correlations, repeated measures ANOVA, multivariate tests, within-subjects contrasts, and pairwise comparisons were conducted.

A paired-samples *t* test was then conducted to evaluate whether the means of the Mathematics test scores for 4 years of the iPad implementation program (2013-2016) differed significantly or not from the means of the Mathematics test scores for 5 previous years (2008-2012) prior to the implementation of the iPad program. The results indicated that the mean Mathematics test scores for the 4 years after the implementation the of the iPad program (*M* = 598.38, *SD* = 120.41) was significantly greater than the mean for the previous 5 years prior to the implementation of the iPad program (*M* = 379.08, *SD* = 103.53), $t\,(224) = 35.31$, $p < .001$ (Table 3. Using the effect size index, $d = \frac{t}{\sqrt{N}}$, where the standardized effect size index, *d*, was 2.35. With a 95% confidence interval, the mean differences between the two ratings were 207.06 and 231.54 respectively (Table 4).

Table 3

Paired Samples Statistics Mathematics Test Scores

		M	*N*	*SD*	*SEM*
Pair 1	After iPad Implementation	598.38	225	120.41	8.03
	Prior to iPad Implementation	379.08	225	103.53	6.90

Table 4

Paired t Test Distribution of Mathematics Test Scores of Matched Students

		Paired Differences							
		M	*SD*	SEM	Lower	Upper	*t*	*df*	*p*
Pair 1	After iPad Implementation Prior to iPad Implementation	219.30	93.17	6.21	207.06	231.54	35.31	224	.002

The correlation coefficient was also computed among the mean Mathematics test scores before and after the years of the iPad implementation program. Using the Bonferroni approach to control for Type I error in the correlation, a p value of .05 was required for significance. The result of the correlational analysis (Table 5) showed that the correlation was statistically significant ($r = .66$, $p < .001$). The results showed a positive correlation in the mean Mathematics test scores of students when measured before and then after the implementation of the iPad program.

Table 5

Paired Samples Correlations Mathematics Test Scores

		N	Correlation	*p*
Pair 1	After iPad Implementation & Prior to iPad Implementation	225	.66	.002

Repeated measures ANOVA was then used to determine if there were significant differences in Mathematics test scores prior to and after the iPad implementation program across a 9-year period. Repeated measures ANOVA is a statistical method that allows a single group to be used as both the control and experimental group by applying different experimental treatments and making comparisons (Creswell, 2012). Since the matched students of this study have had similar Mathematic abilities, ANOVA was appropriate to compare averages.

Repeated measures ANOVA test with a 95% confidence level and a significance level ($\alpha = .05$) was used to help determine if there was a significant difference in Mathematics test scores of students across the years of pre- and post-iPad implementation. The scores were archived Mathematics test scores prior to the iPad implementation program (Time 1 for the testing year 2012) and after the iPad implementation program (Time 2 for the testing year 2013, Time 3 for the testing year 2014, Time 4 for the testing year 2015, and Time 5 for the testing year 2016) were calculated and compared in relation to Research Question 1: To what extent, if any, have standardized test scores on the mathematics portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the

implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status? The comparison of the means yielded a *p* value to test the null hypothesis. There were statistically significant differences in the test scores of students across the years of pre- and post-iPad implementation program (Table 6).

Table 6

ANOVA Descriptive Statistics Mathematics Test Scores

	M	*SD*	*N*
Time 1	430.84	142.810	225
Time 2	512.62	165.268	225
Time 3	601.79	145.075	225
Time 4	680.73	86.855	225
Time 5	691.11	86.922	225

For a one-way within-subjects ANOVA, the multivariate tests (Table 7) indicated a significant time effect, Wilk's $\Lambda = .21$, $F\ (3, 222) = 276.85$, $p < .01$.

Table 7

Mathematics Test Scores Multivariate Tests[a]

	Effect	Value	*F*	Hypothesis df	Error df	*p*	Partial Eta Squared
Time	Pillai's Trace	0.789	276.845[b]	3.000	222.000	.001	.789
	Wilks' Lambda	0.211	276.845[b]	3.000	222.000	.000	.789
	Hotelling's Trace	3.741	276.845[b]	3.000	222.000	.002	.789
	Roy's Largest Root	3.741	276.845[b]	3.000	222.000	.000	.789

Note. [a]Design: Intercept Within Subjects Design: Time [b]Exact statistic

The results showed that with the implementation of the iPad program, there was a significant increase continuously in the Mathematics test scores of students over the years 2013-2016. The null hypothesis was rejected that there were no statistically significant differences in the scores of students across the years of pre- and post-iPad implementation. Therefore, a significant improvement in Mathematics test scores occurred since the implementation of the one-to-one iPad program at this high school.

Data Analysis Science Test Scores

After the Mathematics test score data were gathered, the Science test score data were gathered with the assistance of the High School Principal and the assistance of the Director of Curriculum and Instructional Technology. The Science test score data were entered into an Excel spreadsheet and then uploaded to SPSS. Each archived Science test score was given a unique number in order to replace the student ID to ensure the identities of the students were protected. There were nine repeated measures in this study for the testing years of 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016.

Descriptive Statistics

The sample was $n = 225$ students. The overall mean scores and general descriptive statistics are shown in Table 8.

Table 8

Combined Descriptive Statistics for Science Student Test Scores Across 9 Years

Year	Minimum	Maximum	*M*	*SD*
2008	191	498	342.1	79.30
2009	203	504	352.6	82.40
2010	210	514	345.7	84.30
2011	228	699	393.8	117.2
2012	226	712	460.9	131.8
2013	234	742	511.9	155.4
2014	298	777	631.8	165.2
2015	433	788	687.7	177.8
2016	455	789	688.7	188.9

Data were also analyzed for skewness and kurtosis. In SPSS, skewness and kurtosis are considered acceptable between -2 and +2 for normal distribution. Science test scores for 2008-2012 were positively skewed and Science test scores for 2013-2016 were negatively skewed (Table 9). Then the Science test data were averaged between before the testing years of 2008-2012 and after the testing years of 2013-2016 (Table 9).

Table 9

Mean Science Test Scores of Matched Students for the Testing Years of 2008-2016

	N	Minimum	Maximum	*M*	*SD*	Skewness	Kurtosis
2008-2012	225	244.87	655.00	388.11	111.83	0.69	-0.58
2013-2016	225	333.57	788.00	603.33	133.48	-0.55	-0.88

The mean of Science test scores prior to the implementation of the iPad program for the testing years of 2008–2012 was $M = 388.11$. The mean of Science test scores after the implementation of the iPad program for the testing years of 2013–2016 was $M = 603.33$. Thus, Science test scores increased after the implementation of the iPad program by 215.22 points. To further show that there was a significant difference in the Science

test scores, a paired-samples *t* test with its statistics and correlations, repeated measures ANOVA, multivariate tests, within-subjects contrasts, and pairwise comparisons were conducted.

A paired-samples *t* test was then conducted to evaluate whether the means of the Science test scores for 4 years of the iPad implementation program (2013-2016) differed significantly or not from the means of the Science scores for 5 previous years (2008-2012) prior to the implementation of the iPad program. The results indicated that the mean Science test scores for the 4 years after the implementation the of the iPad program (M = 603.33, SD = 133.48) was significantly greater than the mean Science test scores for the previous 5 years prior to the implementation of the iPad program (M = 388.11, SD = 111.83), t (224) = 37.77, $p < .001$ (Table 10). Using the effect size index, $d = \frac{t}{\sqrt{N}}$, where the standardized effect size index, d, was 2.88. With a 95% confidence interval, the mean differences between the two ratings were 201.02 and 233.54 respectively (Table 11).

Table 10

Paired Samples Statistics Science Test Scores

		M	*N*	*SD*	*SEM*
Pair 1	After iPad Implementation	603.33	225	111.83	8.44
	Prior to iPad Implementation	388.11	225	133.48	7.12

Table 11

Paired t Test Distribution of Science Test Scores of Matched Students

		Paired Differences							
		M	*SD*	SEM	Lower	Upper	*t*	*df*	*p*
Pair 1	After iPad Implementation Prior to iPad Implementation	239.30	97.88	6.88	201.02	233.54	37.44	224	.002

The correlation coefficient was also computed among the mean Science test scores before and after the years of the iPad implementation program. Using the Bonferroni approach to control for Type I error in the correlation, a *p* value of .05 was required for significance. The result of the correlational analysis (Table 12) showed that the correlation was statistically significant ($r = .66$, $p < .001$). The results showed a positive correlation in the mean Science test scores of students when measured before and then after the implementation of the iPad program.

Table 12

Paired Samples Correlations Science Test Scores

		N	Correlation	*p*
Pair 1	After iPad Implementation & Prior to iPad Implementation	225	.66	.002

Repeated measures ANOVA was used to determine if there were any significant differences in Science test scores prior to and after the iPad implementation program across a 9-year period. Repeated measures ANOVA is a statistical method that allows a single group to be used as both the control and experimental group by applying different

experimental treatments and making comparisons (Creswell, 2012). Since the matched students of this study have had similar abilities in Science, ANOVA was appropriate to compare averages.

Repeated measures ANOVA test with a 95% confidence level and a significance level ($\alpha = .05$) was used to determine if there were any significant differences in Science test scores of students across the years of pre- and post-iPad implementation. The scores were archived Science test scores prior to the iPad implementation program (Time 1 for the testing year 2012) and after the iPad implementation program (Time 2 for the testing year 2013, Time 3 for the testing year 2014, Time 4 for the testing year 2015, and Time 5 for the testing year 2016) were calculated and compared in relation to Research Question 2: To what extent, if any, have standardized test scores on the science portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status? The comparison of the means yielded a *p* value to test the null hypothesis. There were statistically significant differences in the test scores of students across the years of pre- and post-iPad implementation program (Table 13).

Table 13

ANOVA Descriptive Statistics Science Test Scores

	M	*SD*	*N*
Time 1	439.11	145.66	225
Time 2	521.12	168.33	225
Time 3	611.39	149.12	225
Time 4	699.66	101.91	225
Time 5	711.22	105.32	225

For a one-way within-subjects ANOVA, the multivariate tests (Table 14) indicated a significant time effect, Wilk's $\Lambda = .24$, $F\ (3, 222) = 288.12$, $p < .01$.

Table 14

Science Test Scores Multivariate Tests[a]

	Effect	Value	*F*	Hypothesis df	Error df	*p*	Partial Eta Squared
Time	Pillai's Trace	0.66	276.845[b]	3.000	222.000	.001	.789
	Wilks' Lambda	0.32	276.845[b]	3.000	222.000	.000	.789
	Hotelling's Trace	3.91	276.845[b]	3.000	222.000	.002	.789
	Roy's Largest Root	3.99	276.845[b]	3.000	222.000	.000	.789

Note. [a]Design: Intercept Within Subjects Design: Time [b]Exact statistic

The results showed that with the implementation of the iPad program, there was a significant increase continuously in the Science test scores of students over the years 2013-2016. The null hypothesis was rejected that there were no statistically significant differences in the scores of students across the years of pre- and post-iPad

implementation. Therefore, a significant improvement in Science test scores occurred since the implementation of the one-to-one iPad program at this high school.

Data Analysis Social Studies Test Scores

After the Science test score data was gathered, the Social Studies test score data was gathered with the assistance of the High School Principal and the assistance of the Director of Curriculum and Instructional Technology. The Social Studies test score data were entered into an Excel spreadsheet and then uploaded to SPSS. Each archived Social Studies test score was given a unique number in order to replace the student ID to ensure the identities of the students were protected. There were nine repeated measures in this study for the testing years of 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016.

Descriptive Statistics

The sample was $n = 225$ students. The overall mean scores and general descriptive statistics are shown in Table 15.

Table 15

Combined Descriptive Statistics for Social Studies Test Scores Across 9 Years

Year	Minimum	Maximum	*M*	*SD*
2008	213	477	366.3	82.5
2009	215	480	367.4	84.5
2010	222	477	369.6	86.2
2011	245	711	377.1	119.3
2012	266	723	488.3	138.5
2013	271	755	545.3	165.6
2014	291	782	666.4	168.7
2015	399	788	687.5	187.8
2016	423	797	699.8	198.8

Data were also analyzed for skewness and kurtosis. In SPSS, skewness and kurtosis are considered acceptable between -2 and +2 for normal distribution. Social Studies test scores for 2008-2012 were positively skewed and Social Studies test scores for 2013-2016 were negatively skewed (Table 16). Then the Social Studies test data were averaged between before the testing years of 2008-2012 and after the testing years of 2013-2016 (Table 16).

Table 16

Mean Social Studies Test Scores of Matched Students for the Testing Years of 2008-2016

	N	Minimum	Maximum	*M*	*SD*	Skewness	Kurtosis
2008-2012	225	255.66	685.00	398.21	116.9	0.73	-0.58
2013-2016	225	355.37	799.00	613.32	138.8	-0.55	-0.88

The mean of the Social Studies test scores prior to the implementation of the iPad program for the testing years of 2008–2012 was $M = 398.21$. The mean of the Social Studies test scores after the implementation of the iPad program for the testing years of 2013–2016 was $M = 613.32$. Thus, Social Studies test scores increased after the implementation of the iPad program by 215.11 points. To further show that there was a significant difference in the Social Studies test scores, a paired-samples *t* test with its statistics and correlations, repeated measures ANOVA, multivariate tests, within-subjects contrasts, and pairwise comparisons were conducted.

A paired-samples *t* test was conducted to evaluate whether the means of the Social Studies test scores for 4 years of the iPad implementation program (2013-2016) differed significantly or not from the means of the Science scores for 5 previous years (2008-2012) prior to the implementation of the iPad program. The results indicated that

the mean Social Studies test scores for the 4 years after the implementation the of the iPad program (M = 612.21, SD = 117.88) was significantly greater than the mean for the previous 5 years prior to the implementation of the iPad program (M = 394.23, SD = 138.44), t (224) = 47.77, $p < .001$ (Table 17). Using the effect size index, $d = \frac{t}{\sqrt{N}}$, where the standardized effect size index, d, was 2.93. With a 95% confidence interval, the mean differences between the two ratings were 211.20 and 222.43 respectively (Table 18).

Table 17

Paired Samples Statistics Social Studies Test Scores

		M	*N*	*SD*	*SEM*
Pair 1	After iPad Implementation	612.21	225	117.88	7.44
	Prior to iPad Implementation	394.23	225	138.44	7.72

Table 18

Paired t Test Distribution of Social Studies Test Scores of Matched Students

		Paired Differences							
		M	*SD*	SEM	Lower	Upper	*t*	*df*	*p*
Pair 1	After iPad Implementation Prior to iPad Implementation	245.30	99.22	7.12	211.20	222.43	38.33	224	.002

The correlation coefficient was also computed among the mean Social Studies test scores prior to and after the years of the iPad implementation program. Using the Bonferroni approach to control for Type I error in the correlation, a p value of .05 was required for significance. The result of the correlational analysis (Table 19) showed that

the correlation was statistically significant ($r = .66$, $p < .001$). The results showed a positive correlation in the mean Social Studies test scores of students when measured prior to and then after the implementation of the iPad program.

Table 19

Paired Samples Correlations Social Studies Test Scores

		N	Correlation	*p*
Pair 1	After iPad Implementation & Prior to iPad Implementation	225	.66	.002

Repeated measures ANOVA was used to determine if there were any significant differences in Social Studies test scores prior to and after the iPad implementation program across a 9-year period. Repeated measures ANOVA is a statistical method that allows a single group to be used as both the control and experimental group by applying different experimental treatments and making comparisons (Creswell, 2012). Since the matched students of this study have had similar Social Studies abilities, ANOVA was appropriate to compare averages.

Repeated measures ANOVA test with a 95% confidence level and a significance level ($\alpha = .05$) was used to determine if there were any significant differences in Social Studies test scores of students across the years of pre- and post-iPad implementation. The scores were archived Social Studies test scores before the iPad implementation program (Time 1 for the testing year 2012) and after the iPad implementation program (Time 2 for the testing year 2013, Time 3 for the testing year 2014, Time 4 for the testing year 2015, and Time 5 for the testing year 2016) were calculated and compared in relation to

Research Question 3: To what extent, if any, have standardized test scores on the social studies portion of the MME from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the one-to-one iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socioeconomic status? The comparison of the means yielded a *p* value to test the null hypothesis. There were statistically significant differences in the scores of students across the years of pre- and post-iPad implementation (Table 20).

Table 20

ANOVA Descriptive Statistics Social Studies Test Scores

	M	*SD*	*N*
Time 1	444.20	149.22	225
Time 2	511.11	178.12	225
Time 3	631.50	155.09	225
Time 4	701.12	121.09	225
Time 5	721.21	125.21	225

For a one-way within-subjects ANOVA, the multivariate tests (Table 21) indicated a significant time effect, Wilk's $\Lambda = .24$, $F\ (3, 222) = 293.33$, $p < .01$.

Table 21

Social Studies Test Scores Multivariate Tests[a]

	Effect	Value	*F*	Hypothesis df	Error df	*p*	Partial Eta Squared
Time	Pillai's Trace	0.69	276.845[b]	3.000	222.000	.001	.789
	Wilks' Lambda	0.37	276.845[b]	3.000	222.000	.000	.789
	Hotelling's Trace	3.98	276.845[b]	3.000	222.000	.002	.789
	Roy's Largest Root	3.95	276.845[b]	3.000	222.000	.000	.789

Note. [a]Design: Intercept Within Subjects Design: Time [b]Exact statistic

The results showed that with the implementation of the iPad program, there was a significant increase continuously in the Social Studies test scores of students over the years 2013-2016. The null hypothesis was rejected that there were no statistically significant differences in the Social Studies test scores of students across the years of pre- and post-iPad implementation. Therefore, a significant improvement in Social Studies test scores occurred since the implementation of the one-to-one iPad program at this high school.

Conclusion

Section 2 addressed the research methodology that framed this quantitative study and provide guides to the research procedures. A description of the research method and design was discussed including data collection procedures. The setting for this study and a description of the sample was also included. The instruments that were used in this study were also discussed along with the data collection and analysis procedures. The

assumptions, limitation, scope and delimitations were also discussed to present some of the facts that were assumed and the potential weaknesses of the study. Section 2 also included a discussion about the protection of participants' rights and summarizes the measures that were taken for the protection and confidentiality of participants, and that the violation of the participants' rights did not happen. Section 2 concluded with the findings from the data collection and analysis. The results showed that with the implementation of the iPad program, there was a significant increase continuously in the Mathematics test scores, the Science test scores, and the Social Studies test scores of 11th grade students over the years 2013-2016. The null hypothesis was rejected for all three research questions that there were no statistically significant differences in the Mathematics test scores, the Science test scores, and the Social Studies test scores of 11th grade students across the years of pre- and post-iPad implementation. Therefore, a significant improvement in Mathematics test, Science test scores, and Social Studies scores for 11th grade students occurred since the implementation of the one-to-one iPad program at this high school.

Section 3, the Project, will include a description of the project and goals that were addressed and identified in Section 1. A rationale will also be included to why this particular project was chosen to address the problems identified in Section 1. A discussion will also be included to address how the project fits in with the data analysis that was completed in Section 2 and if this project was a solution to the overall problem. Another review of literature will be included containing the criteria that was used to develop the project based off of research and engagement theory. A section about

implementation will also be included discussing: (a) the description potential resources and existing supports, (b) the potential barriers, (c) a proposal for implementation and a time table and (d) roles and responsibilities of students and others. Section 3 will conclude with a section about evaluation measures, implications at the local community level and social change on a larger context. Section 4, reflections and conclusions, will include a section about the strengths of the project, a section about recommendations and remediation of the limitations. A discussion about how the problem could have been addressed differently and what other alternatives might have been considered to address the problem will also be included.

Section 3: The Project

Introduction

The literature review from Section 1 indicated several best practices for implementing iPads into the classroom, for using iPads to improve student achievement, and using iPads to reach all types of learners. Apple Inc. (2014a) and research suggested that by placing an iPad into student's hands, their standardized test scores will go up. Per the findings that emerged from the data analysis in Section 2, indicating that Grade 11 standardized test scores significantly improved in the areas of mathematics, science, and social studies since the implementation of a one-to-one iPad initiative, I identified that the district policy of limiting the one-to-one iPad program to only high school students could be a barrier that prevents the use of previously mentioned best practices. There is a need for not only the continuation of the one-to-one iPad initiative, but also a call for the expansion of the program into the middle school, the intermediate school, and the two elementary schools to help fulfill the mission of the school district. This will be discussed in more detail in Section 3. The Office of Educational Technology (n.d.) has stated that their goal is for all students and learners to "have engaging and empowering learning experiences both in and out of school that prepare them to be active, creative knowledgeable, and ethical participants in our globally networked society" (para. l). Currently, the technology policy of limiting the one-to-one program to only high school students does not match the school district's mission or what has been encouraged from the Office of Educational Technology. Expanding the one-to-one program will meet the school district's mission and the needs of all students, not just some. In addition, through

personal communication with other staff members since the beginning of this study, I observed a need to create more professional development opportunities and training for teachers to become aware of different apps, learning strategies, test taking on mobile devices, and best practices for incorporating iPads in the classroom. Thus, a research project in the form of a policy recommendation was created in response to the data analyzed for this study.

Research findings were used to design a project that would help address the issue that only the high school students at this local school district are able to take part in the one-to-one iPad initiative. The project genre selected to address the issue of expanding the one-to-one iPad initiative to all students was a policy recommendation communicated through a position paper. The policy recommendation project is contained in Appendix A. The position paper includes a description of the school district's current technology policy and the school district's current improvement plan regarding the one-to-one iPad initiative, a background on expanding the one-to-one iPad initiative, and recommendations for addressing these issues. Section 3 includes a description of the project and goals that were addressed and identified in Section 1. A rationale is included as to why the selection of a policy recommendation and position paper was chosen to address the problems identified in Section 1. A discussion is included to address how the project fits in with the data analysis that was completed in Section 2 and if this project was a solution to the overall problem. Another review of literature is included containing the criteria that I used to develop the project based on research and engagement theory. A section about implementation is also included discussing (a) the potential resources and

existing supports, (b) the potential barriers, (c) a proposal for implementation and a time table and roles, and (d) responsibilities of students and others.

Section 3 concludes with a section about how the implementation of this project at the local community level could impact social change on a larger context by positively impacting all students, teachers, administrators, and the community through the understanding that Grade 11 students' significant improvement on standardized tests influenced the creation of this policy recommendation so that the technology needs of all students can be addressed and better understood by all students, teachers, administrators, and stakeholders within the community. The data analysis of the standardized mathematics, science, and social studies test scores may allow for the school district's ability to better understand how the one-to-one iPad initiative can be expanded and implemented to help student achievement increase for all students. Thus, administrators, teachers, and the community will have a better understanding about their role in the survival and continuation of the one-to-one iPad initiative program to improve all students' education.

Description of the Project

The mission statement at the school district where this study took place "is to educate every child to achieve his or her full potential." The technology mission statement from 2011 at the school district where this study was conducted stated, "It is the vision of the department to create an environment where students, teachers, and staff have safe, secure, and reliable access to all technology that invokes creativity and critical thinking as well as higher learning." The purpose of the policy recommendation was to

address the issue that not all students are provided with the same access to technology by limiting the one-to-one iPad program to only high school students. The quantitative causal-comparative study I conducted found that using iPads in the classroom significantly increased student achievement in the subject areas of mathematics, science, and social studies for Grade 11 students. This policy recommendation was partially initiated in response to the needs of the school district where it was discovered that the school's mission statement and technology policies had not been evaluated in recent years (curriculum director, personal communication, January 18, 2017). The theoretical framework for the policy recommendation is based on using the 4 Cs framework (Coyle, 1999, 2006) and the living framework known as the 5 Cs.

Coyle (1999, 2006) offered that the 4 Cs framework is a sound theoretical and methodological foundation for evaluating policy. The 4 Cs framework has also been referred to as a living framework due to the nature of change in culture (Sørensen, Raptis, Kjeldskov, & Skov, 2014). The 4 Cs framework has been adapted into the 5 Cs framework founded upon other constructivists theorists like Derry (1996) and Dijkstra (1997) with the incorporation of theories about collaborative learning from Gholson and Craig (2006), Harney, Hogan, and Broom (2012), and Li and Zhou (2010). The local school district has even adapted its own version of the 5 Cs framework called "The 5 C's of Technology" (curriculum director, personal communication, January 12, 2017). This adaption is based on the creation of the National Education Association's (NEA, 2012) framework, *Preparing 21st Century Students for a Global Society: An Educator's Guide to the "Four Cs."* The NEA's (2012) 4 Cs framework included (a) critical thinking, (b)

communication, (c) collaboration, and (d) creativity. The local site's 5 Cs of technology framework included (a) communication, (b) collaboration, (c) critical thinking, (d) creativity, and (e) content availability. The primary difference between the school district's 5 Cs framework and the NEA's (2012) framework is content availability. The five elements of the 5 Cs framework provided policy makers and evaluators, which could include school districts and school boards, with a constant to be able to hold a current school policy accountable. The 5 Cs framework, which was used to help develop a better technology policy, is discussed at length in the policy process section and the social change implications section that can be found later in this study.

Project Goal

The overall goal of this doctoral project study was to help determine if the iPad has helped standardized test scores on the MME and MSTEP either improve, decline, or stay the same. The results and findings from this project study revealed that the iPad has helped Grade 11 students' standardized test scores on the MME and MSTEP in the subject areas of mathematics, science, and social studies. After a thorough data analysis of the students test scores, in the subject areas of mathematics, science, and social studies, agreement was reached that the iPads are helping to improve student achievement on standardized testing. Grade 11 students' performance on standardized tests is more likely to improve thanks to using the iPad. From the findings of this study, I recommend that the school district continue the iPad program and actively engage students and teachers to continue using these mobile devices to improve student learning and achievement. This recommendation to the school district will come in the form of a policy recommendation.

There are four goals for the policy recommendation that I developed for this study. The first goal is not only to continue but also to expand the one-to-one iPad innovation program to all middle school students, which includes Grades 6 through 8, not just the students in the high school, who are in Grades 9 through 12. The second goal is to also expand the one-to-one iPad initiative program to have classroom sets for all intermediate school students, Grades 3 through 5, and elementary school students, kindergarten through Grade 2. The third goal of the policy recommendation was to create more professional development opportunities for all teachers. Currently, there are only 2 half days of technology professional development for all teachers during the academic school year. With the constant changes in technology, teachers need to have more time to work with each other and learn from each other. Professional development time is the best way to accomplish that goal. The fourth goal is to include parent, community, and student representation on the school improvement team for the high school. Currently, the high school improvement team "has no parent, community or student representation, although several of our teachers are community members and/or parents of current students." These goals provide a justification for the policy recommendation and help establish improved outcomes. The next section provides a clear rational for using a policy recommendation with this project study.

Rationale

As a researcher, I have a responsibility to report the results and findings of the results when a study has been completed. According to Lingenfelter (2011), educators, policy makers, researchers, and practitioners all have a collective interest to enhance

student and human conditions. When it comes to researchers presenting a study to the educational community, it is expected that results are reported from a research project by summarizing the purpose of the study, the characteristics, the findings, and report conclusions that were a result of the findings (Creswell, 2012). After the findings have been collected, the researcher then selects a format and a design for the presentation that is based on the results and conclusions that are drawn from the study while also keeping in mind the characteristics of the researcher's audience (Merriam, 2009). The four basic project genres that were considered from the project options offered by my doctoral program included an evaluation report, a curriculum plan, a professional development training with curriculum and materials, or a policy recommendation with detail. The findings from this study yielded an insufficient amount of data to develop a program evaluation report and not enough information to develop a curriculum plan or professional development training. The underlying problem of this quantitative causal-comparative project study was to determine the effects of a one-to-one iPad implementation program on Grade 11 standardized test scores. In addition, there have been community members and stakeholders who have questioned the financial cost of this program and even the sustainability of the one-to-one iPad initiative program. Therefore, I believe that it is essential to measure the one-to-one iPad initiative outcomes on Grade 11 standardized test scores and provide information to the school district's administrative team, teachers, students, and community members for decision making purposes and accountability. The findings from this study demonstrated that there was a significant improvement to standardized test scores in the areas of mathematics, science,

and social studies for Grade 11 students. Based on the results of the study and the above listed factors, the project product for this study provides a research-based solution to the problem of this study in the form of a policy recommendation communicated through a position, which I selected as the most appropriate project genre.

The intended audience for this project was stakeholders in the local school district who were responsible for enacting technology policies in the school district. The potential policy makers were the school district's administrative team, school improvement team, and the board of education. At the time that this study was conducted, there were no parents or other community members on the school improvement team or any other team responsible for enacting policies. Dumas and Anderson (2014) explained that researchers should use policy recommendation papers to convince those responsible for enacting policies in a school district to make changes to current policies that might be out of date. Due to the fact that the purpose of this project was to recommend the continuation of the one-to-one iPad program and call for its expansion, a policy recommendation was the appropriate genre for this project. A policy recommendation includes the identification of a problem, researching the problem, summarizing the findings of the research, the presentation of evidence to support current literature and research, and outline recommendations to address the research problem. A policy recommendation was made in response to the problem that only high school students could take part in the school district's one-to-one iPad initiative program. It was found that there was a lack of current consistent polices in the school district regarding the usage of technology being provided to every student across the school district.

Review of the Literature Related to the Project

This review of the literature section includes an extensive review of current literature in regards to policymaking, technology policies in schools, and other topics related to this projects research findings. Research was completed by using Walden University's online library and Google Scholar search engines. Several databases were used from Walden University's Library to search for different articles and journals that were peer reviewed. These databases were found using Walden University's Library and the Education Research Databases. These databases included ERIC, Education Source, SAGE Premier, Academic Search Complete, Thoreau, and Sage Knowledge. Sear terms included *policy recommendation, policy analysis, 4 C's framework, 5 C's framework, education policy, education reform, policy evaluation, technology policy and iPad policy.* Additional resources included the Michigan Department of Education websites, educational websites, textbooks and current school publications from the local site, were used as deemed appropriate.

I first conducted a search using the for-mentioned search terms related to policy recommendation, technology and education. The initial search presented articles from all over the world so the search was limited to just articles found in the United States. The search was expanded to include articles beyond technology and include general areas of study at all educational levels. However, during the search process, articles were limited and focused on the areas of core disciplines and meeting the needs of all students. I felt confident that saturation was met when the different database searches were repeating the

same articles that had already been found and yielding no new studies or authors. In all, I read over 65 articles for this literature review to provide support to this project study.

Policy Genre

A policy recommendation is the key mean as to how decisions about policies are made at various government levels. An analysis of policy varies from a policy recommendation because it first defines the problem and goals, it then examines the arguments and then concludes by analyzing the implementation of the policy (American University Writing Center, n.d.). A policy recommendation and a policy analysis are both communicated through a position paper. A position paper clarifies an issue, challenges a current practice or policy, and then recommends the implementation of a new or revised policy from an empirical point of view (Archbald, 2008; Ober & Craven, 2011). The position paper structure includes the issue, the current policy and its background, policy options and the evidence related to policy options, and finally, suggestions for changes to the policy (Ober & Craven, 2011). However, for any policy recommendation or policy analysis to be successful, clear and effective communication is necessary (American University Writing Center, n.d.).

Policy recommendation position papers and policy analysis position papers are common in the world of education. Researchers rely on academic leaders to establish policies and academic leaders rely on researchers to identify effective educational strategies to improve established policies (Bartolettie & Connelly, 2013). Researchers present to education administrators and leaders best practices through the findings of research studies and the creation of policy recommendations. However, a concern exists

that there is a gap when it comes to educational research and practice as well as research recommendations and policy enactment (Vanderlinde & van Braak, 2010; Brownson, Chriqui, & Stamatakis, 2009). Also, Vanderlinde and van Braak (2010) found that more cooperation is needed between researchers and practitioners. Whereas other research suggested that competition and conflicting values is the primary reason as to why a gap exists when it comes to policy recommendations and policy enactment (Brownson, Chriqui, & Stamatakis, 2009). There are times when teachers and administrators find the evaluations of educational research to be unclear or unconvincing. This can lead to a greater expansion of the gap when it comes to policy enactment and policy recommendations (Vanderlinde & van Braak, 2010).

To bridge this gap that exists between policy recommendations and enactments and educational research and practice, Vanderline and van Braak (2010) found that one way for these gaps to be narrowed is through the use of professional learning communities (PLCs). Teachers and administrators are able to work together to participate and review research and then work collaboratively in decision-making procedures and the enactment of policy. Another possible way to bridge the gap is through the use of a combination of quantitative data and qualitative data for expanding evidence based policy (Brownson, Chiriqui, & Stamatakis, 2009). Multiple forms of data can make this possible:

> to further evidence based policy, we need to use the best available evidence and expand the role of researchers and practitioners to communicate evidence packaged appropriately for various policy audiences; to understand and engage all

> 3 streams (problem, policy, politics) to implement an evidence based policy presses; to develop content based on specific policy elements that are most likely to be effective; and to document outcomes to improve, expand or terminate policy. (Brownson, Chriqui, & Stamatakis, 2009, p. 1581)

Lim and Churchill (2016) noted that mobile learning has become acknowledged as an important and crucial area in all levels of education. Also, Lim and Churchill (2016) suggested that mobile learning technology has offered various tools for teachers to incorporate into the classroom creating a type of student-technology partnership in learning that has not existed until recently. In addition, Lim and Churchill (2016) indicated that when educationally useful digital resources are appropriately designed, they can be effectively and efficiently delivered via different mobile learning devises to all students at any level, at any time, inside or outside of the classroom. However, although there is sufficient evidence to support and encourage the use of mobile learning devices in education, there is a gap in research when it comes to policy-makers and leaders preparing current teachers and next generation teachers how to take up the availability of mobile devices in the classroom (Lim & Churchill, 2016).

It must be recognized that policy recommendations can be complex when it comes to education issues and recommending changes to a policy. However, by presenting multiple options (Archbald, 2008) and clear effective communication (American University Writing Center, n.d.), it is more likely for a position paper to go from policy recommendation to policy enactment.

Effective Communication and Policy Recommendation

Effective communication and clear information is imperative for the success of any policy. Sometimes the lack of scientific data and the integration of this data when it comes to policy making can be a sizable impediment. Other times there are legal, institutional or stakeholder barriers that can either delay or make the utilization of a policy a challenging one (van Leeuwen et al., 2014). Poor communication at the local level can sometimes be interpreted as a way of humiliating teachers for failure to improve student achievement (Hursh, 2013). However, there are researchers who discuss the importance of using effective communication when it comes to implementing policies to help build trust (Daly & Finnigan, 2013; Ng & Nicholas, 2012; Rapp & Duncan, 2012).

Nathan, MacGougan, and Shaffer (2014) found that the incorporation of social media for teacher-student communication can help increase student engagement throughout the learning process as an outcome when using social media for classroom and teaching purposes. It was found (Nathan et al., 2014) that most educational institutions have policies about technology, the usage of technology, and the usage of mobile learning devices. However, most of these policies are outdated or are too broad. However, due to the ever-changing nature of technology, it would be beneficial to schools to continually adapt and analyze technology policies on a regular basis (Nathan et al., 2014).

In education, policy can be interpreted different between administrators and teachers that can sometimes lead to unintended consequences, such as test anxiety (Embse & Hanson, 2012). When NCLB was introduced, depending on your position as a

teacher, an administrator or a parent, different school districts interpreted the requirements of the law to justify their own policies or actions. Some researchers have expressed dismay with the NCLB policy (Compano, Ghiso, & Sanchez, 2013; Gallagher, 2013; Heilig, Cole, & Aguilar, 2010; Lavery, 2014; Sindelaretal, 2012;), however, NCLB does create a major milestone when it comes to the implementation of education policy (Marin & Filce, 2013).

There is an accepted vision that there will be a continued evolution from traditional educational models to different practices that are new and emerge from new integrated technologies (Twining, et al., 2013). Educational leaders need to create policy that should provide minimum entitlement requirements not only for the purchasing of new technological devices, but also for necessary professional development of teachers for the success of new educational initiatives that come about from new policy creation (Twining, et al., 2013). When policy recommendations are written correctly, the intention should always be realistic and achievable, but with an understanding that the success in moving education into and through the digital age when the recommendations coincide with other policies and working groups (Twining et. al., 2013).

Many people have forgotten the importance of the media when it comes to schools implementing policies. Every year, schools ask local voters to pass different mileages or bonds to help schools purchase new equipment, make upgrades, or build new buildings. At the local school district where this study took place, there is a high percentage of adults who do not have children in school versus adults who have children in school. In the past, school proposals it sometimes took 2-3 times to be voted on before

being passed. Goodall (2016) pointed out that it is the responsibility of schools to ensure that parents are able to make sense of what the school has communicate to them. This would also include policies that the school district has created or enacted. Thus, it is essential for those who make policies to understand how local policy can affect adults with and without children before asking voters to pass a millage. Policy will never meet its intended outcomes without the effort of the organization to propose a detailed policy, with intended outcomes, measuring effectiveness over a time period and keeping in mind how the policy will affect students, parents and other stake holders (Griner & Stewart, 2012; Odhiambo & Hii, 2012; Petrin, Schafft, & Meece, 2014).

A debate exists on the direction and role of education and how it is linked to society. Education is considered as a necessary condition to help construct a more just society (Tedesco et al., 2014). However, at the same time, there is a strong distrust among some citizens when it comes to governments' capability to implement long-term educational policies when responding to challenges and problems (Tedesco et al., 2014). Also, Tedesco et al. explained that in order to help solve problems and challenges in education, there is a need to establish a standard of quality learning and access to education for every student, not some, for the purpose of achieving social justice. In order to accomplish the goal of quality education for all, educators and administrators must ensure a wider policy dialogue and enact upon policy that will be inclusive for all, not just a group of students (Tedesco et al., 2014).

It should be pointed out this study took place at a rural school district in Michigan. Understanding what rural and rural research means does play into

understanding one's audience and rural stakeholders. Hawley et al. (2016) posited that when it comes to the definition of rural research, there is no single best definition that can adequately measure the theoretical constructs of rural. This has resulted in the numerous definitions that have been developed, each with different weaknesses and strengths. When talking about researching and writing policies for rural areas, Hawley et al. (2016) said:

> Rural...research and policy depends on the operationalization of rural, so it is essential that we get rural right. Importantly, there is no one right definition of rural because rural is a multifaceted construct that does not afford a single categorization. Getting rural right does not mean picking one definition but, rather, providing clear, detailed information to readers so they understand. (p. 9)

Also, Hawley et al. indicated that policy makers and producers need to make sure that they understand the rural setting before writing a policy recommendation and making potential policy decisions.

Policy Making

In education, understanding and using views from stakeholders is an important piece when it comes to the process of creating a policy. Simply put, policy makers need to make sure they understand the local supporters of a school. Voogt and Knezekt (2013) noted that it is imperative to reflect on developments in technology in education. Due to the interdisciplinary nature of research on technology in education, many stakeholders have various levels of interest. This can prevent the development of lucid and comprehensive policy's and strategies involving technology in education (Voogt &

Knezekt, 2013). An enacted policy is the action that aims to solve specific problems (Cobb & Jackson, 2012). Policy provides a specific direction and specific guidelines for employees to be able to execute all of the tasks and requirements that exist for working for a school which can even lead to positive working conditions (Koyama, 2011; Priestley, 2011; Orphanos & Orr, 2013). The creation of a policy can also be affected by different assessments (Avalos, 2011). Hence, schools and organizations that want to develop well-made and effective policies must execute proper forms of assessment. Schools should also promote the participation of stakeholders when generating policy because often, the participation of stakeholders falls short or is nonexistent (Werts et al., 2013). Therefore, included in this project policy recommendation is the call for the expansion of stakeholders to participate on the school improvement team.

Policies that have been created on a national level often have impacts on schools at the local level. Policies such as NCLB, RTTT (Race to the Top), and Common Core are some of the most recent and well known federal policies that have been created in education that can have impacts on a schools funding. These policies and mandates were designed to help increase focus, accountability and assessment in schools in the United States. As part of the mandates in NCLB, schools must prepare students for the future as digitally literate adults (Blankenship & Mararella, 2014). Part of the mandates in RTTT incorporate the usage of high stakes student standardized testing statistics within the system for evaluating teachers for the purposes of making determinations about staff positions and employment (Baker, Oluwole, & Green, 2013). For the states that have adapted the Common Core standards, professional development models have had to be

reformed with the standards for Common Core to reinforce the execution of the new standards (Wake & Benson, 2016).

Policies like these have led to the desire to create assessment policy, a way to effectively evaluate systems that are comprised of different methods, indicators, and standards that are used to measure and report research outcomes (Wiseman, 2012). For example, the United States Congress in 1993 passed the Government Performance and Ratings Results Act, which provided mandates for the development of assessment rating tools for programs for the public (Baughman, Boyd, & Kelsey, 2012). In 2010, the United States Congress passed the Government Research and Performance Modernization Act (Moynihan, 2012). Both of these two acts are relevant examples of assessment policy. These acts address policies that have been implemented for the purposes of accountability as well as making justifications for technology funding (Baughman et al., 2012).

Technology and Policies in Schools

Webb and Jurica (2013) noted in their case study that although the Internet was found in 99% of all secondary and elementary schools in the U.S., that it was rarely implemented effectively in the classroom. Part of the problem is that educators are not being trained in their own subject areas to properly use technology in the classroom which is transferring over into the lack of technology integration into their own classrooms (Webb & Jurica, 2013). An analysis of administrator's expectations of new teachers found that there is a need for increased technology skill preparedness for new teachers (Webb & Jurica, 2013). The expectations of administrators when it comes to

new teacher's technology skill preparedness can be remedied with a policy that is designed to help improve professional development with mobile devices and new technologies.

Chou, Block, and Jesness (2014) conducted an exploratory case study examining the impacts of an iPad cart integration on learning and instruction. The results from their case study demonstrated that there was a clear impact on student comprehension and achievement in the fields of engagement, digital literacy, creativity, productivity, and collaboration. Their study recommended that better infrastructure support was needed, more and better integrated professional development opportunities, and having innovative pedagogy through best practices using the iPad (Chou et al., 2014).

It has been found that iPads can be used to help supplement learning without the need of making considerations for the range of students and their abilities (Powell, 2014). Also, Powell recommended that schools be in charge of setting up iPads and having them so the school can monitor what students are doing on them. If students are permitted to use iPads independently, it may be more difficult for teachers in the classroom to monitor students and to help them stay on task and engaged. In addition, Powell (2014) explained that the process of aligning apps to meet state standards can be time-consuming, but it can be less arduous when completed with a team, over time and with the support of administrators in a school district. This recommendation was made in hopes of being able to incorporate more apps into the classroom for the iPad and not make as much work for teachers who are trying to align apps with various skills and state standards.

With the rapid advancement of digital media in the classroom, schools have been forced to make new literacy forms and tools to be compatible with student's literacy experiences (Laidlaw & O'Mara, 2015). The iPad has also created a shift in the way that teachers reach out to their students. Teachers are now using touch screen devices in different ways to address individual needs and address diversity in the classroom (Laidlaw & O'Mara, 2015). Laidlaw and O'Mara (2015) noted that as teachers are demonstrating how the iPad and other mobile learning devices are helping students make advancements in areas like digital literacy, not enough is being done by those who oversee writing policy's and mandates in connection to the continual changing skills and educational standards that are happening due to the advancements of technology in the classroom.

The 4 Cs Framework

There is a small debate as to who first developed the 4 Cs framework. The 4 Cs framework can be found in many different life applications: marketing, language, and policy to name just a few. I found that it was Coyle (1999), who first developed the 4 Cs framework. The 4 Cs framework, per Coyle (1999, 2006), starts with content (cross curricular approaches, subject matter, themes etc.), then communication (use oflanguage), next cognition (through understanding), and finally culture (the awareness of one's self and others). One of the goals of the 4 Cs framework was to help unite different learning theories (Coyle, 2008a). The graphic in Figure 4, The 4 Cs framework, represents the interaction of content, cognition, communication with their influences on culture.

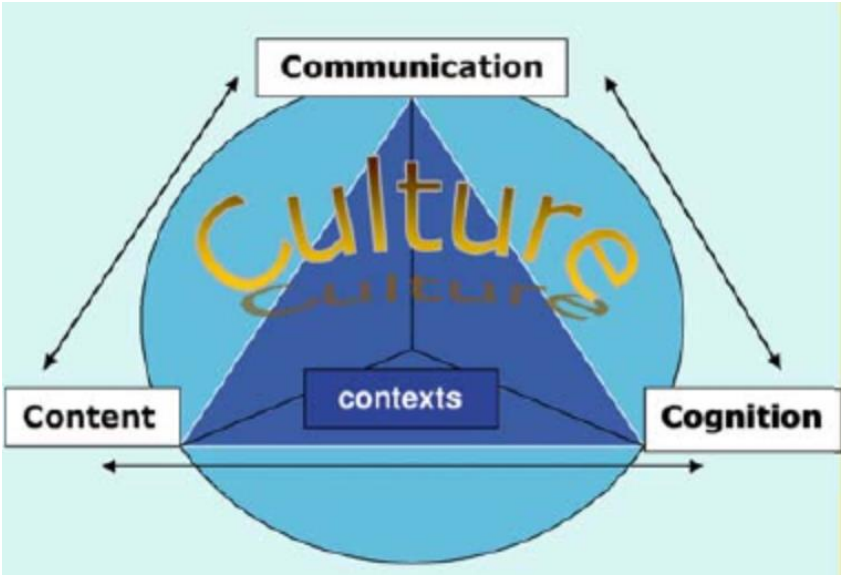

Figure 4. The 4 Cs framework (Coyle, 2008b).

Coyle (1999) is not the only theorist who has claims to developing the 4 Cs framework. P21, known as the partnership for 21st Century Learning, previously known as the Partnership for 21st Century Skills, which was established in 2002 (P21, 2016). Their mission was to draw together businesses, community members, education leadership, and policy makers to have an important conversation about the skills students need for the 21st century (P21, 2016). From that conversation, P21 (2016) developed the framework for 21st Century Learning. Due to how complicated the framework had become, there was a decision to simplify the framework. P21, in collaboration with the University of Connecticut, developed the 4 Cs Research Services in 2015 (P21, n.d). P21's (n.d.) Four Cs framework emphasizes the areas of critical thinking, communication, collaboration, and creativity.

The 5 Cs Framework

The 5 Cs standards have been around for more than 15 years (American Council on the Teaching of Foreign Languages, 2011). Educators who are involved in teaching a World Language are usually familiar with the American Council on the Teaching of Foreign Languages 5 Cs standards: (1) communication, (2) cultures, (3) connections, (4) comparisons, and (5) communities (American Council on the Teaching of Foreign Languages, 2011). What is unknown is if the 5 Cs standards have influenced the 5 Cs theoretical framework or vice versa.

Traditional teaching and traditional policy creation have generally been based upon a teacher-centric pedagogy with a top-down policy creation and delivery method. However, the 5 Cs framework makes a shift away from the teacher-centric pedagogy and top-down methods to a student centered with more of a bottom-up policy creation method. The Five Cs framework was developed to incorporate a students' perspective of learning and how they learn (Tom, 2015). The goal of the 5 Cs framework is to engage students through the different perspectives of affective, cognitive and behavior to gain a deeper understanding (Tom, 2015). The 5 Cs framework is based off the areas of Consistency, Collaboration, Cognition, Conception, and Creativity (Tom, 2015). The 5 Cs framework was created based off of the works of constructivist theories of Derry (1996) and Dijkstra (1997) and the theories about collaborative learning from Harney et al. (2012), Gholson and Craig (2006), and Li and Zhou (2010). The main belief of the 5 Cs framework is that knowledge is developed physically (emphasizing active learning), through symbolism (by mental images), socially (by sharing comprehension), and

theoretically (by clarifying things that are not fully understood) (Tom, 2015). The goal is to empower students "with reflective lifelong learning skills to be successful" (Tom, 2015, p. 23). Each of the 5 Cs are explained as follows: (1) Consistency: being consistent in all teaching, learning and policy practices; (2) Collaboration: working mutually to problem solving and expand comprehension; (3) Cognition: creating a higher-order of thinking; (4) Conception: using assimilation, elaboration, and examples to understand different concepts; and (5) Creativity: to create solutions through the application of learned concepts (Tom, 2015). Implementation of the 5 Cs framework is based upon the accepted practice of using multiple methods to explain concepts (Tom, 2015) and for decision making. The graphic in Figure 5, The 5 Cs framework, shows how the 5 Cs work together to support learns and engage all through discussion, collaborative problem solving and task completion (Tom, 2015).

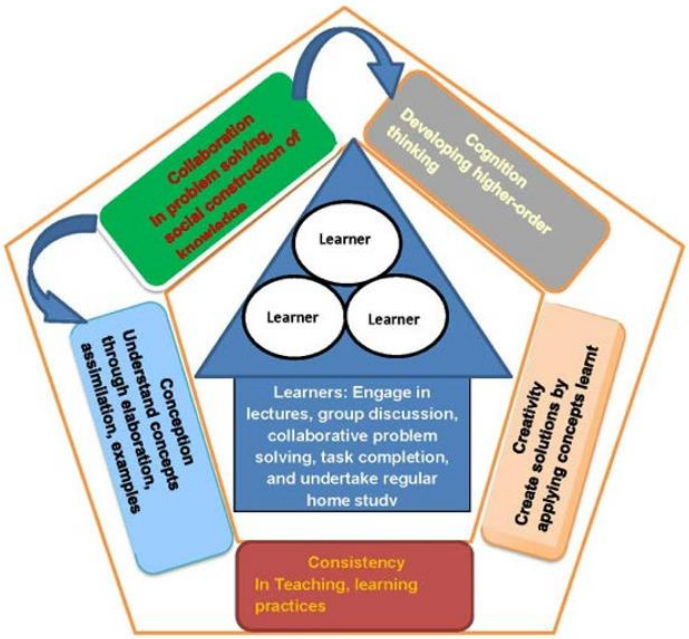

Figure 5. The 5 Cs framework (Tom, 2015, p. 25).

The 5 Cs framework has also lead to the creation of other frameworks using the 5 Cs name, such as the 5 Cs of Technology.

The 5 Cs of Technology Framework

Before considering how the 5 Cs can be used as a technology framework, it is essential to know how the implementation of technology has changed in the U.S. For instance, Internet use in the U.S. has risen dramatically. In the past 10 years, the amount of hours spent being on the Internet per week has more than doubled with 84% of adults in the U.S. using the Internet (Perrin & Duggan, 2015). Perrin and Duggan (2015) noted that people who have higher-income households are more prone to use the Internet and those living in an urban area are more like to use the Internet over rural areas. The local site where this project study was conducted is a rural school.

The curriculum director for the school district and I met several times to discuss not only the findings from this project study that was conducted, but to also discuss how the 5 Cs are used as a framework for this local school district when it comes to policy making and enactment. One of the issues at this current time is an outdated technology plan. The school district currently has a technology plan, but it was developed back in 2011, and it was only a 3-year plan, ending in 2014. Since the creation of the districts technology plan, the school district changed curriculum directors and completely changed the technology department. A new technology director was hired, technology coaches were hired for each building and upgrades were made to the school district with the passing of a $7.29 million-dollar bond. Although the school district has attempted to conduct some informal surveys, by sending surveys via email to students, parents and teachers, there has been no formal evaluation completed on how the technology implementations have been working. The only data that the school district has received to date, has been the informal surveys that have been sent out to students, teachers and parents. Although the curriculum director (personal communication, January 18, 2017) is not sure who developed the 5 Cs of technology framework, the school district adapted its own version the 5 Cs of technology as a framework to help evaluate and develop policies for the district.

This local school districts adapted 5 Cs framework includes communication, collaboration, critical thinking, creativity, and content availability. Compared to the original 5 Cs framework, consistency, collaboration, cognition, conception, and creativity (Tom, 2015), there are a couple of changes that are important to note. Collaboration and

Creativity are the only two Cs that have stayed the same. Communication and Critical Thinking can be compared as synonyms with Consistency and Collaboration. However, the primary change with the 5 Cs of technology framework is the Content Availability. Content Availability coincides with one of the primary principals of the 2016 U.S. National Education Technology Plan:

> The plan articulates a vision of equity, active use, and collaborative leadership to make everywhere, all-the-time learning possible. While acknowledging the continuing need to provide greater equity of access to technology itself, the plan goes further to call upon all involved in American education to ensure equity of access to transformational learning experiences enabled by technology. (U.S. Department of Education, 2017, para. 2)

Joseph South, the Director of the Office of Educational Technology, illustrated that the National Education Technology plan "provides a vision of transformational learning experiences powered by technology that can shrink long-standing equity and accessibility gaps" (U.S. Department of Education, 2017, para. 1).

This school district has used the 5 Cs framework of technology to help it move forward with creating and implementing policies. The curriculum director noted that before the implementation of using the 5 Cs technology framework, the school district was only informally evaluating policies and were not putting technology goals to any sort of test to determine success or to test against a specific framework. There had been a small disconnect when it came to the previous technology department when it came to setting goals/standards and a missing piece of collaboration. However, changes were

made in various ways when the implementation of the 5 Cs technology framework started. Recently, the State of Michigan made it required that schools technology plans had to be included as a part of the school improvement plan; this required more collaboration efforts by all involved in the technology department and the school improvement team. Some professional development needs were changed and adapted to help meet the needs of incorporating the one-to-one iPad program.

The school district uses the 5 Cs of technology framework to made decisions involving technology and other policies. For example, the school district will evaluate how the 5 Cs of technology are being used when deciding on a mobile learning device. District officials ask: How does the device meet communication standards? How does the device affect collaboration? How does the device develop critical thinking skills? How does the device help with creativity? How does the device improve content availability?

The first recommendation for future use of the technology implementation policy is a call for the expansion of the one-to-one iPad program into the lower grade levels. The current program is only a one-to-one program for Grades 9 through 12. The expansion of the one-to-one program to Grades 6 through 8 and creating classroom sets of iPads for kindergarten through Grade 5, would align with the school districts mission statement to "educate every child to achieve his/her full potential." The expansion of the one-to-one policy would also incorporate using the 5 Cs of technology framework into all grade levels and assist with the purpose of improving student achievement. If all grade levels had access to the one-to-one device policy, fewer assessments would be needed to assess

how each school is performing when it comes to technology implementation. All schools would be unified in this regard.

The second recommendation for this policy recommendation is the call for more professional development for teachers when it comes to incorporating technology in schools and in the classroom. The current plan has a technology work camp for teachers for one day before the beginning of the school year and then 2 half days during the school year. Technology changes happen constantly throughout a school year. As I have discussed, the amount of time that is currently allotted with other teachers in the school district, many have said that there is not enough time to learn enough about all of the new apps or websites that are being used by other teachers. Others have mentioned that they wish they had time to practice what they have learned before trying to implement it in the classroom. Therefore, it is recommended to create 2 consecutive full days of professional development three times per year, one per each trimester, to give teachers a chance to learn from other teachers about what technology they are using in the classroom and then another day to create a lesson and practice it with other teachers to get some feedback before trying to implement it in the classroom.

The final recommendation is for the school district to include parents and other local stakeholders on the school improvement teams who are not teachers at each school. Currently, the high school does not have any parents who are not teachers on the school improvement team. As previously noted in the literature review, there can be a division between schools and local stakeholders when it comes to policy creation and enactment. There are times when stakeholders do not fully understand what is expected of them in a

policy and times when the school forgets to include stakeholder expectations when it comes to policies. According to the district website, by having parents and other community members, the school district will be able to continue to establish a strong lasting partnerships with parents and guardians and that together a high-quality education that encompasses academics, the arts, and athletics can be accomplished.

Implementation

I have summarized the research findings and made recommendations for how the local school district, in this study, should address the expansion of the one-to-one iPad program, the creation of more professional development for teachers, and the inclusion of parents and other stakeholders on the school improvement team. This project was designed to help address some of the barriers that the curriculum director from this local school district and I identified during the data collection and data analysis process. The position paper outlined my informed decision that the school district should change from having only high school students in Grades 9 through 12 using a one-to-one iPad initiative program to include Grades 6 through 8 with classroom sets being created for kindergarten through Grade 5. The technology policy recommendation presented six areas that the school district should address in order for the technology policy to be successful when implementing the project: (1) the description potential resources and existing supports; (2) potential barriers; (3) proposal for implementation and timetable; (4) roles and responsibilities; (5) evaluation measures; and (6) social change implications.

Potential Resources and Existing Supports

To implement the recommended changes in the technology policy, the school district will need to commit to the policy changes. Time, financial resources, and human resources will need to be invested to demonstrate the school districts commitment to the recommended changes in the technology policy. The recommendations previously outlined in this position paper will require various levels of comment and support. The schools board of education, superintendent, curriculum director, each of the buildings principals, teachers, students, parents and the community are all needed participants to be as resources and support the policy changes. The initial technology bond that was passed by voters back in 2011 to implement the one-to-one iPad initiative; therefore, the parents, community, board of education, and the school administration are all potential resources and existing supporters for this project implementation. As all high school teachers have already implemented the one-to-one iPad initiative into their classrooms, teachers are a potential resource to provide their expertise and existing support. However, some teachers have expressed their discontent in the current technology policy due to an inadequate amount of time for training. Hence, making changes to include more time for training and practice using devices could increase the likelihood that teachers will support the changes in the technology policy.

The majority of other needed resources to implement the technology recommendation policy and assess its future outcomes already exist within the school district. Teacher collaboration already exists with its use of professional learning communities (PLCs); refinement of teacher assessments occur on an ongoing basis as

teachers are using common assessments and pre/post tests for their classes; there is already a model for how the high school implemented iPads for its one-to-one program and the same model can be used for the middle school. However, with the lack of parents on the school improvement committee, the school district needs to promote and advertise that they are looking for parents to join the school improvement committee to help with continued growth.

Potential Barriers

There are three recommendations for future use of the technology implementation policy made by using the 5 Cs of technology framework. These recommendations were the expansion of the program the middle school and carts for each classroom in the elementary schools, the implementation of more time for quality professional development for educators to be able to run-through practice lessons using technology in the classroom, and to include parents on the school improvement team. The biggest barrier for implementing these policy changes is time. After the school board approves these policy changes, the curriculum director, technology department, and building principals will have to create a roll out plan for the one-to-one iPad program at the different schools. The district will need to obtain bid orders, have an accurate account for how many devices to purchase for students, and to set up a time table for purchase and delivery. The technology team will have to set up all of the devices to be able to work on the school districts network. Paperwork will need to be created, delivered to parents, signed by parents, and organized by the school for record keeping purposes before students are able to use these devices. Parents might request help with knowing how to

use these devices so the school district will have to make arrangements for meeting times and create presentations.

A second barrier for these recommendations is the length of longitudinal analysis. Currently, the school district has a pattern of evaluation policies and contracts either every 2 years or 4 years. For this policy recommendation, it is recommended a period of 4 or more years for the benefit of being able to collect enough measurable data and analyze the data for the purpose of making data driven decisions about the successfulness of this policy recommendation. It is possible for this barrier to be overcome by the administrative leadership team and school board if a decision is made to keep this policy recommendation for a period of 4 years or more.

A third potential barrier is parent involvement. Parent surveys have previously been sent to parents via email by the school, however, there are usually a low number of replies. One of the difficulties when sending out parent surveys is that because the school district is a "School of Choice" district, parents who live outside of the school district are not able to vote on mileages. In addition, with the low number of replies from parents to surveys, it can make it difficult to have accurate information from parents. To overcome this barrier, it is important to have some parents on the school improvement team to be able to have parental input on policy creation and enactment.

The fourth barrier to this policy recommendation is the decision making process when it comes to utilizing bond money that was passed in 2011. The technology bond that was passed is a three-part series. The school district currently is in the second part of the series with the fund expiring in the year 2020 (curriculum director, personal

communication, January 18, 2017). Although the bond is set up specifically for technology purchases and some building upgrades, prices of technological devices change and there does become a need for upgrading devices due to changes in operating systems, new software, student enrollment, and other potential various needs within the school district. With the bond set to expire in the year 2020, the school district will need to replace the bond to be able to continue with the one-to-one iPad implementation program or potentially change to a cheaper mobile learning device, such as a Chromebook or other tablets.

A fifth potential barrier to this policy recommendation could be for the need to provide teachers with professional development opportunities. Time must be allotted to teachers during the school year to meet the professional development needs. This means that there will be a financial cost for placing substitutes in the classroom for teachers. The district may need to use an external organization in order to provide quality teacher training, which would require additional funding. The school district would also need to provide more time for teachers to work collaboratively with other teachers to design common assessments, common instructional lessons and implement research-based teaching strategies for implementing technology in the classroom that have been identified in Section 1. A solution to this potential barrier could be the continuation of the school districts Professional Learning Communities that the school district already utilizes. This could help cut some of the cost, but additional funding would be needed to help increase professional development opportunities.

Proposal for Implementation and Timetable

After this doctoral study and position paper are approved from Walden University and published, I will schedule a meeting with the local school district's director of curriculum and administrative team to present the findings and a summary of this doctoral study along with the policy recommendation generated from the research findings. After meeting with the curriculum director and administrative team, a time to present the findings from this project study and the policy recommendation to the school board of education will be selected. To date, I have already met with the curriculum director of the school to discuss some of the findings and discuss parts of the policy recommendation. After meeting, the curriculum director then notified the school board and the administrative team of my intentions to present a copy of this published project study and present the findings along with the policy recommendation at a school board meeting before the end of the school year in June of 2017. This school board meets the third Monday of each month.

After the policy recommendation findings have been given to the school board of education and have received their sustaining vote, the administrators, district personnel, students, community member's parents and other stakeholders, can collaborate to ensure that teachers and students see the viability of the implementing of the technology policy to expand the one-to-one iPad program in the greater context for improving student standardized test scores and their digital citizenship. The recommendation of this policy calls for the school district to implement the expansion of the one-to-one iPad program initiative for the start of the 2017-2018 school year. Professional development expansion

will also be established before the commencement of the 2017-2018 school year. The inclusion of parents on the school improvement team will be accomplished before the beginning of the 2017-2018 academic school year. After the technology policy has been approved, the administrative teams will be required to hold education meets open to parents regarding the change in the technology policy and the expansion of the one-to-one iPad imitative prior to the implementation of the program. Table 22 offers a timetable for the implementation of the technology policy recommendation.

Table 22

Timetable for the Implementation of the Technology Policy Recommendation

Activity	*Target Date*
Meeting with the School District's Curriculum director to present project study and policy recommendations.	March, 2017
Meeting with the School Districts Administrative team to present project study and policy recommendations.	April, 2017
School Board Meeting to present project study and policy recommendations.	May, 2017
Obtain approval for the implementation of the recommended technology policy.	June, 2017
Parents and other community stakeholders join school improvement team.	June, 2017
Follow the previous iPad implementation procedures model from the high school and implement one-to-one iPad program in the middle school.	September, 2017
2-day professional development with a focus on implementing iPads in the classroom three times per year.	October, 2017; January, 2018; April, 2018

The school district will continue to evaluate the effectiveness of the new technology policy by continuing to conduct pre/posttests, collect their data, and analyze this data at all levels. Standardized test scores will be analyzed each year as well for Grade 11 students. The school will also begin to analyze PSAT data that is given to Grades 9 and 10.

It is possible that the recommendations from this technology policy recommendation could have holistic and positive impacts on all the school district's

participants including administrators, teachers and students. With the three primary objectives of the policy recommendation that are geared toward meeting the needs of improving standardized test scores for all students, this school district has the resources available for the continuation of positive policy improvement. From a community perspective, the teachers who engage in the technology policy could also benefit from the potential relationships that could be fostered and nurtured by the addition of parents on the school improvement committee. In addition, there is a possibility that the way that teachers currently use assessment tools to improve instruction will be improved through the use of the one-to-one iPad initiative. From a national perspective, this technology policy recommendation goes above and beyond the technology requirements and recommendations that correspond to the NCLB and the RTTT policies that have already been mentioned in this study.

Roles and Responsibilities of Students, Teachers, Administrators, and District Officials

As the researcher, I am responsible for writing and delivering a published copy of this project study and a copy of the position paper to the curriculum director and the building administrators. I will also offer assistance during the planning and implementation phases of the new technology policy. I am also responsible for accepting other suggestions not outlined in the position paper and fore presenting the new technology policy to the administrative team for approval prior to the board of education presentation. The curriculum director is responsible for setting a presentation date of the project study, its findings, and the new technology recommendation policy to the school

board of education. The school board of education is responsible for approving the proposed policy changes. The curriculum director will be responsible for explaining the new technology policy to teachers, parents, and students who might attend future meetings.

The students' and parents' roles regarding the recommended Technology Policy is to participate in the one-to-one iPad implementation program. It is expected that students use the device for educational purposes. These devices are not owned by the student, they are owned by the school district. Just as text books and classroom supplies are owned by the school district, these devices are loaned to students for their use as a tool to help engage, improve, and motivate student achievement. Damages and loss of products will be treated just like when textbooks are loaned to students; students will be held culpable for all expenses correlated with damage or loss to the devices.

Teachers' roles regarding the recommended Technology Policy are to assist in the implementation of the devices in the classroom and to carry out the policy. Currently teacher evaluations are based in part on how technology is implemented and demonstrated in the classroom. The expectation for teachers is to use the iPads in the classroom to enhance instruction and to collaborate with other teachers regarding best practices of technology in the classroom. During teacher evaluations, educators can also explain their roles in implementing technology in the classroom and findings from their own data collection about how technology has affected student achievement in the classroom.

The school administrators' roles regarding the recommended Technology Policy are to oversee the implementation, continuation, and collaborative efforts of all participants within the school district. Administrators have the responsibility of helping teachers and students to continue to use iPads in the classroom to help all those involved to maintain ownership of the policy. Administrators also need to continue to allow access to teachers and stakeholders to all of the data that is used to assess the success of the technology policy.

Finally, other district officials within the central office also play a major role in this recommended Technology policy. District officials will need to continue to allow access to both school employees and community members about the benefits of using technology in the classroom and the continued documentation of student outcomes and student achievement.

Project Evaluation

The goal of this doctoral study was to identify the effects of a one-to-one iPad initiative program on Grade 11 standardized test scores at a rural school in Michigan. The proposed policy recommendation purpose of updating the technology policy was to expand the one-to-one iPad program and provide mobile learning devices as another tool for teachers and students in order to implement research-based strategies and meet students' needs in order to improve standardized test scores. The evaluation of the technology policy is best measured through outcome-based and goal-based approaches. In order to effectively assess the technology policy and its ability to meet the outcomes

and goals, I believe that through the use of quantitative measures, proper evaluation can be achieved.

This evaluation will be accomplished through the generation of assessment reports once the technology policy has fully been implemented. The curriculum director, with the assistance of technology coaches, teachers and the school improvement team, will design, develop and execute an assessment plan that uses the recommendations from this technology policy. By having the curriculum director design, develop and execute this assessment plan, it can be tailored to the specific needs and circumstances of the school district. This plan should be quantitative in nature examining the results of pre/posttests, PSAT scores, and SAT and MSTEP scores of Grade 11 students. The school district has already developed parent, student, and teacher surveys that have been given to high school parents, students, and teachers requesting their input on how iPads have effected student achievement. These surveys can be adapted to meet the needs of all schools within the district. The surveys should be modified to be quantitative in nature to provide accurate information to made data driven decisions. It should be a goal to generate an assessment report twice per year, one at the half-way point of the school year and one at the end of the school year.

Implications Including Social Change

Local Community

This project study and policy recommendations should be able to address and meet the needs of all students and learners in the local community. The results from the project study found that the one-to-one iPad program was in fact helping to improve

standardized test scores for Grade 11 students. The policy recommendation made based off the findings recommended for the expansion of the one-to-one iPad program to include Grades 6 through 8 and create classroom sets in kindergarten through Grade 5. The expansion of this program creates the opportunity for every student to have more, better, and equal access to information and learning. Students from financially struggling families stand the most to benefit from this program because these families might not have the means to afford a mobile learning device. However, all students stand to benefit from the many different apps and learning platforms that are presented on the iPad. Students are able to learn at their own speed. Teaching becomes interactive, engagement will rise, and overall student achievement will improve.

Social change can be accomplished in various ways through teachers, students, administrators, and the local stakeholders who are willing to participate in the technology policy recommendation process. This policy recommendation was based on the findings that the one-to-one iPad implementation program and the current school improvement plan. The policy evaluation and recommendations that have been mentioned include: a) time for the administrators to analyze standardized assessment data; b) time to be able to collaborate with local community members, parents, stakeholders, teachers, and students; and c) time to plan and implement future technology assessment policies and assess the one-to-one iPad program by using the 5 Cs of technology framework. The ability to ensure that the recommendations originating from this technology policy recommendation will be met require the addition of parents and/or other stakeholders on the school improvement team.

Far-Reaching

This project study has the potential to benefit other rural school districts that are interested in implementing a one-to-one iPad initiative program. However, implication for this policy recommendation and evaluation include positive social change that goes well beyond the technology recommendation policy and has a potential to greatly impact other rural school districts and beyond. This could occur through the continuation of collaborative practices that the school district currently has with the county schools in the area. The changes that are made to the technology plan that are submitted to the State of Michigan that will contain the recommended technology plan have the ability to reach other schools and inform the State of Michigan what this school district has done to help improve student achievement. Finally, students in kindergarten through Grade 12 will be offered greater opportunities, more access to content, and improved communication ability, more ways to collaborate with each other and teachers, demonstrate creativity, and develop critical thinking skills which will lead to improved student standardized test scores. Gone are the days of student excuses that the "dog ate my homework" as students have access to real time/all the time materials that they are learning and sharing.

Conclusion

Section 3, the Project, included a description of the project and goals that were addressed and identified from Section 1. A rational was also be included to why this particular project was chosen to address the problems identified from Section 1. A discussion was included to address how this project fits in with the data analysis that was completed in Section 2 and if this project was a solution to the overall problem. Another

review of literature was also included containing the criteria that was used to develop the project based off of research, engagement theory, and the 5 Cs framework. A section about implementation was also included discussing: (a) the description potential resources and existing supports, (b) potential barriers, (c) proposal for implementation and timetable, (d) roles and responsibilities, (e) evaluation measures, and (f) social change implications. Section 4, reflections and conclusions, will include a section about the strengths of the project, a section about recommendations and remediation of the limitations. A discussion about how the problem could have been addressed differently and what other alternatives might have been considered to address the problem will also be included.

Section 4: Reflections and Conclusions

Introduction

The purpose of this doctoral project study was to examine the effects of a one-to-one iPad initiative program on Grade 11 standardized test scores at a rural high school in Michigan in an effort to determine if test scores have improved, declined, or stayed the same. The data analysis from this study determined that test scores for Grade 11 students in the subject areas of mathematics, science, and social studies have significantly improved since the implementation of the one-to-one iPad program in 2012. An analysis of current literature has also indicated that iPads and other mobile learning devices have contributed towards helping students improve overall in student achievement and on standardized test scores. Based upon the data analysis from this doctoral study and other researchers, I decided to write a position paper in the form of a policy recommendation to change three elements in the current technology plan that is part of this school district's school improvement plan: (a) expand the current one-to-one iPad initiative to include Grades 6 through 12 and create classroom sets for kindergarten through Grade 5, (b) expand the current technology development days from 2 half days to a total of 6 full days per year, and (c) include parents on the school improvement team.

The primary purpose of Section 4 is to reflect on the process of creating this doctoral study. As I reflect upon this study, I discuss strengths and limitations in addressing the problem as well as suggest alternative methods to address the problem. A reflection is also discussed about scholarship, project development, leadership, and change that occurred through this study. A discussion is also included about how this

study has shaped my role as a scholar, practitioner, and project developer. Finally, the conclusion provides an overall analysis of my work, including what I have learned about implication, application, and directions for future research when it comes to improving student achievement through a one-to-one iPad initiative program.

Project Strengths

A rural school district in Michigan has invested millions of dollars in a one-to-one iPad initiative program with a belief that the devices would help improve student achievement. Although the one-to-one iPad initiative started in 2012, over 4 years ago, the effects of the program on standardized test scores had yet to be assessed formally or be formally evaluated to provide relevant findings and information to the school board of education, administrators, teachers, parents, students, and stakeholders for accountability purposes and for the ability to make data-driven decisions (Mandinach, 2012). Therefore, this study provides a vital first step to all stakeholders in this school district to provide an assessment in determining the effects of the one-to-one iPad initiative on standardized test scores.

One of the major strengths of this study was how this problem was first selected. I sat down with the high school principal (personal communication, January 17, 2014) to discuss potential studies that could be conducted either at this high school or within the school district. During the discussion, the principal wondered how the one-to-one iPad program was affecting student achievement or if they were just a distraction. After several discussions with the high school principal and the school district's curriculum director, I determined that the best way to determine if the iPad has helped student

achievement or not was to analyze how student standardized test scores have changed since the implementation of the one-to-one iPad initiative. I have received an overwhelming amount of support from the administrators and the curriculum director at this school district. This has helped reinforce to me that this school district wants the one-to-one iPad initiative to be formally analyzed and to see the results.

A second strength of this project was choosing to use a quantitative causal-comparative research approach to this study. According to Yilmaz (2013),

> Quantitative research is informed by objectivist epistemology and thus seeks to develop explanatory universal laws in social behaviors by statistically measuring what it assumes to be a static reality. It emphasizes the measurement and analysis of causal relationships between isolated variables within a framework which is value-free, logical, reductionistic, and deterministic, based on a priori theories. (p. 312)

Archived data were collected and analyzed to determine the changes in Grade 11 standardized test scores since the implementation of the one-to-one iPad initiative and then compare those scores to the previous 5 years' scores. As a result of this doctoral study, the policy recommendation was research based and data driven. The frameworks of engagement theory and the 5 Cs of technology were chosen to specifically help reach greater academic success, digital skills, and digital citizenship in the pursuit of improving standardized test scores through a data-driven process. Data analysis could have unwanted and dramatic consequences when they are used without a proper theoretical framework (Greller & Drachsler, 2012). Also, Greller and Drachsler (2012) explained

that the frameworks of engagement theory and the 5 Cs of technology were used as guides from start to finish building trust in the data analysis process.

A third strength from this study is that the policy recommendation will ensure that every child in Grades 6 through 12 will benefit from having access to a mobile learning device to help improve communication, collaboration, critical thinking, creativity, and content access full time. Students in kindergarten through Grade 5 will benefit from having access to the devices during the school day. Teachers will have the means to engage more students in active learning, foster an environment where technology is used to facilitate learning, and classrooms where differentiated instruction is used to meet the needs of all levels of learning that is adapted to all learning styles.

A fourth strength for this study is the connection made to both state and federal mandates. The study incorporated irrefutable quantitative research findings that supported mandates made from NCLB, RTTT, and proficiency goals on standardized tests set by the State of Michigan. The findings and policy recommendation also support the school district's school improvement team's plan, which incorporates the district mission to "educate every child to achieve his/her full potential" (State of Michigan, 2016, para. 2).

The final strength for this study can be found in the position paper. The policy paper was scholarly in nature and full of evidence to support the recommendation to expand the one-to-one iPad initiative, to include more professional development time for teachers, and to include parents on the school improvement team. The evidence provided in the position paper fully supported the recommended changes to the technology policy as a result of an analysis of current peer-reviewed literature. The databases that were used

for this study were saturated with a variety of studies that included different methodologies. Two extensive literature reviews were included in this study to demonstrate evidence for the need for this study to be conducted and to demonstrate a need to make changes to the technology policy.

Project Limitations

Although an academic approach was used for the development of this study, there are some limitations that exist. The biggest limitation is that this study was designed, developed, and conducted for a rural high school in Michigan where stakeholders had previously passed a technology bond to implement a one-to-one iPad initiative program. The setting, sample size, and narrow focus can play a part in limiting the generalization of this study. Due to changes in the English portion of the MSTEP, I could not accurately compare the data in English from before the iPad implementation program to the current status of the iPad implementation program. Only the areas of mathematics, science, and social studies were able to be compared.

A second limitation to this study is that the school district might not have the financial resources or the time needed to implement some of the recommendations that are included in the technology policy recommendation. Due to the cost of the iPad, the school district might not have the necessary funds that are needed to buy enough iPads for a one-to-one program that would include Grades 6 through 12. The school might have to consider other device options that are cheaper, such as a Chromebook. Also, the recommendation to expand the number of days for technology professional development for teachers requires the school district to provide time and more financial resources to

establish a professional development plan that accommodates the needs of students, provides meaningful training for the teachers, and is collaborative in nature. Currently the school district does not have the resources to train every teacher at once, so a plan might have to be adopted to train some teachers and have those teachers train other teachers. The district might have already committed some of the financial resources to other plans or technology upgrades that are bigger priorities, which could prevent the adoption of this technology policy recommendation.

One final possible limitation to the policy recommendation is the call for the inclusion of parents and other stakeholders on the school improvement team. It is possible that there are no parents who want to be a part of the school improvement team or they do not know that they are allowed on the school improvement team. The school district will also have to invest a large amount of time and financial resources in addressing the need for parents to be on the school improvement team. The district will also have to decide the maximum number of parents to be on the team and the process for choosing the parents that will be on the team.

Recommendations for Remediation of Limitations

The technology policy recommendation provides some possible remediation of limitations. However, the limitation of being able to generalize the results of the one-to-one iPad initiative will vary based on location, school demographics, sample size, age groups, and rural versus urban school districts. Generalization of this project can be improved by noting that the focus of this study was on standardized test scores only. The financial limitations could be addressed in several ways: passing another bond;

purchasing cheaper devices like a Chromebook or other tablets; repurposing old devices to elementary levels from the high school; and upgrading all devices at the same time. Finally, placing parents on the school improvement team can be addressed through advertising the need for parents in the school newspaper that is sent out monthly to every home in this local school district. The school district will then establish the number of parents per team and how long the parents should serve on the team. Accommodations will have to be made to meet the needs and expectations of aligning the school district's mission statement to fulfill the plans that exist within the school improvement team's plans and goals.

Ways to Address the Problem Differently

Researchers generally present alternative approaches when addressing a problem with solutions for any given topic (Lewis, 2015; Smith, Cannata, & Haynes, 2016; van der Walt & Potgieter, 2012; Zirkel, Garcia, & Murphy, 2015). I could have chosen a qualitative methodology or even a mixed-methods approach to this study instead of a quantitative approach. These approaches would have entailed using interviews, observations, and would have completely changed the approach of this study. As a result of archived data being used for this study, confidentiality was able to be guaranteed instead of having to gain permission from parents, students, and teachers. If a qualitative approach had been used, results would not have been able to have been generalized to represent the population; instead, a smaller sample size would have been used, thus not guaranteeing the ability to generalize. Biased views from students and teachers also might have been present through the interview or observation process.

Another approach to this study could have been to focus on the standardized scores of only one subject instead of three, such as mathematics. Although this approach could have been very beneficial to the math department, other core subject areas would be missing out on having their data analyzed. As I have reflected upon other electives that could have been used for this study, it came clear that courses such as world languages could have been affected by the implementation of iPads in the school. A quantitative approach could also have been used with a pretest–posttest methodology instead of the posttest only method that was used for this study. Different age groups could also have been chosen for this study. However, these different approaches would have concluded with very different results due to different variables being examined. I specifically wanted to know the effects of the one-to-one iPad initiative on Grade 11 standardized test scores. Although other approaches have some potential to yield results and findings, I believe that the quantitative causal-comparative ex post facto method was the best approach for this study.

Scholarship

Scholarship has been characterized as the process of acquiring knowledge (Compton & Compton, 2017). Creating, presenting, analyzing, and then writing up the findings for this project study has taught me what it means to take a scholarly position and provide evidence to support that position. Addressing the issues of implementing iPads on a one-to-one basis and creating a technology policy recommendation by conducting two different literature reviews showed me what it means to saturate the literature and the importance of literature saturation. Through the literature saturation

process, I discovered how to share an engaging presentation that tells an accurate story about the reality of this project study and the results from other similar studies. The scholarship that I have gained through this doctoral journey has reinforced the philosophy of being a life-long learner. As a result of this study, collaboration, enriching experiences, and the hundreds of hours reading and studying have provided a priceless experience that only those who have also been on a doctoral journey can understand and appreciate. This scholarship has given me a valuable experience that will transfer over into the roles of an educator and an administrator.

The scholarship process also requires the passing on of knowledge that has been gained (Isett, Mergel, ILeRoux, Mischen, & Rethemeyer, 2011). A scholar is someone who has a profound knowledge of a particular subject or an expert (Depaepe, Verschaffel, & Kelchtermans, 2013). I believe that it is useless to be an expert in a particular subject if there is no one to share that knowledge. By being a scholar and a life-long learner, I hope to not only share the expertise that has been gained during this doctoral journey, but to also inspire others to strive to become scholars in their own respected fields and become engaged as a life-long learner.

Project Development and Evaluation

Project development and evaluation can be effectively executed through collaboration when dealing with educational issues (Argelagos & Pifarre, 2012).). Alone, I struggled to even find a problem to study, let alone develop a project. It was not until I heard others' questions the effectiveness and marvel at the millions of dollars that were spent on iPads to wonder, is it really worth it? The educational and professional

experiences that I have gained have solidified the importance of questioning program effectiveness and then how to make the program better. Discussing problems in education with other teachers, parents, and administrators has improved my collaboration, communication, critical thinking, and creativity skills dramatically. Thanks to Walden University's online library full of peer-reviewed articles, knowledge of content access has grown exponentially. At the beginning of this project, it was not realized until the end that I was being developed and molded by the 5 Cs of technology framework.

After the collection and data analysis was completed in Section 3, my committee was consulted with to discuss the best way to address the research questions. From the four project genres emphasized by Walden University (curriculum plan, evaluation report, professional development curriculum, and policy recommendation) it was determined that the best way to answer the project questions was through a policy recommendation. I believed that the other three genres were inadequate based off the results and findings of the iPad implementation program. After further discussion with the school district's curriculum director, there has been discussion about the possibility of expanding the one-to-one program to include Grades 6 through 8. However, before this study was conducted, there has been no formal study evaluating the effects of student achievement on standardized test scores (curriculum director, personal communication, January 17, 2017). Only informal surveys distributed to parents, teachers, and students have been used to collect opinions about the program. Considering the potential goal that the school district has to expand the program, it confirmed the rational to use a policy recommendation as means to present a solution to the school district and community

stakeholders. This process has made me believe that collaboration should be used whit comes to project development and evaluation in education settings. By using collaborative, data-driven decision making, it can improve the probability that the school district will accept the technology policy recommendations.

Leadership and Change

This doctoral journey has changed me as an educator and as a future administrator. Change is a part of life. Change is a part of education. As an educator, policy has changed on a yearly basis in my classroom. From an administrator perspective, policy has changed the way that leadership has been used. Problems and issues that exist in education or in a school district are often complex with no easy solution. However, the doctoral journey creates a framework for creating change to find solutions to problems through the process of identifying a problem, analyzing literature, conducting a study, analyzing data, presenting findings, and creating a policy to change/make improvements to a program, it has only reinforced that leaders are responsible for using knowledge to evoke change. This project has changed my perspective on leadership, administrators, and teachers. A teacher has the strength and endurance to elicit change in their classroom. This change in one's classroom can be used to change the goals of an entire department in a school, which can change how a school works. When a leader values change, anything is possible. As an administrator, one hopes that the change will help take steps forward instead of backwards. The proposed policy recommendation in this project study may lead to improvements to benefit the entire school district. Because the process of identifying a problem, analyzing literature, conducting a study, analyzing data, presenting

findings, and creating a policy recommendation was followed, other school districts can use this study to help improve student achievement. Change is not only for an individual but it can be for the benefit of those around them. Conducting this project study has given me the confidence and experience to believe that anything is possible when you have a goal.

Analysis of Self as Scholar

When one hears the word scholar, one usually thinks of someone who is an expert in a particular field or is very knowledgeable. Noonan (2015) explained that in order to turn into a noteworthy scholar, one must amass practical knowledge and comprehend how to accomplish research and work in the field or at an institution. Due to human behavior, the complexities of becoming a scholar in education are not an easy task. Because of the issues of culture, learning styles, family dynamics, background, and more, it is difficult for many educators and administrators to reach all learners and students all of the time. There is a hope to engage students to the best of one's abilities by using the tools and resources that they have been given. Research in education helps administrators and teachers know what some of the best practices that are being used by others. Research can share the results of how a tool has affected students. His project has reinforced the need to follow a scholarly framework when it comes to problem solving. The practices and information that were acquired throughout this project study have broadened my horizon in becoming a scholar.

This projected has helped me to realize that I have an untapped skill in policy research, recommendation, and evaluation. It is my hope to be able to continue to share

the skills that I have learned through this doctoral journey. As a researcher and scholar, I would like to share what I have learned with more than my local school district, but to include other school districts that have a desire to implement a one-to-one iPad program or other mobile learning device. Finally, I have committed myself to keeping a viewpoint of continuous improvement as a scholar.

Analysis of Self as Practitioner

The purpose of this doctoral project developed a project that was designed to solve a problem and create a change for better practices. This purpose has made me a better practitioner. A practitioner engages in the practice of a profession which can be in a business, medicine or education. This experience has helped me grow as a practitioner. I have gained knowledge about the local school district where this study was conducted. I have improved communication and collaborative efforts with administrators and teachers throughout this study. By conducting two literature reviews, experience was gained about researching other researchers, studies, and methodologies to find best practices. This has enabled me to question some of the current policies in place and conduct a proper policy recommendation to help improve a policy towards positive outcomes.

A practitioner has to be constantly evolving and must be committed to life-long learning. This study has helped me to learn more about how this local school district writes, evaluates, and implements policies. Learning how the one-to-one iPad program was initially implemented, helped me to understand the amount of work that goes into such a project. It is not as simple as Apple Inc. (2014a) makes it out to be; you cannot just give an iPad to a student and expect standardized test scores to be improved. It takes

administrators and teachers who are engaged in using 21st century technology and tools as a way to help advance and improve student achievement, it is not a device. I have learned that it truly does take a community to raise a child, not a device. As a practitioner, I have gained a better understanding about the roles administrators, teachers, students, parents, and other stakeholders take to help ensure the mission of this school district, to help "educate every child to achieve his or her full potential."

Analysis of Self as Project Developer

The role of an educator is constantly involved in projects; whether these projects are in the classroom, professional development, or towards school improvement. This doctoral project has helped me learn the process that is required to develop a research project. It is imperative to first recognize and define a problem. The next step is to carefully craft a research question that addresses the problem. Next, the researcher must choose the proper methodology that will best contribute to answering the research question. The study is then conducted and data is collected. Next, research findings are analyzed to help develop a project that will either solve the problem or make improvements. All of this is conducted with the approval of an IRB. A project developer must follow the rules and regulations that are stipulated by the IRB. It is imperative that participants rights are protected and confidentiality guaranteed. Understanding the entire process has made me a better project developer. My hope is that the next project study that I help develop will continue to improve in quality and have an impact towards social change.

The Project's Potential Impact on Social Change

This project has the potential to impact social change for all students, teachers, and administrators at this local school district. This project provides the positive impacts that the one-to-one iPad initiative has had on Grade 11 students on standardized tests. The information from this study has the potential to improve all students' communication, critical thinking skills, collaboration, creativity, and content access by having a mobile learning device available anytime. The findings from this study showed that student test scores have significantly improved in the subject areas of Mathematics, Science, and Social Studies. With an increased exposure to content and other best practices, all students have the potential to improve performance on tests and increase proficiency levels determined by the State of Michigan.

This project also has the potential to impact social change on more schools than just the local district where this study was conducted. By sharing the findings of this study and other future policy evaluations with other school districts and even the State board of education for Michigan, a framework can be established towards implementing other one-to-one device programs in schools throughout the state. The overall importance of this project takes the stance that a current inequality exists at this local school district when it comes to the districts mission statement and the current technology policy; only some students are being education to achieve their full potential because only Grades 9 through 12 are currently participating in the one-to-one iPad program. With an expansion of the program to include Grades 6 through 12 in the program, and classroom carts for

every elementary class, social change will be able to impact all students at this local school.

Implications, Applications, and Directions for Future Research

This project study has helped me understand that when it comes to educational issues and problems, they are often complex and one simple study cannot fully describe a problem or a phenomenon. This quantitative causal-comparative study is just the beginning to understanding the complexities of the effects of how iPads have helped improve student achievement on standardized test scores at the school in this study. The findings from this study and policy recommendation were intended to promote change and provoke questions and curiosity in a collaborative manner about this problem and how application, implications and directions for future research can happen.

The implications of this project study have the potential to impact social change on two levels: the local school district and the State of Michigan. At the local level, the findings and information in this study has the potential to guide this school district with improving the technology policy and expanding the one-to-one iPad initiative program. The one-to-one initiative program can impact the State of Michigan by providing school improvement reports documenting how the one-to-one iPad initiative has helped meet state proficiency goals.

The application of this study can impact the local school district and the general field of education. The policy recommendation for this study was in response to the findings that the one-to-one iPad initiative was helping to improve standardized test scores. Hence, the recommendation was specifically applicable to this school. The policy

recommendation for this study can also be applied to the general field of education. Schools that are considering implementing a one-to-one device initiative program can use the results and findings from this study as a framework to share with their stakeholders to encourage the passing of a technology bond in order to financially support the program.

In Section 3, it was recommended that this school district continue evaluating the one-to-one iPad initiative program and evaluate the technology policy at a minimum every 4 years. Future research could be conducted based off the expansion of the one-to-one iPad initiative to all grade levels. If this school district makes the decision to change the one-to-one device from the iPad to Chromebook for financial reasons, a study could be conducted comparing test scores since the change of device. Other research questions could be asked such as: the effects on ELA test scores, the effects on World Language test scores, the building of critical thinking skills, or assessing the improvement of student achievement for students who have special needs. Future research could also use different methodologies such as a qualitative study or a mixed-methods study. Data from student perceptions and teacher perceptions could also be gather and analyzed to produce a different approach for a policy recommendation. These different perspectives could help to develop a more rounded story about the effects of a one-to-one iPad initiative on student achievement.

Conclusion

Section 4 for this project study provided a summary about my reflections on the process for conducting a doctoral study. Reflections based off the strengths and limitations were discussed in order to address the problem. A short discussion about

alternative methods to address the problem was also included. Scholarship, project development, leadership and change that occurred through this study was also reflected upon. A discussion about how this study shaped my roles as a scholar, practitioner, and project developer for this research was also included. Social change was discussed throughout Section 4. Section 4 then concluded with an overall analysis of my work including a discussion about implication, application, and directions for future research when it comes to improving student achievement through a one-to-one iPad initiative program.

Mobile learning devices have the capability of completely changing the world of education. However, these devices need to be viewed as a tool for improvement not as a distraction or a toy. Educators in the classroom need to manage the use of these mobile learning devices. Administrators need to support the use of these devices by all students. Finally, it is my hope and prayer that this doctoral project study has had a positive influence on all stakeholders at this local school district and provides inspiration to all to strive to be life-long learners.

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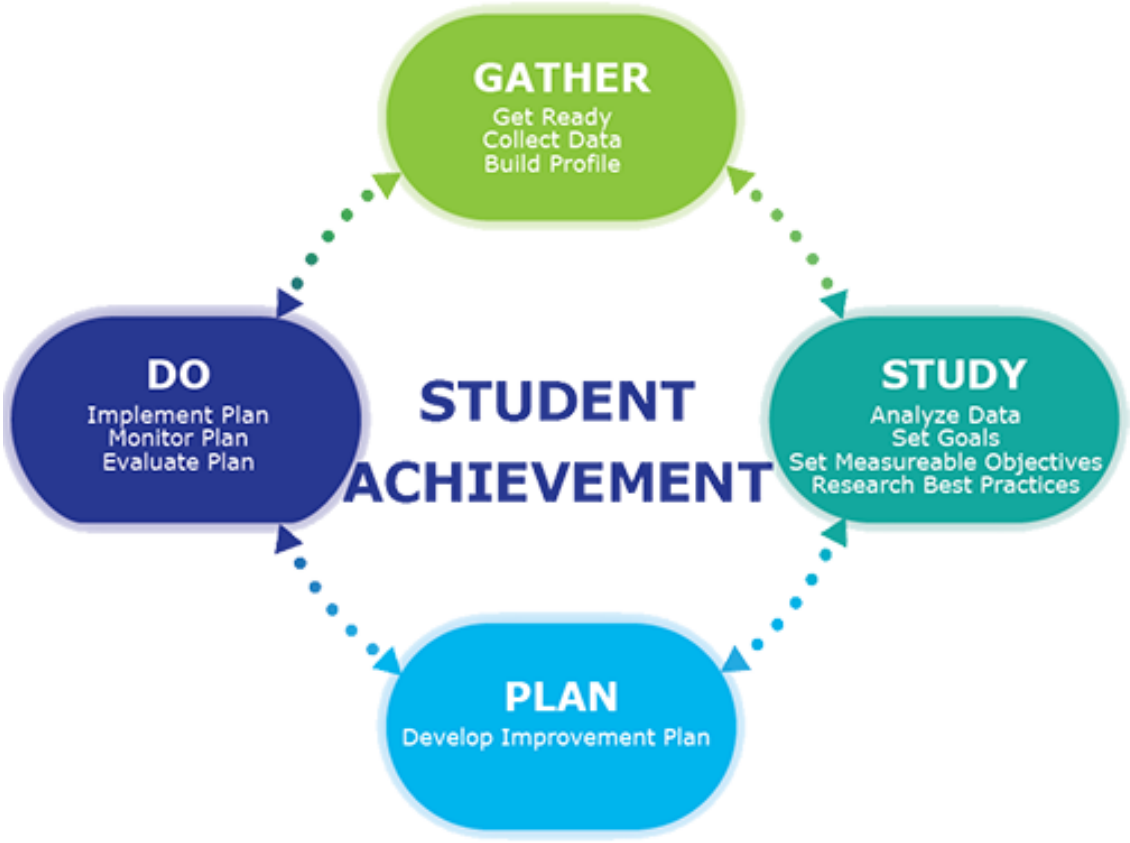
Appendix A: Policy Recommendation Position Paper

A Technology Policy Recommendation for Expanding the 1-to-1 Device Initiative at [redacted]

By Brendan Howard

June 2017



To: The Board of Education at [redacted]

The Superintendent of [redacted]

The Curriculum Director of [redacted]

The Principal of [redacted]

The Principal of [redacted]

From: Brendan Howard, Doctoral Candidate at Walden University

Subject: A Technology Policy Recommendation for Expanding the 1-to-1 Device Initiative at [redacted]

The Problem

[redacted] has invested millions of dollars in a 1-to-1 iPad initiative program, which started at the beginning of the 2012-2013 school year only at the high school. This initiative was developed in part to help meet the school districts mission statement, "to education every child to achieve his or her full potential." [redacted] p. 4). To pay for the 1-to-1 iPad initiative and other necessary technology upgrades, voters passed a $7.29 million dollar technology bond ([redacted], 2012c). This high price tag has raised some questions among various stakeholders and community members as to whether it was worth the investment for the school district to purchase the iPads ([redacted], 2014). Although there are many studies and researchers that support and promote the use of iPads to help improve student achievement, (Carr, 2012; Conn, 2012; Cumming, Strnadova, & Singh, 2014; Friedman & Garcia, 2013; Haydon et al., 2012; Retter, Anderson, & Kieran, 2012; Simpson, Walsh, & Rowsell, 2013; Ward, Finley, Keil, & Clay, 2013) there has been very little

research about the direct impact that iPads have had on student learning and student achievement at GLCS, in particular when it comes to the results of the State of Michigan's MME, the ACT, the SAT and the MStep tests for 11th grade students.

After 4 year of implementing the 1-to-1 iPad initiative, no formal study had been conducted to determine if the iPad has helped improve academic performance on standardized tests. Apple (2014b) has boldly made the claim that using the iPad improves academic performance, specifically on standardized tests and other key student outcomes. However, many researchers believe that there is a lack of research and evidence to determine if the iPad is actually improving student achievement and student learning (Banister, 2010; Crichton, Pegler, & White, 2012; Haydon et al., 2012; Huang, Liang, Su, & Chen, 2012; Lucking, AL-Hazza, & Christmann, 2012; Murray & Olcese, 2011; Pegrum, Oakley, & Faulkner, 2013; Simpson, Walsh, & Rowsell, 2013; Thoermer & Williams, 2012;). Therefore, a genuine need for this project study to fill in the research gap that currently exists to help determine if the iPad actually has helped students improve student achievement levels on standardized tests and to help administrators make decisions about technology implementation in the classroom.

Background

Prior to this study, no study had been conducted to determine the iPads impact on standardized test scores. One of the focuses at GLHS has been to help increase test scores for all students on the Michigan's standardized tests. The school district Curriculum Director noted that with the change from NCLB to Every Student Succeeds Act, the bar has been adjusted from 100% of students being proficient to 85% of students being

proficient by 2022 ([redacted], personal communication, November 7, 2016). Data shows that standardized test scores in the areas of Mathematics, Science and Social studies have been below the proficiency goals of grade 11 students for the years previous to the 1-to-1 iPad implementation. The low proficiency of students in Mathematics, Science and Social Studies at GLHS are indicated in Figures 1, 2, and 3:

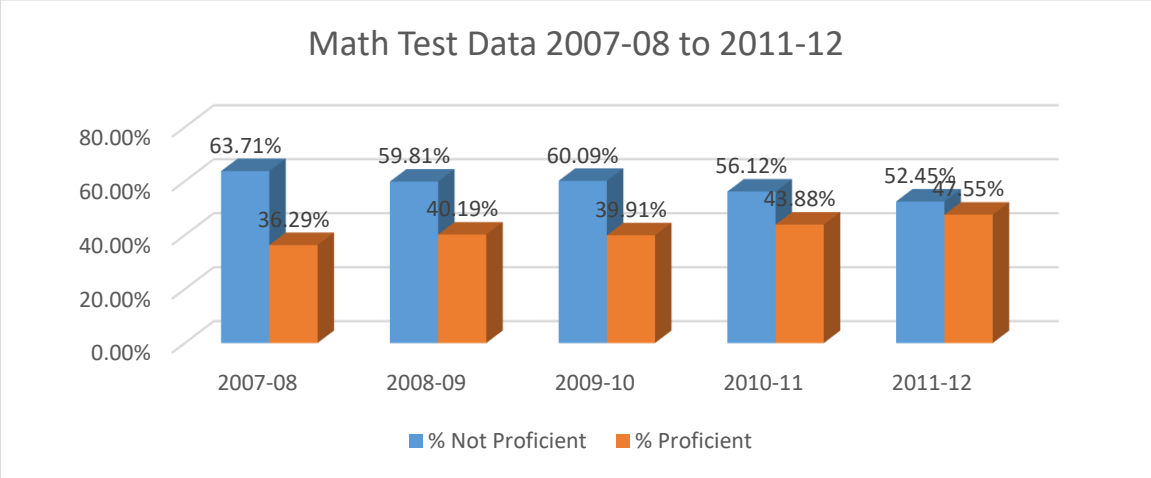


Figure 1. MME Math scores from 2007-2008 to 2011-12 academic years. Adapted from the MI School Data: Student Assessment: MME: 11th Grade Content: Mathematics test. Retrieved from

[redacted]

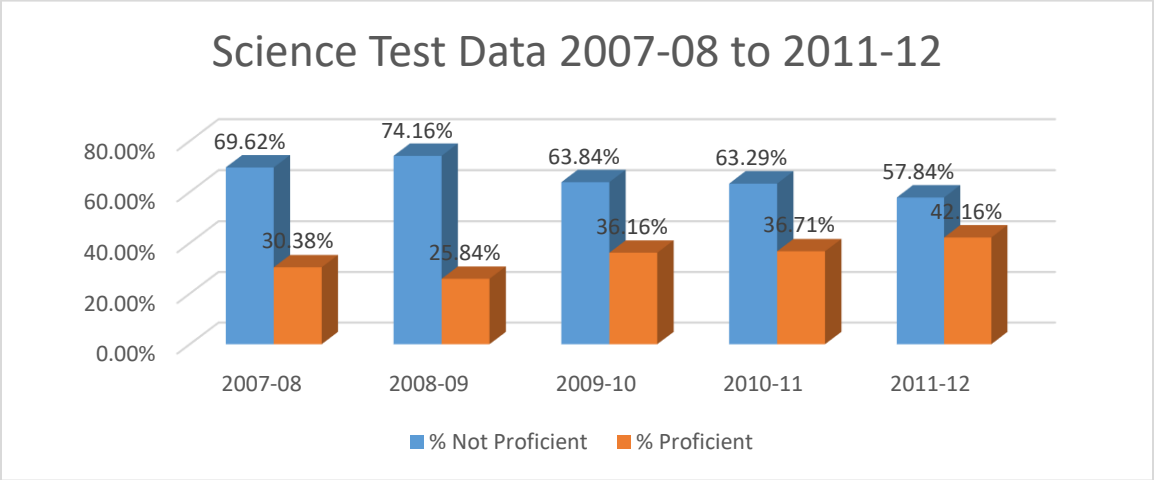


Figure 2. MME Science scores between 2007-2008 to 2011-12 academic years. Retrieved from the MI School Data: Student Assessment: MME: 11th Grade Content: Science test. Retrieved from

[redacted]

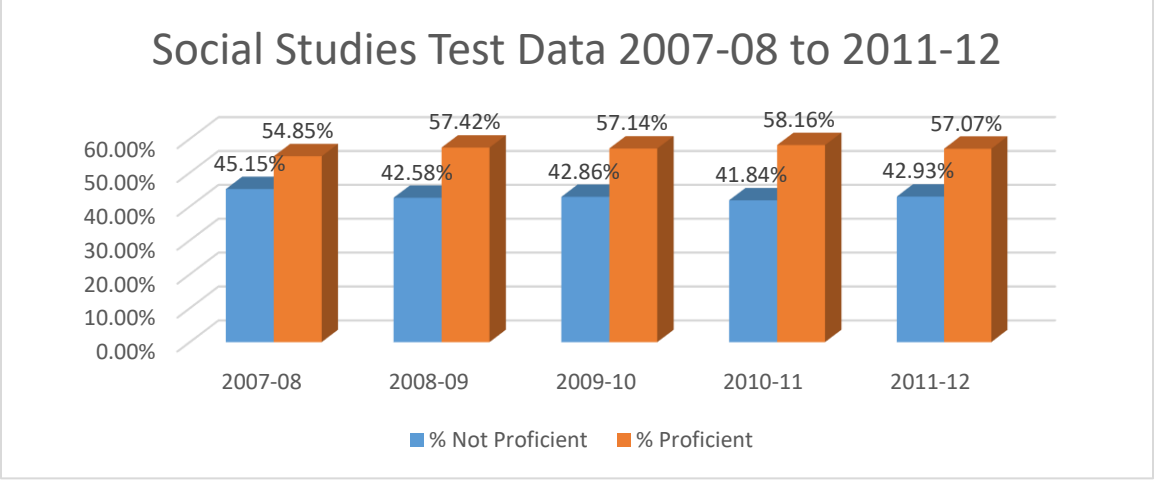


Figure 3. MME Social Studies scores between 2007-2008 to 2011-12 academic years. Retrieved from the MI School Data: Student Assessment: MME: 11th Grade Content:

Social Studies test. Retrieved from

[redacted]

The primary reason for conducting this study was to compare standardized test scores of 11th grade students from GLHS since the implementation of the 1-to-1 iPad initiative program to the standardized test scores of 11th grade students from before the implementation of the iPad program and determine if the test scores have significantly improved, stayed the same or decreased. If the students' scores have significantly improved on the standardized test scores in Michigan due to iPad use, then the school administrators and teachers need to continue to provide iPads for every student and teacher and potentially look at expanding the iPad initiative for all students at every level not just the high school students.

Research Questions

There were three research questions for this study:

RQ1: To what extent, if any, have standardized test scores on the mathematics portion of the Michigan Merit Exam from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the 1-to-1 iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socio-economic status?

RQ2: To what extent, if any, have standardized test scores on the science portion of the Michigan Merit Exam from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the 1-to-1 iPad program in

2012, controlling for student characteristics of gender, ethnicity, and socio-economic status?

RQ3: To what extent, if any, have standardized test scores on the social studies portion of the Michigan Merit Exam from the years 2008-2016 improved for Grade 11 students at a rural high school in Michigan since the implementation of the 1-to-1 iPad program in 2012, controlling for student characteristics of gender, ethnicity, and socio-economic status?

A quantitative approach with a causal-comparative design was used for this project study. The causal-comparative design was the most appropriate design for this project study due to the use of ex post facto data (MME and MSTEP scores from the testing years 2008-2016) and due to the fact that the independent variable was not manipulated because it has already occurred (Creswell, 2012).

Based off the findings from this project study, the administrative team now has the necessary data demonstrating how students have performed on standardized tests since the implementation of the iPad program and it was compared with the scores before the iPad program began. The administrative team can now make data based decisions about the continuation of this program or if other mobile devices should be considered.

Data Collection Methods

This project study obtained 5 years of archived student standardized state test data from before the iPads were issued. The data were compared with the past 4 years of archived student standardized state test data since the iPads have been issued. The results of all standardized test scores are public data and can be accessed by anyone. For this

project study, the Michigan Department of Education website and the school districts Smart Data Warehouse, also known as the "Golden Package" was used to obtain data from the past nine years for this school district. The MME and MSTEP include the areas of Mathematics, Science and Social Studies. The State of Michigan uses a 4-point number, ordinal scale to determine student achievement rates: 1 (Advanced), 2 (Proficient), 3 (Partially Proficient), 4 (Not Proficient). Since the high value, advanced is coded as a one, the scores were reverse coded so that the high value was coded as a 4 instead of a 1. A Repeated Measures Analysis of Variance (ANOVA) was used to compare the standardized test scores.

Data Analysis Summary

The data for Mathematics, Science and Social Studies was analyzed to first determine mean scores and general descriptive statistics. Next, the data was analyzed for skewness and kurtosis in SPSS. A paired-samples *t* test was conducted to evaluate whether the means of the test scores for 4 years of the iPad implementation program (2013-2016) differed significantly or not from the means of the test scores for 5 previous years (2008-2012) prior to the implementation of the iPad program. The correlation coefficient was also computed among the mean Mathematics, Science and Social Studies test scores before and after the years of the iPad implementation program. Using the Bonferroni approach to control for Type I error in the correlation, a *p* value of .05 was required for significance. The result of the correlational analysis showed that the correlation was statistically significant. The results showed a positive correlation in the mean Mathematics, Science and Social Studies test scores of students when measured

before and then after the implementation of the iPad program. Finally, a repeated measures ANOVA test with a 95% confidence level and a significance level ($\alpha = .05$) was used to determine if there were significant differences in Mathematics, Science and Social Studies test scores prior to and after the iPad implementation program across a 9-year period. The archived test scores were calculated and compared in relation to research question. The results showed that with the implementation of the iPad program, there was a significant increase continuously in the Mathematics, Science, and Social Studies test scores of students over the years 2013-2016. The null hypothesis for all three questions was rejected that there were no statistically significant differences in the scores of students across the years of pre- and post-iPad implementation. Therefore, a significant improvement in Mathematics, Science, and Social Studies test scores occurred since the implementation of the 1-to-1 iPad program at GLHS.

The Project

As previously mentioned, the mission statement at GLCS where this study was conducted "is to educate every child to achieve his or her full potential" ([redacted], 2017, p. 4). The technology mission statement at the school district where this study was conducted states, "It is the vision of the department to create an environment where students, teachers, and staff have safe, secure, and reliable access to all technology that invokes creativity and critical thinking as well as higher learning" ([redacted], 2011, p. 3). The findings from the project study indicated that there is a significant increase in Mathematics, Science, and Social Studies test scores for 11th grade students. However, there is a disconnect between the findings of this study and the

mission statement for the school district and the mission for the technology plan. To bridge the gap between the mission statement and the current technology policy, a policy recommendation based on the research findings and the literature review from this study has been written to address the issue that not all students are provided with the same access to technology by limiting the 1-to-1 iPad program to only high school students. This policy recommendation was partially initiated in response to the needs of the school district where it was discovered that the schools mission statement and technology policies had not been evaluated in recent years ([redacted], personal communication, 2017). In fact, the current technology plan was written before the implementation of the 1-to-1 iPad initiative and it was only designed as a three-year plan. The goal of this policy recommendation is to not only update the current technology plan, but also to call for the expansion of the 1-to-1 program into the middle school levels to encourage the continued development of Communication, Collaboration, Critical Thinking, Creativity, and Content Availability, also known as the 5 C's of Technology.

The 5 C's of Technology

The 5 C's of Technology is a living theoretical framework, meaning that it is continually being developed to meet the needs of different life applications such as marketing, language, and policy. This researcher found that it was Coyle (1999), who first developed the 4 C's framework. The 4 C's framework, per Coyle (1999, 2006), starts with content (cross curricular approaches, subject matter, themes etc.), then communication (language), next cognition (thinking), and finally culture (awareness of self and others). One of the goals of the 4 C's framework was to help unite different

learning theories (Coyle, 2008a). The graphic in figure 4, The 4 C's Framework, represents the interaction of content, cognition, communication with their influences on culture.

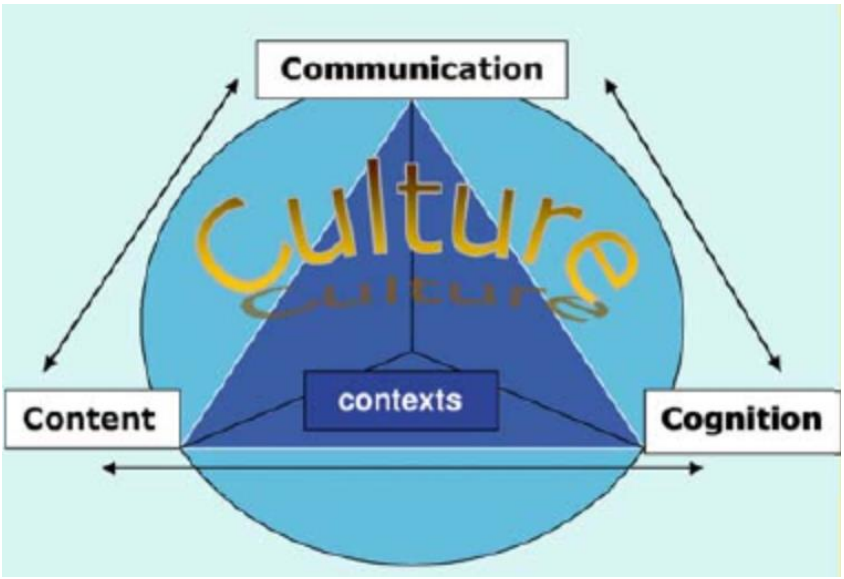


Figure 4. *The 4 C's Framework* (Coyle, 2008b).

The 5 C's standards have been around for more than 15 years (American Council on the Teaching of Foreign Languages2011). Educators who are involved in teaching a World Language are usually familiar with the American Council on the Teaching of Foreign Languages 5 C's standards: (a) communication (interpersonal communication, interpretive communication and presentational communication), (b) cultures (understanding culture practices to perspectives and understanding cultural products to perspectives), (c) connections (establishing connections and gaining information and differing perspectives), (d) comparisons (language and cultural connections), and (e) communities (institutional and global communities to promote lifelong learning (World-

readiness standards, 2011). What is unknown is if the 5 C's standards have influenced the 5 C's theoretical framework or vice versa.

Traditional teaching and traditional policy creation have generally been based upon either a teacher-centric pedagogy and a top down policy creation and delivery method. However, the 5 C's framework makes a shift away from the teacher-centric pedagogy and top down methods to a student centered and more of a bottom up policy creation method. The Five C's framework was developed to incorporate a students' perspective of learning and how they learn (Tom, 2015). The goal of the 5 C's framework is to engage students through the different perspectives of affective, cognitive and behavior to gain a deeper understanding (Tom, 2015). The 5 C's framework is based off the areas of Consistency, Collaboration, Cognition, Conception, and Creativity (Tom, 2015). Implementation of the 5 C's framework is based upon the accepted practice of using multiple methods to explain concepts (Tom, 2015) and for decision making. The graphic in figure 5, The 5 C's Framework, shows how the 5 C's work together to support learns and engage all through discussion, collaborative problem solving and task completion (Tom, 2015).

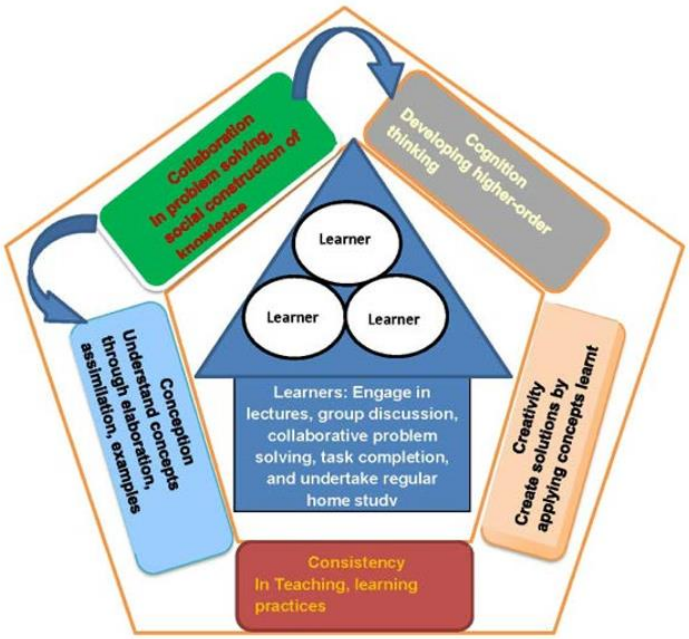


Figure 5. *The 5 C's Framework* (Tom, 2015, p. 25).

The 5 C's framework has also lead to the creation of other frameworks using the 5 C's name, such as the 5 C's of Technology.

[redacted] has used the 5 C's Framework of Technology to help it move forward with creating and implementing some policies. The curriculum director noted that before the implementation of using the 5 C's Technology Framework, the school district was only informally evaluating policies and were not putting technology goals to any sort of test to determine success or to test against a specific framework. There had been a small disconnect when it came to the previous technology department when it came to setting goals/standards and a missing piece of collaboration. However, changes were made in various ways when the implementation of the 5 C's Technology Framework started. Some professional development needs have changed and adapted to help meet the needs of incorporating the 1-to-1 iPad program. The school districts use of professional learning

communities (PLC's) has been one area of professional development that has been continually changing and adapting to help meet the needs of incorporating technology into the classroom. Vanderline and van Braak (2010) found that one way to bridge the gap that exists between policy recommendations and enactments with educational research and practice can be narrowed by PLC's.

The school district uses the 5 C's of Technology Framework to made decisions involving technology and other policies. For example, the school district will evaluate how the 5 C's of Technology are being used when deciding on a mobile learning device. District officials ask: How does the device meet communication standards? How does the device affect collaboration? How does the device develop critical thinking skills? How does the device help with creativity? How does the device improve content availability?

Laidlaw and O'Mara (2015) noted that as teachers are demonstrating how the iPad and other mobile learning devices are helping students make advancements in areas like digital literacy, not enough is being done by those who oversee writing policy's and mandates in connection to the continual changing skills and educational standards that are happening due to the advancements of technology in the classroom. This is a primary reason why GLCS should not only update the current technology policy, but look to expand the current 1-to-1 device program.

Policy Recommendation

Recommendation One

The first recommendation for future use of the technology implementation policy is a call for the expansion of the 1-to-1 iPad program into the lower grade levels. The

current program is only a 1-to-1 program for grades 9 through 12. The expansion of the 1-to-1 program to grades 6 through 8 and creating classroom sets of iPads for grades K-5, would align with GLCS's mission statement to "educate every child to achieve his/her full potential" ([redacted], 2017, p. 4). The expansion of the 1-to-1 policy would also incorporate using the 5 C's of Technology Framework into all grade levels and assist with the purpose of improving student achievement. If all grade levels had access to the 1-to-1 device policy, fewer assessments would be needed to assess how each school is performing when it comes to technology implementation. All schools would be unified in this regard.

Recommendation Two

The second recommendation for this policy recommendation is the call for more professional development for teachers when it comes to implementing technology in the classroom. The current plan has a technology work camp for teachers for one day before the start of the school year and then two half days during the school year. Technology changes happen constantly throughout a school year. As this researcher has discussed this issue with other teachers, the amount of time that is currently allotted to work with other teachers in the school district, many have said that there is not enough time to learn enough about all of the new apps or websites that are being used by other teachers. Others have mentioned that they wish they had time to practice what they have learned before trying to implement it in the classroom. Therefore, it is recommended to create two consecutive full days of professional development three times per year, one per each trimester. This would give teachers a chance to learn from other teachers about what

technology they are using in the classroom and then another day to create a lesson and practice it with other teachers to get some feedback before trying to implement it in the classroom.

Recommendation Three

The final recommendation is for the school district to include parents and other local stakeholders on the school improvement teams who are not teachers at each school. Currently, the high school does not have any parents who are not teachers on the school improvement team. As noted in the literature review of the project study, there can be a disconnect between schools and local stakeholders when it comes to policy creation and enactment. There are times when stakeholders do not fully understand what is expected of them in a policy and times when the school forgets to include stakeholder expectations when it comes to policies. By having parents and other community members, the school district will be able to continue to "create strong lasting partnerships with parents and guardians and believe that together we assure a high-quality education that encompasses academics, the arts, and athletics" ([redacted], 2016, para. 2).

Project Evaluation

The goal of this doctoral study was to identify the effects of a 1-to-1 iPad initiative program on grade 11 standardized test scores at a rural school in Michigan. The proposed policy recommendation purpose of updating the technology policy was to expand the 1-to-1 iPad program and provide mobile learning devices as another tool for teachers and students in order to implement research-based strategies and meet students' needs in order to improve standardized test scores. The evaluation of the technology

policy is best measured through outcome-based and goal-based approaches. In order to effectively assess the technology policy and its ability to meet the outcomes and goals, this researcher believes that through the use of quantitative measures, proper evaluation can be achieved.

This evaluation will be accomplished through the generation of assessment reports once the technology policy has fully been implemented. The curriculum director, with the assistance of technology coaches, teachers and the school improvement team, will design, develop and execute an assessment plan that uses the recommendations from this technology policy. By having the curriculum director design, develop and execute this assessment plan, it can be tailored to the needs of the school district. This plan should be quantitative in nature examining the results of pre/posttests, PSAT scores, and SAT and MSTEP scores of grade 11 students. The school district has already developed parent, student, and teacher surveys that have been given to high school parents, students, and teachers requesting their input on how iPads have effected student achievement. These surveys can be adapted to meet the needs of all schools within the district. The surveys should be modified to be quantitative in nature to provide accurate information to made data driven decisions. It should be a goal to generate an assessment report twice per year, one at the half-way point of the school year and one at the end of the school year.

Future Considerations

Additional research will need to be completed to further study how the 1-to-1 iPad implementation program affects student achievement on standardized tests and other areas in education. Currently, [redacted] seems has a pattern of evaluation policies and

contracts either every two years or four years. For this policy recommendation, it is recommended a period of 4 or more years in order to be able to collect enough data and analyze the data to be able make a data driven decision about the successfulness of this policy recommendation. This researcher recommends that the school board and administrative teams make decision and develop a policy to keep this policy recommendation for a period of four years or more. A longitudinal analysis of student achievement would give [redacted] a better big picture look at how the 1-to-1 device program has affected student achievement and the efficacy of the technology policy recommendation over time.

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Appendix B: Request for Access to Information

Brendan Howard <bhoward[redacted]>

Request for Access to Information
4 messages

Brendan Howard <bhoward[redacted]> Wed, Sep 14, 2016 at 3:47 PM
To: [redacted]>

Dear Mr. [redacted],

I am currently a doctoral candidate at Walden University pursuing a doctor of education in Administrator Leadership for Teaching and Learning. The research that I wish to conduct for my doctoral project study is entitled: The Effects of a 1-to-1 iPad Initiative Program on 11th Grade Standardized Test Scores. This project is being conducted under the supervision of Dr. Peter Kirkidis Powell and Dr. James Schiro.

I am hereby seeking your consent to have access to private data concerning 11th grade test scores from the school years 2006-2007 to 2015-2016 for the MEAP, MME and MSTEP tests with gender, race and socioeconomic status as identifiers.

If needed, I can provide you a copy of my approved project study proposal which contains information about the research that will be conducted.

Upon completion of this study, I would like to provide the school board and the school district a copy of the full research report.

Thank you for your time and consideration in this matter.

Yours Sincerely,

Brendan Howard

Walden University

[redacted] Thu, Sep 15, 2016 at 8:35 AM
To: Brendan Howard <bhoward@gulllakecs.org>

Brendan, you do have my permission and permission from the [redacted] district to utilize this data for your research. You may access the "Golden Package"

and our SAT data as you need it. Please feel free to ask me for any help if you need it. Also, please let me know if you need anything more formal than this email for your purposes.

[redacted]

Brendan Howard <bhoward[redacted] Thu, Sep 15, 2016 at 8:50 AM
To: [redacted]

Mr. [redacted],
Thank you very much for your permission. For right now this will be sufficient for the IRB and then I will eventually have a formal user data agreement form that will need to be signed. Thanks again.

[redacted]

[redacted] Thu, Sep 15, 2016 at 8:57 AM
To: Brendan Howard <bhoward[redacted]

Great

Appendix C: Data Use Agreement

DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of October 17, 2916 ("Effective Date"), is entered into by and between Brendan Howard ("Data Recipient") and XXXXX Community Schools ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in scholarship/research **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. Definitions. Due to the project's affiliation with Laureate, a USA-based company, unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the USA "HIPAA Regulations" and/or "FERPA Regulations" codified in the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.

3. Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** In preparing the LDS, Data Provider shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the project: All data within the "Golden Package" concerning 11th grade test scores from the school years 2006-2007 to 2015-2016 for the MEAP, MME and MSTEP tests with gender, race and socioeconomic status as identifiers. The areas of Mathematics, Science and Social Studies are the specific tests that data will need to be accessed and gathered in order to analyze.

4. Responsibilities of Data Recipient. Data Recipient agrees to:

    a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

    b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

    c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

    d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS **for the present project's activities only.**

6. Term and Termination.

a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER **DATA RECIPIENT**

Signed: [redacted] Signed: Brendan Howard

Print Name: [redacted] Print Name: Brendan Howard

Print Title: Principal Print Title: Researcher - Data Recipient. Walden University