THE EFFECT OF DIGITAL TABLETS’ APPLICATIONS ON READING ACHIEVEMENT
OF FIRST GRADERS IN TWO PRIVATE SCHOOLS

by
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Liberty University

A Dissertation Presented in Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

Liberty University
2018
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2018

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ABSTRACT

The focus of this research study was to determine the impact of integrating tablets into reading instruction in four first-grade classrooms in two private elementary schools in the southeastern United States. This is important because many schools are utilizing tablets in the instructional process and this seeks to determine if there is an academic value to their use in the classroom. The study was based on the cognitive theory of multimedia learning by Richard Mayer. The researcher sought to identify any possible differences in standardized test scores of students who used tablet applications during reading instruction versus students who did not. The researcher utilized the Children’s Progress Academic Assessment as the standardized testing tool. The researcher used a quasi-experimental research approach with nonequivalent control groups. A pretest/posttest design was used to examine the effectiveness of interactive reading and phonics applications when used for literacy instruction. This approach was used to compare groups and/or to measure change resulting from an experimental treatment in which one group received treatment and a control group received no treatment. Two classes received literacy instruction with specific applications delivered via a tablet while the other two received instruction in a traditional, guided reading approach. Interaction with the apps supported various components of Mayer’s theory. The results of the pretest/posttest indicated that there was a significant difference between the classes that used tablet apps during instruction when compared to the classes that did not. This led the researcher to conclude that there is indeed a value for use of tablet apps in the classroom. It is recommended that additional studies with larger sample sizes and including different subjects be conducted for further research.

Keywords: Tablet, app, cognitive, literacy instruction, standardized test
Acknowledgements

I would like to communicate my sincere gratitude to those who played a vital role in the completion of my research including my chair, Dr. Constance Pearson, professors, peers, fellow classmates, the incredible faculty that I work with as well as interview participants.

I am also thankful to my wife Katrina and my children Andrew, Aaron, and Abigail. Their support has been a source of constant motivation and guidance throughout the completion of this journey. There have been many times when they were doing something fun and I was chained to the computer working when I would have rather been with them. Thank you for understanding and supporting me in this process.
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American Association of University Women (AAUW)

Applications (apps)

Children’s Progress of Academic Assessment (CPAA)

Cognitive Theory of Multimedia Learning (CTML)
CHAPTER ONE: INTRODUCTION

Overview

Technology integration into the educational process has been ongoing for decades. This chapter examines how tablets, like the iPad by Apple, Amazon Fire, Samsung Galaxy, and many others, have been integrated into classrooms and are being utilized for instruction. It specifically examines how the tablet is affecting classroom instruction, especially reading instruction, and student achievement in early elementary classrooms.

Background

There have been many articles written about how U.S. students compare to their international counterparts. U.S. students have consistently scored below average in math, reading and science on the Program for International Student Assessment (PISA) exams since 2000 (Layton, 2013). These tests compare American students with students from 64 other countries from around the world. Because of this, there has been a complete overhaul of the American educational system with the goal of improving the standing of American students.

Flewitt (2013), Hutchison, Beschorner and Schmidt-Crawford (2012), and Issacson (2014) have all written about the need for improving early childhood literacy, if reading scores are to be positively affected. Flewitt suggested that we must begin to think differently in our approach to teaching early literacy if we expect to see a difference in the outcomes. Because of the need to improve childhood literacy, over the last six years, millions of tablets have been introduced into classrooms all over America. The use of the tablet during literacy instruction could be the fresh approach (Flewitt, 2013). In this study the researcher examined the use of tablets in the acquisition of reading skills of first-grade students in four elementary classrooms. The purpose was to help determine if there was an academic benefit of using tablets, like the
iPad, specifically, in early reading instruction. In this chapter the researcher provides background on the relatively recent explosion of tablet devices being introduced and implemented in educational classrooms across the country and even in a broader sense, in classrooms all over the world. It also discusses the ongoing struggle for teachers to raise the test scores of their students in both math and reading.

The iPad was the first tablet to be introduced to consumers and subsequently is the most widely used tablet in the academic world (Sterling, 2013). A tablet is defined as a general-purpose computer contained in a touch screen panel that is operated and interacted primarily with the finger or a stylus (Brandrick, 2010). Since the launch of the iPad in April of 2010, there have been continual improvements and updates each year. Additionally, other manufacturers like Samsung, Google, Amazon, and others have introduced their own tablets that directly compete with the iPad. The introduction of tablet computers along with smart phone devices that also use the same touch-screen technology have permeated society today. Apple CEO Steve Jobs in 2010 predicted that tablets would overtake sales of the personal computer (Anthony, 2014). In 2015, we witnessed Job’s bold prediction, which seemed unfathomable at the time because the tablet did not even exist, come true. In the last year, tablet sales totaled 320 million units compared to 316 million sales of the personal computer that consists of desktop and laptop units (Anthony, 2014). Since 2010, the tablet market has witnessed an explosive growth across the globe. These statistics show that the tablet has become a device that students are familiar with because they have personal access to the tablet. Henderson and Yeow (2012) believe that the successful integration of the tablet in education can be linked to the students’ familiarity with the device before they attend school. As the statistics show, millions of families are using tablets, which means that many children are familiar with the functionality of the tablet.
The Teachers College at Columbia University developed the Reading and Writing Project to address the ongoing goal of raising the literacy rates of students in the United States. The Reading and Writing Project showed that children need to read a lot of texts with high levels of comprehension (Allington, McCuiston, & Billen, 2014). We know that students are using tablets in the classroom (Sterling, 2013), and Carr and Prater (2013) showed that students have greater ability to focus for longer amounts of time when utilizing tablets during reading instruction. The goal of this study is to determine whether first-grade students who use tablet apps, Aesop’s Quest and Sight Words Learning Games and Fish Cards, show greater reading gains than first-grade students not taught with these apps.

The scope of this study may be wide in terms of the applicability of its findings, since the research focused on the use of technology in classrooms, and more specifically, the use of technology as a tool for teaching reading. Therefore, the findings of the study may have a grand scope as the researcher provides data about a crucial topic in our contemporary educational system. The goal of this research study was to examine the impact of electronic tablets on early reading performance. The study was based on the work of Dr. Richard Mayer (2005a) and his development of the cognitive theory of multimedia learning. Mayer’s theory of multimedia learning is a cognitive theory that says multimedia learning occurs when students build mental representations from words and pictures with which they interact. Mayer’s (2005a) theory contains the following components: (a) a dual-channel structure of visual and auditory channels, (b) limited processing capacity in memory, (c) three memory stores (sensory, working, long-term), (d) five cognitive processes of selecting, organizing, and integrating (selecting words, selecting images, organizing work, organizing images, and integrating new knowledge with prior knowledge), and theory-grounded and evidence-based multimedia instructional methods.
Mayer’s work is also supported by such theories as Baddeley and Hitch’s (1974) model of working memory theory, Paivio’s (1986) dual coding theory, and Sweller’s (1988) theory of cognitive load (Sorden, 2013). In this research, students interacted with two related computer applications (apps) in a manner that may support various components of Mayer’s theory. The two apps were Aesop’s Quest, and Sight Words Learning Games & Flash Cards. These apps were designed to help develop and improve reading skills.

The study may be significant in exploring a crucial topic in the theoretical context of previously conducted literature and research. The purpose of this quasi-experimental, pretest/posttest control group study was to test Mayer’s theory of multimedia learning as it relates to literacy instruction for first-grade students. In this study, the researcher used the instructional model, either with or without the use of Aesop’s Quest, and Sight Words Learning Games and Flash Cards, as the independent variable that was tracked as a result of the various teaching styles (with tablets versus without tablets). It is essential to note that the study was based on measured outcomes of standardized test scores of the first-grade students.

The overwhelming data concerning the sheer number of tablets currently being utilized in classrooms (Sterling, 2013) would suggest that technological innovations are impacting our lives in unprecedented ways, both in the realm of daily life and in academia. For this reason, technological research in these areas has become increasingly crucial. In most developed countries, classroom technology has become as common as that of the chalkboard of the past. Keypads have replaced pencils and pens for integrating technological innovation in the learning process (Nickerson & Zodhiates, 2013). Buckenmeyer (2010) stated that implementing technology in the learning process triggers major changes in the classroom activities that are most likely to positively affect the performance of the students. Many researchers have affirmed
the significance of computer technology in providing better learning opportunities for students. Mansbach (2015) found that effective use of technology in the learning environment can have a positive impact on both the learning ability and educational performance of students. Those effects centered on student engagement and a better connection with the subject content in the lesson.

This study applied to tablets, in general, but it was also important to understand that the iPad tablet controls 82% of the market share worldwide and over 90% of the market share of education (Sterling, 2013) and is being adopted in all facets of education. Thus, the classrooms used for the study used iPads. It is important to note, however, that the type of tablet was not viewed as significant as was the interactive nature of tablet. The question at hand was whether the use of tablets during instruction was making a difference in student achievement (Malone, 2011).

**Problem Statement**

Since 1989, the United States Department of Education has focused on the enhancement of learning student outcomes. They have invested billions of dollars to ensure the effective and successful integration of technological innovation in the educational system (Anthony, 2014). The assumption that the integration of technological learning activities in schools prepares students for the challenges of the contemporary technological world serves as the rationale for this investment (Schulstad, 2013). Furthermore, Isaacson (2014) asserted that the use of technological devices like tablets is exceptionally significant in facilitating teachers and students in the overall learning process. At the same time, effective and successful integration of the technology in schools provides a positive effect in terms of better learning outcomes and educational performance of students (Burden, Hopkins, Male, Martin, & Trala, 2012). Because
the tablet is such a relatively new learning tool, few research studies have shown the usefulness of the iPad in the classroom.

Researchers have observed that the integration of technology in the instructional process enhances the quality of learning (Milman, Carlson-Bancroft, & Boogart, 2015). According to Wilson and Friedrich (2013), increased implementation of laptops can enhance overall student comprehension, increase student engagement in the learning process, and assist in preparation for future classes. In all facets of education, educators are integrating tablets into the learning environment. The problem of this research study is that there are limited data that show if usage of tablets in first-grade reading instruction increases student learning. There appears to be a gap in the literature regarding the impact of tablet usage on students’ early reading achievement. Researchers have examined the benefits of tablets in special education (McClanahan, Williams, Kennedy, & Tate, 2012), high school level math (Hu, 2011), and on high school exit tests (Harmon, 2012) but there are little data that show benefits of tablet usage in early elementary reading instruction. The data that are available seem to suggest that tablets can serve as tools for reading intervention that helps to individualize and differentiate instruction, and, provide a consistent delivery of instruction that also increases the motivation of students (Musti-Rao, Cartledge, Bennett, & Council, 2014). The problem is whether the use of tablets, and specifically, the apps of Aesop’s Quest and Sight Words Learning Games and Flash Cards impacts the reading achievement of first-grade students.

**Purpose Statement**

The purpose of this quasi-experimental nonequivalent control group, pretest/posttest design study, was to examine whether the use of two tablet apps, Aesop’s Quest and Sight Words Learning Games and Flash Cards, positively affects early reading instruction. For the purposes
of this study, the researcher used two tablet apps that focused on reading comprehension of first graders. The apps are interactive in nature, meaning that the students must navigate through a series of questions, puzzles, flash cards, and other items showing that they mastered the information before them. The apps are also intuitive in nature, meaning that if a student does not answer a question correctly, more questions of the same type are asked before moving on to a more difficult question or concept.

The independent variable of the study was the instruction of reading in two first-grade classrooms using tablet apps (experimental group) and the instruction of reading in two first-grade classrooms using traditional guided reading (control group). The students who participated in this study were all enrolled at two independent schools in a southeastern city. One of the schools was faith-based and the second was a non-sectarian private school. The dependent variable was the composite scores of the literacy section of the Children’s Progress Academic Assessment (CPAA).

**Significance of Study**

The study played an important role in exploring the data regarding a perplexing issue of the United States educational system. The use of tablets and other interactive technologies is the most recent trend in the classroom. Recent research indicated that over 80% of American schools either implemented tablets or was in the process of implementing this device (Sterling, 2013).

The need exists for additional research to determine the tablet’s impact on student learning, especially in early elementary education. A study that examined the effectiveness of tablets was completed by a group of researchers in Scotland in 2012 (Burden et al., 2012). Burden et al. (2012) looked at the positive effects of tablets on education in a one-to-one
environment, that is, one device for every student. Their study provided much insight into how schools should be using tablets. Because the scope of the study was so large, there were several key findings that related to the proposed study. Many of the findings centered directly on student learning. First, teachers noted that tablets promoted more collaboration between them and students. Second, teachers saw many students coaching and teaching their peers without the intervention of the class teacher. Third, software and apps supported these processes and resultant changes in pedagogy. Fourth, the use of tablets enabled more students to express their creativity, and engage in peer assessment in a group critique. Fifth, teachers felt that the functionality of these devices better-supported students of all abilities. Sixth, students reported that within a month of the pilot starting, they noticed, from their perspective, that the quality of the teaching seemed to have improved. Lastly, teachers reported that the tablet allowed them to develop and extend homework and provide better feedback to the students about their learning (Burden et al., 2012).

Although many schools are implementing tablets into their academic programs, the associated costs with a one-to-one program have prohibited this approach from being widely adopted in U.S. schools. To decrease the expenses of tablet usage, many schools are purchasing smaller number of tablets or classroom sets, and, using them in classroom settings such as centers for math and literacy instruction (Pilgrim, Bledsoe, & Reily, 2012), but data showing their actual effect on student learning is still not available. Harmon (2012) found through an examination of state compiled statistics in Ohio that students with tablet access in the year leading up to the Ohio Graduation Test had a 6% greater chance of passing the reading portion of the test when compared with students who did not have tablet access. However, limited research indicated the implementation of tablets in early education settings had a positive influence on
student learning. The researcher sought to determine if there was a connection between the test scores of first-grade students who used tablet technology and those who did not. Data was collected from both groups of students who participated, allowing the researcher to compare the performance of the students who were using the tablets during reading instruction with those who did not use tablets during reading instruction.

**Research Questions**

The research questions for the study are defined as follows:

**RQ1:** Is there a difference among the composite literacy scores (CPAA) of first-grade students who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

**RQ2:** Is there a difference among the composite literacy scores (CPAA) of first-grade students, based on gender, who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

**Definitions**

For the purpose of this study, several key terms will be used to discuss the process and outcomes of the research.

1. **App** is a type of application software designed to run on a mobile device, such as a smartphone or tablet and allows interaction with a specific program. For the purpose of this study, the app will be a literacy-based app that focuses on phonemic instruction (Falloon, 2013).

2. **Cognitive** refers to perceiving and knowing (Mayer, 2005a).
3. *Children’s Progress Academic Assessment (CPAA)* is a computer adaptive assessment of core early literacy and mathematics skills for pre-k – Grade 3 students (Northwest Evaluation Association, 2012).

4. *Encoding* takes place when knowledge constructed in working memory is transferred to long-term memory (Mayer, 2008b).

5. *Literacy instruction* refers to the act of teaching students to read using a variety of learning techniques (Gabriel, 2013).

6. *Multimedia* is generally defined as the combination of words (e.g. printed or spoken text) and pictures (e.g. static graphics, graphs, photos, maps, or dynamic graphics including animation or video, Mayer, 2008a).

7. *Standardized test* is a test for which procedures have been developed to ensure consistency in administration and scoring across all testing situations (Gall, Gall, & Borg, 2007). The CPAA will be used as the standardized testing instrument for the study (Northwest Evaluation Association, 2012).

8. *Tablet* refers to an interactive computer that is in the form of a tablet. Users interact with the tablet by using their fingers or stylus. The most popular tablets are iPads and Kindles. There are various other types as well (Burden et al., 2012).
CHAPTER TWO: LITERATURE REVIEW

Overview

This literature review examines the role that the cognitive theory of multimedia learning plays in early elementary reading instruction that uses interactive tablet apps. The apps are delivered to students on tablet devices. Since its inception in 2010, the iPad has become the dominant tablet in education (Malone, 2011). Although there are other types of tablets on the market, the iPad has an 82% market share, and is widely used in all facets of education, including pre-k, elementary, middle/high and college (Sterling, 2013). The author understands that there are other types of tablets being used, but for this study, the researcher used the iPad as it is most widely used, not only locally, but also globally. This research focuses on how related apps uploaded on tablets are affecting the reading skills of emerging readers who are using them. The researcher also reviews the process by which students utilize the principles of the cognitive theory of multimedia when developing their reading skills.

Theoretical Framework

Over the last century, there have been many new technologies introduced and identified as the next great thing to revolutionize education. For decades we have witnessed many of these technologies integrated into education, and often cycle out with little change in the educational continuum. Mayer (2005a) concluded that the cognitive theory of multimedia learning establishes that students are better able to transfer their learning when utilizing multimodal instruction. According to Mayer (2005b), students learn better with multimedia, animation, and narration when compared to only animation and the traditional text-based materials typically found on paper. The result of Mayer’s study concluded that students understand the meaning and the concepts being presented with less effort when using multimedia.
Mayer (1999) argued that the cognitive theory of multimedia learning (CTML) supports the way that the human brain learns or acquires new knowledge. Mayer (2005a) asserted that students have a deeper knowledge from the interaction with both words and pictures than merely by words or text alone. An interaction referred to as the multimedia principle. Multimedia researchers like Mayer (2005a), Baddeley and Hitch (1974), Paivio (1986), and Sweller (1988), define multimedia simply as the combination of pictures and text and believe that learning happens when students build mental representations from those words and pictures. It is important to understand that words can be spoken or written while the pictures can come in many forms including illustrations, video, photos, animation, or digital pictures (Mayer, 2005b). When teachers incorporate a multimedia instructional design, they are attempting to use cognitive research to combine words and pictures in ways that maximize the effectiveness of the instruction. Mayer (2009) also believes that a key component to his theory is that the student becomes an active participant in the learning process, which helps as they construct new knowledge.

The theoretical foundation of the cognitive theory of multimedia learning draws from several other cognitive theories including Baddeley and Hitch’s (1974) model of working memory, Paivio’s (1986) dual coding theory, and Sweller’s (1988) theory of cognitive load. Baddeley proposed a three-part working memory model as a direct alternative to the short-term memory store proposed by Atkinson and Shiffrin’s (1968) multi-store memory model. Paivio’s theory suggested that the formation of mental images aids in the learning process; and Sweller’s theory derived from the premise that learning happens best under conditions aligned with human cognitive architecture. Sweller’s theory suggested that schemas, or combinations of elements, are the cognitive structures that develop a student’s knowledge base (Sorden, 2005). Because
CTML is a cognitive theory of learning, it belongs under the larger framework of cognitive science as well as the information-processing model of cognition (Sorden, 2013). While examining the cognitive theory of multimedia learning, it is important to understand that the information processing model which serves as a basis, suggests that several information stores (memory) are governed by processes that convert stimuli like pictures and words to information (Moore, Burton, & Myers, 2004). The cognitive theory of multimedia learning centers on the concept that students can build deeper connections between both words and pictures than simply by words or pictures alone (Mayer, 2009). The cognitive theory of multimedia learning encourages students to construct mental representations from the material that has been presented by the teacher in the lesson. Mayer (2009) suggested that when students can make sense of the presented content as active participants, they then construct new knowledge.

Mayer (2005a) also stated that the cognitive theory of multimedia learning is based upon three assumptions:

- Dual-channel assumption – this is the assumption that the working memory in students has both auditory and visual channels and is based in large part on Baddeley and Hitch’s (1974) theory of working memory.

- Limited capacity assumption- this states that each subsystem of working memory has a limited capacity.

- Active processing assumption – this assumption suggests students build knowledge in more meaningful ways when they pay attention to the relevant material and organize it into a coherent mental structure, and integrate it with prior knowledge (Mayer, 1999).
Mayer’s (2005a) cognitive theory of multimedia learning is grounded in a model that divides the memory into the three different types: sensory memory, working memory, and long-term memory. Australian researcher John Sweller (1988) provided a good working definition of each memory structure: Sensory memory is the cognitive structure that allows us to recognize new information, working memory is the cognitive structure in which we actively and consciously process information, and long-term memory is the cognitive structure that stores our knowledge base. We are only conscious of information in our long-term memory after the transfer to working memory. This memory structure is important to Mayer’s (2005a) theory because he stated that both visual and auditory memory are parts of sensory memory and these specific types of sensory memory are used in the theory of multimedia learning. Sweller maintained that sensory memory has sensory registers or channels that help students view work in dual processes like eye-to-visual or ear-to-auditory learning. This makes it possible for the introduction of information into working memory, such as reading with fingers through Braille, or a deaf person being able to hear by reading lips, or even a student utilizing their fingers to navigate apps on a tablet.

Working memory selects information from sensory memory for processing and integration and allows a student to complete a task. Sensory memory holds an exact copy of what was presented for less than .25 of a second, while working memory holds a processed version of the image for generally less than 30 seconds and can only process a few pieces of material at any one time (Mayer, 2008a). Mayer (1999) suggested that long-term memory holds the entire store of a person’s knowledge for an indefinite amount of time. Once an item is processed into long-term memory, it is not forgotten. There are five forms of representation of words and pictures that occur as information is processed by memory and each one of them
represent a particular stage of processing in the three-memory stores model of the cognitive theory of multimedia learning (Mayer, 2005a). The first form is easily defined as the words and pictures in the multimedia presentation itself. The second form is the acoustic representation (sounds) and the iconic representation (images) in the sensory memory store. The third form is the sounds and images stored in working memory. The fourth form of representation is the verbal and pictorial models which are also found in the working memory. The fifth form is prior knowledge, or schemata, which are stored in long-term memory. Schemata are defined as cognitive constructs that organize information for storage in long-term memory. They also can organize simpler elements, and as learning takes place, these schemas are developed and learned and then are transferred from controlled to automatic processing. This process frees up capacity in the working memory for other functions to then occur (Mayer, 2005a).

Mayer (2005a) also proposed that meaningful learning from words and pictures happens as the student enlists in five different cognitive processes:

1. relevant words are selected for processing in verbal working memory.
2. relevant images are selected for processing in visual working memory.
3. selected words are organized into a verbal model.
4. selected images are organized into a pictorial model.
5. verbal and pictorial representations are integrated with each other and with prior knowledge.

These five processes in a student’s working memory help determine which information is attended to or selected, which knowledge is retrieved from long-term memory and integrated with new information to build new knowledge, and finally, which pieces of new knowledge transfer to long-term memory (Mayer, 2008b). This transfer process is called encoding. Dwyer
and Dwyer (2006) maintained that proper encoding needs rehearsal time. Because of this, teachers must allow an adequate amount of time after teaching the multimedia lesson, or it can be ineffective. This need for rehearsal time is also why learner control is important when using animation or multimedia. The student can control the speed of the content and can also go back and either watch or attempt again depending on the multimedia being used.

It is also important to note that Mayer (2009) distinguished meaningful learning from no learning or rote learning and stated that active learning where the student constructs knowledge can define meaningful learning. The student then demonstrates this learning by applying presented information in new situations. They also perform better on a problem-solving transfer test when they learn with both pictures and words. This theory is instrumental in this study based on Mayer’s (2009) assertion that students are better able to transfer their learning when utilizing multimodal instruction. The use of tablets and educational apps falls under the description of Mayer’s (2008b) multimodal instruction.

**Related Literature**

In this section, the researcher attempted to include the significant literature regarding the impact of successful integration of interactive technology, such as tablets, in reading instruction. The goal was to include information from previously conducted studies that illustrated the impact of technological innovation in education systems from the perspectives of different researchers. A simple online search revealed that the tablet has influenced all levels of education and yielded thousands of articles dealing with many different facets of the tablet in the educational process. For this literature review, the researcher categorized articles into the following crucial areas of focus that pertained to the purpose of this study: types of technology
used in schools, impact of technology on education, pedagogical approaches, negative aspects of using digital tablets, and differences between boys and girls in technology interaction.

**Types of Technology Used in Schools**

It is very easy to think of technology integration as a new phenomenon when those in education have been talking about technology integration for well over forty years. McKenney, Kali, Markauskaite, and Voogt (2015) suggested that school leaders must be the early adopters of technology because they are planning and incorporating classroom lessons and activities that utilize technology. It was with this mindset that schools implemented new tools that would assist students in learning. Technology is not new to the learning environment. The introduction of several technological tools beginning in the 1950s helped the educational process. In today’s world, items like the overhead projector, scantron, videotapes, calculator, and photocopier do not necessarily equate with technology, but at the time, they were all valuable educational tools that allowed schools to implement what were new technologies in the educational process (Schulstad, 2013). Personal computers were originally developed in the 1930s, but we are familiar with the modern computers introduced in the 1980s. The first portable computer, introduced by IBM in 1981, cost $1,795 and weighed almost 25 pounds. Technology burst onto the mainstream that year and Time magazine named The Computer as its “Man of the Year” in 1982 and declared “the foundation of immediate learning capabilities has been laid. It is the end result of a technological revolution that has been in the making for four decades and is now, quite literally, hitting home” (Schulstad, 2013). We have also seen the introduction of interactive boards like Promethean and SMART boards into classrooms over the last ten years. In the spring of 2010, Apple released the first generation of the iPad tablet. The device followed the same design template as their popular iPhone first released in 2007. The tablet’s significance in education
was different from other types of educational technology in that it was widely available for individual or private use away from school. It also had a significant advantage because it operated in the same format as the iPhone. Because the iPhone was such a commercial success, many students were already familiar with how the iPad functioned and were not required to acquire new knowledge. Another benefit of this was that many students and teachers were using these devices away from school (Oliver, 2013). The research presented here focused on touch-sensitive tablets like the iPad. There are other tablets on the market as well that are comparable to the iPad, including tablets manufactured by Samsung, Microsoft, Amazon, and others. The portability of the tablet allows interaction between students and teachers in a way that has not been seen in education before. Teachers can now use various online tools like Moodle, Blackboard, blogs, RenWeb and so forth, to share information and projects with students. Students can also keep their own blogs, online portfolios, and so forth, to share with teachers and others.

Quillen (2011) reported that educators have noticed that students’ focus and interest has risen with the introduction of iPads in the classroom. Students seem to be more engaged in the learning process when utilizing the iPad during instruction (Quillen, 2011). Teachers have reported that students in middle schools and later are often using the iPad for note-taking and see it is an efficient substitute for pen and paper (Carr & Prater, 2013). There are various apps for note-taking like Evernote, Word, iNote, and others. Note-taking can occur by typing on the built-in keyboard, attaching a traditional keyboard, or even using a stylus, which resembles the conventional pen and paper note taking. Depending on the circumstance, the desired method of taking notes may differ because of variation in approaches and the functionality, as well as the availability (Carr & Prater, 2013).
Additionally, Murray and Olcese (2011) pointed out that text entry and editing are easy with the selection of font type and size, as well as the additional features like indentation, bold, italic, bulleting, and auto-indentation can be made quickly. Existing notes can also be edited, added to, or deleted very easily as well. Though note-taking via the iPad appears to be efficient, to do it quickly requires practice. There are a few primary thoughts to consider when taking notes on an iPad. On the iPad, the organization of notes occurs by date and in the same location or file, rather than disorganized like in conventional pen paper note taking method. Students can separate notes by subject, dates, and titles and can easily find the information when needed. Another consideration is audio or video recording and playback. AudioNote is an example of an app that allows the student to record lessons taught. Users draw on the paper and integrate audio into the pen strokes. When played back, the words become highlighted at the point they were written during the audio. This app helps students in searching the notes at the time of the lecture. This app lacks some features such as bullets, only one font and size are available, and the user cannot organize notes in folders. Positives include that notes are easily exported to PDF, and iTunes facilitates backup. Murray and Olcese concluded that this focus possibly elicits a sense of ownership that students feel when using a tablet. They are in control of what apps they use, and the time spent using those apps in the education process.

**Impact of Technology on Education**

As the use of tablets has permeated our schools, educators are still discovering their impact. It is interesting to note that the trend of using tablets covers all levels of education (Clark & Luckin, 2013). They are used in preschools, elementary, middle, and high school classrooms as well as in higher education. Both undergraduate and graduate levels of higher education use them. An example of an impact experienced because of the implementation of
Tablets is the use of various types of alerts from these apps or software that allows teachers to receive alerts when assignments are completed and posted online. The assignments are delivered to teachers on their online location rather than on their desks, enabling them to provide immediate feedback from anywhere there is an Internet connection (Clark & Luckin, 2013).

When the subject of reading is introduced, the first image that used to come to mind involved the idea of a traditional paper book. However, with the successful integration of the tablet, this concept has been forever altered. There are many varieties of mediums available for reading instruction, including apps found on tablets that focus on the development of reading comprehension skills. It is also essential to note that the tablet can also store the content like e-books that allows students to utilize it for reading (Sheppard, 2011). Books are now interactive in nature and come alive to the reader. Where traditionally the reader’s only interaction with a book was turning the page, tablets allow the reader to interact with the text in numerous ways (Verenikina & Kervin, 2011). Embedding videos into the text as well as additional information like glossary terms, charts, graphs, and so on, that are always updated will not lose their usefulness because they are out-of-date. This updated information is a reason that school districts across the country are now focusing on successfully integrating iPads into their curriculum. The desired result of this integration is to enhance the overall scope and the quality of learning in all grade levels and subjects including reading instruction. To construct effective online learning, teaching requires an in-depth understanding of the system and the processes through which students will learn (Cviko, McKenney, & Voogt, 2014). Branch and Kopcha (2014) asserted that learning also includes components like delivery of courses, online assessment, student and teacher two-way communication, the usage of Internet resources, and the implementation of apps.
According to Gabriel (2013), it is crucial for teachers to understand the significance of using tablets and other interactive technological media in reading instruction. Teachers need to have command over such media to provide the maximum learning for students, as well as to ensure the positive and effective use of the technology, such as iPads, in the learning activities of the class. The utilization of tablets for reading instruction is not only beneficial for the curriculum activities but also can help to develop critical thinking skills in our students (Flewitt, 2013).

Flewitt (2013) also reported in his research that the use of iPads in elementary classes could increase children’s motivation and concentration, and offers rich opportunities for early literacy as well as collaborative interaction and independent learning. Both collaborative interaction and independent learning are goals of most elementary classrooms and are also components of Bloom’s (1956) Taxonomy of Educational Objectives. According to Musti-Rao et al. (2014), when technology, specifically tablets, is used as a supplemental instructional tool in the classroom during reading instruction there are many benefits. The benefits include an active student response, an easier way to individualize and differentiate instruction, consistent delivery of instruction, increased student motivation to learn, and another resource for classroom management. These benefits are only realized when a teacher successfully leverages the tablet during classroom instruction (Musti-Rao et al., 2014).

Bloom’s (1956) objectives are used by teachers as a resource or guide to help ensure students are developing higher-level thinking skills. The taxonomy is a part of many teacher education programs in colleges. Teachers are trained to create lessons in which students can show mastery of the content presented at multiple levels. Students with a higher level of
understanding and critical thinking may interact with a topic in a way that shows deeper understanding. The taxonomy has six stages that build or scaffold from the preceding domain:

- **Knowledge** – This is often described as remembering basic facts. An example would be a small child memorizing the ABCs.

- **Comprehension** – This differs from knowledge in that the student moves from just remembering facts to understanding the facts presented. An example would be a student writing in their own words the steps for solving a math problem.

- **Application** – This is the process of applying the learned material or skill. An example of this stage would be a child constructing a sentence with each part of speech that they had learned about in a language arts class.

- **Analysis** – Students are able to separate material or concepts into smaller parts so that it may be better understood. Analysis is often described by the student exhibiting the ability of being able to take something (whether concrete or abstract) apart. An example of this would be a student troubleshooting why a computer is not functioning properly.

- **Synthesis** – This domain is often defined by using the term evaluating. In the synthesis domain students can make judgments about the value of ideas or materials being presented. An example of this would be a student being able to explain and justify why his answer to a problem is the best solution.

- **Evaluation** – This is the top domain and shows the most critical thinking ability or skill. In this domain, the student becomes the creator. A student can take content and create their own ideas and theories. An example of this domain would be a student...
taking a problem and revising the process to solve the problem and improving the outcome while working towards the solution (Bloom, 1956).

The taxonomy is important in technology because the goal of educators should be to develop students who can think critically and become independent in solving problems. Any technology that does not provide students with these opportunities will have problems with widespread adoption and ultimately, success (Sadun, Grothaus, & Sande, 2011).

Conducting more research aids educators who are looking for returns on the investment of time and money associated with learning a new way to deliver content. Harmon (2012) discovered by reviewing state-compiled data that 6% more of the students who worked with iPads for one year prior to taking the Ohio Graduation Test passed. When Harmon examined the writing statistics of the tests, he found that 8% more of students that used the iPad for one year prior to testing passed the writing section (Harmon, 2012). Studies like this are providing researchers with data that show there is an academic benefit to adopting the tablet as a teaching tool in the classroom.

Multiple studies have shown a common benefit of utilizing tablets for instruction. Initial studies have revealed the tablet can have a positive learning effect in a variety of contexts: in reading and writing (Harmon, 2012; McClanahan et al., 2012), in collaboration and engagement (Henderson & Yeow, 2012; Milman et al., 2014), and in motivation to learn (Kinash, Brand, & Mathew, 2012). Additionally, both Flewitt (2013) and Burden et al. (2012) have shown tablets are providing the opportunity for interaction with instructional text for a greater amount of time than possible with conventional instructional tools. Word processing is a helpful tool in reading instruction, as writing builds upon reading instruction. Multimedia software is useful for reading instruction and appears to benefit students more when compared to conventional methods.
Multimedia speech can be very helpful in an instructional context, and a National Reading Panel (NRP, 2000) report showed a need for greater promotion. The tablet also has a motivational advantage in reading instruction because students are eager to interact with it in a learning environment (Falloon, 2013). Hypertext can also play a vital role in reading instruction. If a student is reading a passage and is facing difficulty in understanding, they can click the hypertext and get more information on it. Because of this, the use of hypertext is increasing and is providing additional help in the reading instruction process.

Until recently, there was not an easy way to integrate technology into literacy instruction. With the innovation of tablets in technology, reading and writing systems have evolved, and teachers are now documenting success stories from students (Henderson & Yeow, 2012). The integration of the tablet as a meaningful piece of technology into reading instruction has addressed some of the deficiencies that were present before the integration of the tablet. Henderson and Yeow (2012) reported that examples of common problems with the basic computer were the inability of the computer to understand oral reading and judging its accuracy, and the inability to accept free responses to comprehension questions. The result of this was a heavy reliance on multiple-choice only formats. With the infusion of the tablet into the learning environment, apps can recognize speech, and thus are able to recognize and help develop correct phonemic skills (Carr & Prater, 2013). These developments have spurred the development of many new apps that can now assist in instruction and reading comprehension (Hutchison et al., 2012). Many of the apps are intuitive and are now capable of tailoring specific questions to the current level of the student using the device (Hutchison et al. 2012). Many apps are now available for tablets that incorporate these components into instruction. The apps included in this research also have these components built into them.
Technology has become helpful in language acquisition also. Flewitt (2013) concluded that students learning in multimedia and hypertext environments (which he defines as using an interactive tablet) develop in their language arts skills faster when compared to the students who are learning in a traditional environment.

Yang and Wu (2012) concluded that technology could be used to improve linguistic comprehension in many ways. It enhances accessibility through digital multimedia. Multimedia presentations including videos, images, sound, and text that create stronger a memory. Additionally, technology allows instant playback allowing students to access different sections of the instructional material quickly and effortlessly when compared to a text-book. The Internet provides students with authentic materials and literature for linguistic and culturally relevant materials to students. Moreover, it also provides authentic and instant communication opportunities like chat rooms, digital classrooms, texting, and allows for communication between the student and teacher that can provide immediate assistance in reading instruction.

Analysis by Carmichael and Farrell (2012) concluded that a wider range of digital tools improves reading understanding and vocabulary learning. Students have access to word pronunciation, meaning, and contextual information. Comprehension then begins to scaffold that guides and improves the student’s reading abilities. Instructional scaffolding is a process through which a teacher adds supports for students to enhance learning and aid in the mastery of tasks. The teacher does this by systematically building on students’ experiences and knowledge as they are learning new skills. As students master the assigned tasks, teachers gradually remove the supports (Gabriel, 2013).

Teachers with knowledge and dedication are the most crucial element in the success of reading instruction programs (Allington, 2014). Technologies, like the tablet, can assist teachers
in helping students learn, but they can never replace qualified experienced teachers. Teachers gain insight into students’ understanding abilities and emotional needs. Students are dependent upon the guidance and support that a trained, caring, and experienced teacher provides (Arlington, 2013). The tablet provides a medium of support to the teacher. It can provide support for students’ learning to read in new ways by presenting required information and activities to students in an interactive way (McClanahan et al., 2012). It may assess their work and can respond accordingly, and, can provide access to the correct pronunciation of words as well as provide definitions. These tools can assist students in learning to read successfully and more effectively. The advancements of technology have changed how students read and learn. With access to the Internet included on tablets, students could retrieve every type of information at any time. Students benefit from the release of several apps that are specifically for reading instruction helping students to upgrade and enhance their reading abilities (Lamb, 2011).

**Early Reading Instruction/Learning**

Because this study is examining the impact that tablets have on literacy instruction, it is good to have an understanding of the components of effective reading instruction. The NRP published a report in 2000 on the main components of effective reading instruction for students and abstracted five main components. The first component is phonemic awareness, which is instruction that enables students to break and comprehend spoken words into individual sounds and merge the sounds to form words. The second component focuses on phonics instruction and the connection between the sounds and the letters. This instruction helps students identify the words and develop the new written words into their oral forms. The third component examines fluency instruction. This skill strengthens the student’s ability to learn and read text with speed, accuracy, and the proper expression. Fluency is an essential component of learning to
understand text. The fourth component is vocabulary instruction, which helps students in comprehending that words can have different meanings in text based upon the use of words. The fifth and final component is text comprehension (also known as reading comprehension), which helps students develop tactics for comprehending the text they read. These components need to be joined together as students learn to read. By doing so, teachers help ensure that all students can distinguish words, are familiar with written words, do not lack fluency, understand the meaning of the words, and have adequate text understanding capabilities.

When experiments are conducted to test the validity of the tablet as an instructional tool, it is important to remember and utilize these components. As stated earlier, the tablet is a relatively recent invention; therefore, there is very little research about the benefits of using tablets in the classroom. Author Andy Isaacson (2014) wrote about researchers from Tufts and Georgia State University who wanted to investigate if children could learn to read on their own. To conduct their study, they delivered 40 tablets to children in two different villages in Ethiopia without any instructions on how to operate the tablets. Their findings are incredible. Within four minutes of receiving the tablets, the students had figured out how to power on the devices. When the researchers followed up with the students one month after the delivery of the tablets, they found that students had taught themselves the ABC song in English and were writing letters (also in English). This project opened the researchers’ eyes to the possibilities of utilizing the tablets in rural areas in America where 30% of parents do not have books in the home. The researchers are conducting a similar project in a small rural town in Alabama.

**Pedagogical Approaches for Integrating Tablets**

The art and way of teaching is the definition of pedagogy. It entails the process, approach, and strategies of teaching. Many articles exist about the pedagogical approaches that
teachers are using as they integrate tablets into their everyday teaching. Cviko et al. (2014) have studied the relationship between the pre-existing knowledge that teachers bring into their classes and how that knowledge affects their goals and beliefs. They concluded that this knowledge can sometimes inhibit the results that teachers expect as they integrate a new technology pedagogy into their classes. In their study, the researchers compared two teachers who were at different levels and along different time spectrums in their technology integration. Their study showed that the transitions between the various states of development are nonlinear. As with any new pedagogical approach, desire drives educators to enhance the critical thinking ability for their students. Research is also being done to determine if the use of new technology has any effects on critical thinking skills of students (Mansbach, 2015; Northrop & Killeen, 2013). Mansbach (2015) concluded that online tools could play an important part in the development of critical thinking in students. This development occurs because the students use their proficiencies to climb through Bloom’s (1956) taxonomy of learning. In education, when children use self-discovery abilities to acquire new knowledge, they are exhibiting higher order thinking skills (Northrop & Killeen 2013). Northrop and Killeen (2013) also developed a framework for using tablets to help teach literacy competencies. Although the data are young, there appears to be a new way to build early literacy skills among emergent and beginning readers. The authors propose a gradual release of responsibility framework as a way of integrating tablets into the literacy classrooms (Northrop & Killeen, 2013).

A group of researchers in Scotland (Burden et al., 2012) spent a year studying nine different schools that had adopted a one-to-one iPad program for their students. This study provided significant information about the pedagogical approach pertaining to tablet instruction. The most significant findings relating to Burden et al.’s (2012) study were:
• The adoption of mobile technologies on a personal basis significantly increases access to technology for students, both inside and beyond school, with many attendant benefits for learning, which include greater motivation, engagement, parental involvement, and understanding of complex ideas.

• Personal ‘ownership of the device is seen as the single most important factor for successful use of this technology.

• Teachers are equally engaged by using a tablet like the iPad, which has a low learning curve enabling them to use it immediately as a teaching tool and a learning tool for themselves.

• The use of the tablet is contributing to significant changes in the way teachers approach their professional role as educators and is changing the way they see themselves and their pedagogy.

• Parents also appear to become more engaged with the school and their child’s learning when the iPad travels home with the student (Burden et al., 2012)

With the innovations and developments in technology, students have become digital natives. In the current age, students are far different from their earlier generation. They are flourishing in the world where digital technology is part of daily lives, and for the most part, have never experienced a world without technology. Today students are technology savvy, and this carries over into schools. The tablet is becoming a more interactive and efficient teaching device, and as a result, the usage is increasing because of its success (Pitler, Hubbell, & Kuhn, 2012). The tablet has become a perfect learning provider and partner. It is assisting teachers with new, creative ways of providing education to students. This technology is allowing students to take more interest, and thus it is becoming a major pedagogical tool for teachers. The tablet
provides interesting and interactive ways of learning and seems to be a perfect alternative to textbooks (Burden et al., 2012). There are different apps specially designed for teachers that allow them to manage their teaching, develop their methodologies, and develop more innovative and interactive teaching pedagogy. In addition to literacy instruction, tablets are useful in other facets of the classroom. This usefulness is lending itself to their increased popularity as well. They can help teachers stay up to date on their subject area as well as teaching methodologies and pedagogy. Teachers can also maintain their own digital libraries, research, lesson plans, notes, and schedules.

Tablets also serve as eReaders. An eReader is just a term that denotes the consumption of a book on a portable device or tablet like an iPad, Kindle Fire, or other similar product (Harmon, 2012). The tablet can have thousands of books loaded onto it for student consumption. This ability can be beneficial in a couple of different ways. First, a student can move from one book to the next without having to stop and find another book. A benefit of having the capability of having multiple books in one place is that the tablet can have books with various reading levels loaded on it allowing multiple students to use the same tablet throughout the day for instruction. Digital textbooks do not tear and do not need to be replaced like traditional books do. The tablet’s flexibility also allows for students to use it for presentations and note taking, and this flexibility helps because they can reduce the amount of technology needed in a class. The tablet has become the must-have device that is cheaper than a classroom computer and serves multiple classroom functions (Malone, 2011).

However, it should be taken into account that the success and effectiveness of the tablet as the interactive reading medium depends on the ability of the teacher’s integrating this technology into the classroom (Milman et al., 2014). Teachers must be comfortable in their use
of the technology, or they will not fully buy into its usefulness in the classroom (Henderson & Yeow, 2012). Some of the most popular tools used for reading instruction include Kindle, iBooks, Storia, and Interactive book app MegaReader 2.5. Other interesting tools and useful apps include Overdrive Media Console, Timbuktu, Newsstand, content specific apps, the web, and the Google App. These tools have different functions and the teachers must be familiar with them to ensure the successful integration of them into their classrooms. The goal of using apps like these is to provide maximum reading opportunities to all students as well as to make them familiar with the interactive technology that plays a crucial role in burnishing the learning abilities of the students (Harmon, 2012). The sheer number of apps available, as well as the number of devices used globally, is evidence of spectacular growth in interactive technological mediums like the iPad. A major question and issue for schools and textbook publishers is how to deliver digital textbooks in the hands of all students in an efficient manner.

Evolution in technology has brought changes to every facet of education. Changes include the introduction of new methods of instruction with the developments of technology in teaching and learning.

The tablet presents a new way of learning and development and is more information and knowledge absorbent than the traditional classroom learning structure (Northrop & Killeen, 2013). Students answer questions and immediately receive feedback. This immediate feedback makes learning more interactive and interesting for students, and the information saturation level is high for both teachers and students. We know that teachers spend a lot of time and attention focusing on keeping their student attentive and that research has shown that tablets help hold a child’s focus (Quillen, 2011). It encourages attention and focus while also offering multiple methods of interaction with the subject of instruction. The adoption of tablets like the iPad has
significantly transformed access to and the use of technology inside the classroom (Murry & Olesce, 2011). It has encouraged teachers to explore alternative activities of assessment for learning. Kinash et al. (2012) showed that the iPad device is bringing changes in the way teachers approach their professional role as educators. Their study shows that when teachers promote the use of iPad with their students, the collaboration between teacher/student and also student/student increased significantly. The result of this collaboration is increased creativity in student work as well as teachers incorporating new teaching styles (Kinash et al., 2012).

Successful adoption of the iPad by teachers is based in part on the teacher’s efficacy for the iPad. Minshew and Anderson (2015) suggested that for the student to have the most benefit of technology adoption, the teacher must have buy-in into the adoption process. This study specifically addressed what happens when forcing technology upon the teacher instead of the teacher taking the initiative to incorporate it on his or her own volition. When using the tablet as a tool in the classroom, the teacher takes on the role of a facilitator and students become more proactive in their role of learning. Such constructive teaching practices are successful in a consistent relationship between the teachers and the students (Minshew & Anderson, 2015).

The use of the iPad in virtually all levels of education is increasing gradually because the iPad creates a collaborative, interactive, and efficient learning-oriented environment (Sheppard, 2011). With the additional apps availability for download, the iPad has been able to maintain its relevance as well. Often in technology, a new device loses its effectiveness or draw because the students become bored with it. Because there are millions of apps, and new ones are constantly being developed and released, there is always something new for students to do on the iPad. Henderson and Yeow (2012) concluded that technologies like the iPad are transformative agents, upgrading teachers’ professional development opportunities, which has a direct benefit to
students. The iPad also allows teachers to instruct students across multiple learning styles. The touchscreen technology allows students to connect more interactively and also to take control of their learning (McKinging & Fitton, 2010). Teachers can customize education programs for each student. Another benefit of the iPad is that it can integrate and synchronize with existing IT systems, like cloud-based computing. Lesson planning, better organization, easier grading, increased productivity, better and effective communication, and a creativity boost are some of the benefits teachers can have when implementing iPads into their classrooms (Hutchison et al., 2012).

**Negative Aspects of Using Digital Tablets**

As there are many benefits of using iPad, there are some drawbacks or barriers to overcome. Barriers are factors that restrict teachers from using the technology. Teachers often fail to adopt new technology due to the barriers like institutional and administrative support, experience, not being tech savvy, lack of training, personality and attitudinal factors, and availability of resources. In addition to these common reasons, Minshew and Anderson (2015) also found that lack of time, lack of necessary knowledge, and lack of self-confidence in using the technology. Administrative barriers can come in various forms, including access to the equipment, support from the technical side, and availability of updated software. Cviko et al. (2014) highlighted that the unavailability of the technology as a major factor in the adaptability of technology by teachers. Resistance from teachers to integrate new technology into their classrooms can stem from vagueness in expectations, lack of clear vision, and moreover lack of knowledge and skills, as well as blurred expectations and inadequate feedback from administrators (Cviko et al., 2014). The uneasiness to adopt new technology can also be a result of a failure in providing appropriate training. According to research by Charles Buabeng-Andoh
technology adoption decreases as the age of the teacher increases and technology adoption increases as technology uneasiness decreases. Young teachers are keener towards adapting technological tools for teaching when compared to older teachers who are more comfortable with the traditional way of teaching. In other words, more experienced teachers are less likely to use technology as compared to teachers with less experience comparatively (Buabeng-Andoh, 2012). Another issue that can affect implementation is the difficulty that teachers can face in identifying which apps to use for instruction. Since its inception in 2008, Statista (2016) reported over four million available apps in the two most popular app stores – Apple and Google/Android. Through June 2016, these apps that have been downloaded over 195 billion times on various mobile devices like phones and tablets. Over the last decade, millions of apps have been created, not only in the Apple store but also in the Google/Android market as well. The sheer number of apps that are available make it very hard to determine which apps are most beneficial for classroom use. There are reviews available before purchase, but trial and error is the only way to determine if an app is good in classroom settings.

For this study, the researcher employed two specific apps during the instruction process.

- **Aesop’s Quest** – This app is based on Aesop's Fables and is a learning game where the student must remember elements of a story to complete a level. At the end of each story segment or level, the student receives puzzle pieces as a reward. After solving the puzzle, the story is complete, and the child can continue to the next story. Developed in association with the Virginia Department of Education (New River Community College Games, 2011).

- **Sight Words Learning Games and Flash Cards** – This app combines fluency, vocabulary, spelling, and comprehension practice with entertaining, engaging
graphics in a disguised-learning format. Children will want to play again and again and by doing so, will be learning up to 300 all-important sight words. Great for young learners and older children struggling with reading. This app contains words 1–100 with planned related activities. Activities change and progress as the child moves along (eFlashApps, 2011).

With the introduction and integration of specific apps, e-books, and other new technologies in a class, Roskos, Burstein, You, Brueck, and O’Brien (2011) pointed out that proper training is essential for teachers who want to use these technologies in their class successfully.

**Difference in Technology Integration in Boys and Girls**

It is not uncommon to hear the drawing of various stereotypes when society contrasts thinking the different ways that males use technology when compared to their female counterparts. When utilizing the term techie or computer geek, we usually envision a man sitting behind a screen. Common stereotypes tell us, and labor statistics confirm that males tend to outnumber their female counterparts in scientific jobs (Miller, 2012). These jobs include many different types of engineers as well as the various types of information technology (IT) jobs. According to Miller (2012), the Bureau of Labor Statistics reports females account for roughly 25% of IT professionals. When one examines the various fields inside of IT, the 25% number shrinks even more. According to Miller (2012), and Lenhart, Smith, Anderson, Duggan, and Perrin (2015), IT security analysts are 92% male. These are the individuals tasked with keeping hackers out of sites like LinkedIn and Facebook (Miller, 2012). When one further examines the differences between the genders, we see other significant differences as well. Researchers Nina Haferkamp, Sabrina Eimler, Anna Papadakis, and Jana Kruck (2012) found that men visit a
wider variety of websites than women do, in part because females usually devote more time to Facebook. Haferkamp et al. have also found differences in how genders interact daily with the Internet. Their research showed that males tend to express more confidence in their ability to conduct online research (Haferkamp et al., 2012). This greater confidence may also explain why males are more likely to seek complicated security jobs in the banking and governmental sectors. This research also pointed out that even though a gap between genders existed, it is not like the Grand Canyon, that is, large and permanent. There is evidence suggesting that gender differences in Internet usage will decrease as technology becomes more pervasive in our lives (Haferkamp et al., 2012). According to Miller, and Lenhart et al., 34% of men over the age of 65 use the Internet, versus 21% of women in the same age group. These age groups are digital immigrants growing up in an era that was more gendered and much less technological than recent generations. This fact clearly influences their views on technology, as gender differences in Internet usage fall drastically when looking at the total population. Specifically, 68% of males and 66% of females in the U.S. access the Internet regularly (Miller, 2012). It is also important to remember that gender is not the only predictor for Internet usage. Other factors like race, income, education, and marital status can also influence the interaction that people have with technology (Miller, 2012).

There is also a common thought or stereotype that women are more social than men in their use of social networking sites. According to Miller (2012), Facebook identified that over 51% of their users are male with almost 49% being female. While these numbers show that there is no significant difference among genders, the same research does show that women spend 66% of their total Internet time on Facebook, while men only spend 44% of their Internet surfing on the social network (Miller, 2012).
Additional research conducted by Nilanjana Dasgupta and Jane Stout (2014) showed that women, specifically, underrepresent the fields of science, technology, engineering, and mathematics. Data suggested that women made tremendous progress in traditionally male-dominated fields such as law, medicine, and business in the last 50 years (Dasgupta & Stout, 2014). In the past decade, schools have begun to focus on science, technology, engineering, and math (STEM) initiatives to further support the development of girls in their ability to learn science and math (Dasgupta & Stout, 2014).

So, the question then is how do the differences we see in adults compare to differences we see in school children? We know that both boys and girls take math and science courses in roughly equal numbers in elementary, middle, and high school (Ganley & Lubienski, 2016). We also know that fewer women pursue these majors in college when compared to men (Ganley & Lubienski, 2016). When questioned during their first year of college, women are much less likely than men to say that they intend on majoring in STEM-related fields. By graduation, male students outnumber women in virtually every science and engineering field and in some specific fields such as computer science, physics, and engineering. The differences between the two are dramatic. Women earn only 20% of bachelor’s degrees (Ganley & Lubienski, 2016).

Ganley and Lubienski (2016) also suggested that the environment around them shapes girls' achievements and interest in math and science and that bias, even unconscious, limits girls’ interest in mathematics and mathematically challenging career fields. It is important for educators to address the stereotypes that exist about girls concerning science and math. Teachers need to employ a growth mindset that encourages girls to take the harder math and science classes. Research shows that negative stereotypes about girls’ can have a significant influence on their decision to take the harder math and science classes (Ganley & Lubienski, 2016). The
differences pointed out thus far in this study have focused on things pertaining to older students. An area where significant data are available on children in elementary grades is video gaming. For this study, video gaming can be played on many different devices including cell phones, desktop or laptop computers, tablets, iPods, gaming consoles (Xbox or PlayStation), or even a portable gaming device like a Gameboy (Lenhart et al., 2015). Lenhart et al. (2015) reported that the numbers of elementary age children that play video games are almost identical with 99% of boys and 94% of girls reporting that they play video games. A notable difference between boys and girls exists in the frequency of play and duration of play. This difference is important to the scope of this study because Lenhart et al. showed us that both boys and girls are using technology like the tablet. Further research is needed to examine differences in learning of boys and girls based on their use of digital tablets.

**Differences in Reading in Boys and Girls**

It is also important to consider the differences that exist between boys and girls in reading. There is extensive literature published on the differences in test scores based on gender. In 2012, the National Literacy Trust in the United Kingdom published a study entitled Boy’s Reading Commission. This study revealed some powerful research such as only one in four boys read outside of class each day (Clark, 2013). The study also found that boys’ underachievement in reading is a significant concern for schools. In the survey conducted by the National Literacy Trust, 76% of the schools responding indicated that boys did not do as well as girls in reading (Clark, 2013). Clark (2013) also found that boy’s attitudes toward reading and writing, along with the amount of time they spend on these skills are poorer than those of girls. Further evidence also supports that this issue is deep-seated and is evident internationally. A group of researchers from Beijing Normal University and the University of California, Irvine completed a
study that looked at both math and reading outcomes of a study where 1,556 boys and girls ranging from 8 to 11 years of age completed 10 cognitive tasks. They discovered that female children, on average, consistently outperform their male counterparts in arithmetic tasks that including simple subtraction, complex multiplication, number comparison, number series completion, choice reaching time, and word-rhyming task (Wei et al., 2012). The boys in this study outperformed girls in a mental rotation task. The results suggest that girls’ advantage in math is likely due to their advantage in language processing. Research identified that reading text has become more complex in the elementary grades over the last fifty years (Gamson, Lu, & Eckert, 2013). There is also research evidence that suggests that volume of reading correlates to attaining higher-order literacy proficiencies (Allington, 2013). There seems to be a connection between the lack of time spent reading and the development of literacy proficiencies.

**Summary**

Technology and education are intersecting in ways previously unseen. Anthony (2014) reported that Americans have purchased over 320 million tablets in the 2014 calendar year and their sales were not expected to decline. The sheer number of tablets that have been purchased by schools is proof that teachers are utilizing them in unprecedented numbers. The successful integration of tablets into the classroom can be linked to the student’s familiarity with the device before they ever attend school (Henderson & Yeow, 2012). What is not yet known is whether these tablets make a positive difference in how students learn. We know that students are using them in various ways and that teachers are working harder to utilize tablets in the instructional process (Clark & Luckin, 2013). This researcher sought to determine if the use of tablets during the instruction of early elementary reading had a greater positive effect on student learning than the use of traditional direct instruction. We know that many schools have adopted the use of this
technology, but we do not know if there is educational validity to this pedagogical approach.

Data created in this study helped to answer this question and identified what types of differences occurred when educators utilized tablets during reading instruction in first-grade classrooms.
CHAPTER THREE: METHODS

Overview

Chapter three explains the research methods utilized by the researcher in this study. The chapter begins with the design of the study followed by the statement of the research questions and corresponding null hypotheses. The researcher presents information about the participants and setting. Also presented is a description of the CPAA, the instrument used to measure the dependent variable. The researcher then shares the validity and reliability of the instrument as well as the procedures of the study, and an explanation of the data analysis methods. Data screening and assumption tests are specified. *Educational Research* (8th Edition) by Meredith Gall, Joyce Gall, and Walter Borg (2007) served as the main reference to guide the methodological procedures used in this research study.

Design

This researcher employed a quasi-experimental nonequivalent control group design. According to Gall et al. (2007), this is the most commonly used quasi-experimental design in educational research. This design best fit this study because of the nonrandom assignment of research participants to groups and the administration of a pretest and posttest to all groups Gall et al. (2007). Because of the nature of this study, the pretest/posttest model was selected to identify if the independent variable (use of tablets apps Aesop’s Quest and Sigh Words Learning Games and Flash Cards for first-grade reading) impacted the dependent variable (students’ reading scores). In the pretest/posttest design, a pretest was given to participants prior to starting the program to measure the implemented intervention, and then a posttest was administered to measure for any differences between the two tests.
Research Questions

The research questions for the study are defined as follows:

**RQ1**: Is there a difference in the formative standardized test (CPAA) scores between students in first grade who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

**RQ2**: Is there a difference in the formative standardized test (CPAA) scores between male and female students in first grade who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

Hypotheses

The null hypotheses for this study are:

**H₀1**: There is no statistically significant difference in the composite literacy scores on the CPAA among first-grade students who use tablet applications during reading instruction and those who do not use tablet applications during reading instruction when controlling for pretest scores.

**H₀2**: There is no statistically significant difference in the composite literacy scores on the CPAA of first-grade students based on gender, who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores.

Participants and Setting

The researcher used a convenience, non-random sample of students in the first-grade classes at two private schools in the southeast during the fall semester of the 2017-2018 school year in this study. The researcher chose first-grade students as the population of interest because
this age group is where reading skills are most developed. Both schools are located in urban areas. The city for sample A experienced a strong economic growth over the last decade with the addition of a major automotive manufacturing facility that added over 3,000 jobs. Outdoor enthusiasts know the surrounding geographic area for rock climbing, mountain biking, hiking, and various water sports. Sample B is a suburb of the fifth largest metropolitan area in the United States with a population of just under six million people.

The schools range in size from 275 students to just under 1,000 students. The schools are accredited through the Southern Association of Independent Schools (SAIS) and have rich traditions of independent education in the cities of their locations. Additionally, both schools are members of the National Association of Independent Schools (NAIS). Sample A’s graduates matriculate to highly regarded middle/high schools in the city while the students that graduate high school from Sample B continue to the top colleges of their choice. The tuition ranges from $9,300 to just under $17,000 per year at the sample schools. Both schools also offer need-based financial aid for families who qualify. The schools attract students from seven different counties in an area with a total population of over 300,000 people.

The first school (Sample A), founded in 1953, is a non-denominational Christian school. At the time of this study, it had 286 students in Grades pre-k3 through Grade 5 and located in a residential area close to the downtown area along a major interstate that runs through the city. The two teachers (Teacher A and Teacher B) who participated in the study from sample A were both considered master teachers with one having over twenty years teaching experience, and the other having over ten years teaching experience. Both ladies had bachelor’s degrees in education. Teacher A taught first grade at their school for over ten years while Teacher B taught first grade at her school for nine years.
The second school (Sample B), founded in 1986, is also a non-denominational Christian school, housing 70 preschool students and located in a popular suburb of Atlanta, Georgia. The school benefited from the rapid growth of the surrounding region and at the time of the study enrolled 900 students in Grades pre-k through Grade 12 with 275 of them enrolled in their elementary.

The students who participated in the study varied in ages from 5 to 7 years old. Four teachers participated. The two teachers (Teacher C and Teacher D) who participated in the study from sample B were also both considered master teachers with one having over twenty years teaching experience, and the other having over ten years teaching experience. Both ladies had bachelor’s degrees in education. Teacher C also held a graduate degree in education and taught first grade at her school for over ten years. Teacher D taught first grade at her school for twenty-one years.

This study consisted of two groups of students enrolled at independent schools. According to the Council for American Private Education (CAPE), the majority of families (87%) that choose an independent education for their children tend to make more than $75,000 annually. Additionally, CAPE reported that many families are choosing to make sacrifices in other areas to be able to send their children to a high-quality school. The most common areas where families cut spending in order to be able to afford tuition are retirement, college savings, and new vehicle purchases. Both schools in this study offered need-based financial aid that helped offset the cost of attendance for families that could not afford full tuition. Between 15% and 20% of the enrolled students at both schools received need-based financial aid with the average financial aid award being around 40% of the total tuition.
The first group (Sample A) used iPad apps exclusively for reading instruction and was considered the treatment group. The second group (Sample B) received reading instruction in a traditional classroom environment that employed a traditional text in print form only and was considered the control group. The researcher selected one group of students from Sample A, and the second group from Sample B. For this study, the total number of participants sampled was 78 students. According to Gall et al. (2007), this number exceeds the required minimum for a medium effect size with a statistical power of .5 at the .05 alpha level. The male/female ratio is representative of the student population in each of the schools.

Table 1

<table>
<thead>
<tr>
<th>Student Participants</th>
<th>Sample A</th>
<th>Sample B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>33</td>
<td>25</td>
</tr>
<tr>
<td>African-American</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Middle Eastern/Indian</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Instrumentation**

The researcher utilized the CPAA to track academic gains of the students who participated in this research project. The CPAA is a type of computer-based standardized testing program specifically developed for young children in Grades K-2. The CPAA was conceived and initially designed at Columbia University under the guidance of Professor Eugene Galanter, Ph.D (1959). Dr. Galanter has been at the forefront of educational technology since his
publication of *The Ideal Teacher* in 1959 (Camacho, 2010). The purpose of the CPAA is to measure core early literacy and mathematics skills for pre-k to Grade 3 students. Over several decades of research at Columbia University, Dr. Galanter identified several challenges that educational technology presents and that educators must overcome to benefit students.

According to Galanter, those challenges are:

- **The Programming Challenge**: This pertains to identifying what is the correct order of presentation of material and how far apart (conceptually) to place assessment items. The CPAA addresses this challenge by basing items on a growth model in early literacy and mathematics skills. The CPAA begins with the assumption that each student is performing at an average level for his/her grade. As the student responds, the complexity of the questions adjusts. If a student struggles with grade-level material, they receive more foundational concepts. Additionally, if a student demonstrates a more advanced ability, they receive more complex questions. This information identifies what material the student is partially capable of grasping and provides the teacher with targeted instruction within the zone of proximal development (Camacho, 2010).

- **The Multiple Track Challenge**: Galanter wanted to determine if one program could be satisfactory for all students? The CPAA is an intuitive assessment that adjusts based on the student’s responses. The assessment experience is different for each student and uniquely adapts to be challenging but also developmentally appropriate for the learning needs of the students (Camacho, 2010).

- **The Prompting Challenge**: This deals with how should prompts be used. The CPAA utilizes positive feedback throughout the assessment to increase motivation and
engagement. Scaffolding is utilized after incorrect responses to allow students to try to answer the question one more time. This scaffolding builds a learning opportunity into the assessment and allows the CPAA to pinpoint misunderstandings more precisely (Camacho, 2010).

- The Error Rate Challenge: The attempts to hone in on areas of partial understanding to determine each child’s zone of proximal development. Children who demonstrate mastery of grade-level content are challenged with harder material, while those students who are struggling with questions are more likely to reveal their current level of performance. The CPAA provides little opportunity to top out or fail. This approach allows the CPAA to present questions that are likely to reveal shades of understanding and provides teachers with additional information (Camacho, 2010).

- The Learning Progress Challenge: This pertains to the challenge of identifying how do you know what the student has learned. The CPAA addresses this challenge by providing the teacher with narrative and graphical reports that summarize performance and progress in each domain immediately after each assessment. As the students take multiple assessments throughout the year, and from one year to the next, a measure of progress is calculated that helps the teacher make necessary instructional adjustments (Camacho, 2010).

Academic researchers developed the tests in 1999 at Columbia University after years of extensive study. The researchers from Columbia then began working with a team of scientists at Massachusetts Institute of Technology (MIT) to develop patented assessment technology (Northwest Evaluation Association, 2012). Additionally, other research utilized the CPAA as
well (Bebell, Dorris, & Muir, 2012; Bossaert, Doumen, Buyse, & Verschueren, 2011; Brenneman, 2011).

The standardized test was conducted via laptop or tablet at the end of each quarter and specifically assessed literacy and math. It differs from normal standardized testing in several ways. First, schools conduct the CPAA multiple times a year instead of once. This approach allows the school (and the teacher) to capture multiple data points throughout the year and to create a more accurate picture of student academic gains. Second, CPAA is an adaptive test. Being an adaptive test means that if a student answers a question incorrectly, the test prompts the student to consider another answer, and then the student is asked a similar type of question to determine better if the student is deficient in a particular skill or content area. As the student progresses through the test, the more questions that are answered correctly in a row results in the CPAA posing more challenging questions to the student.

The literacy scores from the CPAA are a composite of three categories: phonemic awareness, phonics/writing, and reading (Northwest Evaluation Association, 2012). Each section of the test consists of five to 10 questions with various types of questions specific to each skill tested in the section. Because the test is intuitive, the total number of questions in each section will vary depending on a student’s performance. The composite scores are scaled 40-100 with 40 being the lowest possible score and 100 being the highest. The administrator divides the scores into four different ranges: scores considered below expectation fall within the 40-46 range equate, scores in the 47-61 range are approaching expectation, scores in the 62-85 range are at expectation, and scores considered above expectation fall within the 86-100 range (Northwest Evaluation Association, 2012). Also, the CPAA scoring report contains students’ raw scores as well as the class average on each section of the test.
The classroom teacher administered the test with assistance from the academic counselor. The test took approximately 20 to 30 minutes to complete. The CPAA grading program, which was developed by Northwest Evaluation Association (2012), automatically scored the test.

According to Gall et al. (2007), validity is one of the most sensitive aspects of the research methodology. The validity of this research tool is both internal and external. Children’s Progress was awarded a research grant from the National Institutes of Health to examine the reliability and validity of the CPAA. Data were collected and analyzed from over 2400 students who completed the fall, winter, and spring CPAA assessments between September 2006 and May 2007. The sample consisted of 120 students in pre-kindergarten, 650 in kindergarten, 686 in Grade 1, 683 in Grade 2, and 273 in Grade 3. These students attended 32 various schools throughout New York City, Yonkers, New Haven, and Philadelphia (Northwest Evaluation Association, 2012). Trained research staff from Columbia University administered all CPAA assessments. The fall assessments occurred between October 1 and November 10, the winter assessments between January 15 and February 20, and the spring assessments between April 1 and May 10. The reliability analysis of the CPAA only included students who completed the three tests administrations (Northwest Evaluation Association, 2012). All scores reference end-of-the-year expectations for grade-level learning standards. The data presented in the tables (Northwest Evaluation Association, 2012) demonstrated that student performance on the CPAA was both regular and sound. Approximately 31% of all students scored “above expectation,” 35% scored “at expectation,” 26% scored “approaching expectation,” and the remaining 8% scored “below expectation.”

Students’ internal validity can be defined as the approximation of the truth inferred from the analysis of the information included in the study. The idea is to express the cause and effect,
as well as casual relationships between the variables of the study. For this reason, the researcher identified internal validity as the most significant aspect of this study. A factor analysis was performed on all individual concepts within each domain (literacy and mathematics) to ensure that the CPAA had internal validity. The result provided evidence that the CPAA was internally valid and allowed for a rigorous test of the CPAA’s reliability (Northwest Evaluation Association, 2012). In addition to demonstrating internal validity, it was also essential for the CPAA to display external validity, which affirms that the assessment measures what it is intended to measure. External validity can be defined as the generalization of the results to the broader population by the information provided by the small sample of the study. In addition, CPAA was validated by a concurrent validity design (Northwest Evaluation Association, 2012) that compared the CPAA to the Dynamic Indicators of Basic Early Literacy Skills (DIBELS), the Terra Nova Achievement Test (TN), and the Arizona Instrument to Measure Standards (AIMS; Northwest Evaluation Association, 2012). High external validity reflects the high chance of generalization of the research outcomes based on the responses of the research participants. Researchers should consider that the inequality of reading ability in the study groups may present some internal validity issues.

According to Gall et al. (2007), the threats to validity within this study are identified below:

1. Testing – Using a pretest/posttest design may cause a reactive effect of testing or testing sensitization.

2. Interaction – Possible interaction between the pretest and the experimental treatment may have a direct effect on the results.
3. Sample Size – The data collected in this study will come from four elementary school classes from two independent schools in the southeastern United States. The smaller sample size does pose a threat to validity.

The reliability of the CPAA hinges upon the accuracy, consistency, and stability of the results across multiple situations and over a specific length of time. Because schools administer the CPAA three different times throughout the year, it is important to validate the stability and reliability over an entire school year. A Cronbach’s alpha was utilized to measure reliability of the CPAA. The CPAA demonstrated a reliability of 0.89 or higher (Northwest Evaluation Association, 2012).

Both schools participating in this research study have purchased the rights to use the CPAA on an annual basis (See Appendix A for Permission to Use CPAA).

**Procedures**

The researcher utilized the following procedures for this study. First, the researcher attained approval to conduct the study from the Liberty University Institutional Review Board (IRB) committee (See Appendix B for IRB Approval) and from the two schools that participated in the study (See Appendix C for School Permission Letters). Once the researcher received approval to conduct this study, the researcher sent permission forms to the parents of the students at each school via email (See Appendix D for Permission Forms). This email included the information for the study, the timeframe for participation, and contact information to enable parents to contact the researcher with questions (See Appendix E for Participant Consent Form). Parents gave written consent for their children to participate in the study.

The researcher followed these four steps for this quasi-experimental design. Class enrollment determined the grouping of the participants. First, the researcher assigned classes to
serve as experimental and control groups. Second, the researcher administered a pretest to both groups. Third, the researcher administered the treatment to the experimental group but not to the control group. Fourth, the researcher administered a posttest to both groups (Gall et al., 2007). The researcher compared the students’ pretest scores to their posttest scores at the completion of the study to determine the impact of the treatment on students’ reading achievement.

The treatment for the experimental groups consisted of daily instruction for six weeks that utilized phonemic-based apps on the tablet. The students in this group spent approximately 20 to 30 minutes daily working independently at learning centers with two reading apps, Aesop’s Quest and Sight Words Learning Games and Flash Cards, on the tablet. The researcher met with the teachers for both groups to discuss the lesson topics and goals. The lesson plans were similar with the main difference being the utilization of a tablet at one of the centers in one group while the other group utilized traditional center learning-based activities. Traditional guided reading lessons consisted of a teacher working with a small group of students on a particular text. The teacher led a reading activity with the students and then discussed the passage to see if the students comprehended the text (See Appendix F for Sample Lesson Plans).

The teachers who participated in this study used the CPAA extensively in their classes previously. For this study, the researcher provided all teachers with a basic CPAA instructional template to help ensure the pretest and posttest were administered in the same manner (http://165.139.150.129/NWEA/CPAA_Detailed_Teacher_User_Guide.pdf). At the end of the experiment period, the teachers administered the CPAA to all students. The CPAA automatically collects the scoring reports; the reports were analyzed to determine if a significant change existed between the students’ pretest and posttest scores.
**Data Analysis**

The researcher used a pretest-posttest control group design for this study. All conditions for the study were the same for both the experimental and control groups, with the exception that the experimental group had exposure to the treatment (T), which was the use of two related apps on tablets during reading instruction, whereas the control group did not have exposure to the treatment.

The students in this study took the CPAA early in the school year as the pretest. The use of pretest scores helps to reduce error variance and produce a more powerful test than research designs that do not use pretest data (Gall et al., 2007). A convenience sampling method was used to determine the two groups, and according to Gall et al. (2007), both groups should have equivalent mean scores on the pretest. The researcher used the analysis of covariance (ANCOVA) to adjust for initial differences in the pretest means. The analysis of covariance is used to test the main and interaction effects of categorical variables on a continuous dependent variable (Gall et al., 2007). Because the researcher was utilizing pretest scores (which was a covariate), it was imperative to use the ANCOVA as opposed to the ANOVA. The ANCOVA controlled for initial group differences on reading ability. The gain scores on the posttest ($D = Y_2 - Y_1$), represented the dependent variables in the ANCOVA comparisons of the two groups. Once the students completed the treatment, the researcher administered the CPAA again as the posttest to test for academic gains as a result of the treatment.

The researcher checked for outliers using a Box and Whisker plot for each group of students. Included in the assumptions for ANCOVA was Independent Observations – two observations are independent if the occurrence of one observation provides no information about the occurrence of the other observation (Field, 2013). Also included, was the Levene’s test for
equality of variance to test the samples to see if the variances were equal across all groups or samples (Gall et al., 2007). Finally, the researcher used the Kolmogorov-Smirnov test to test the assumption of normality. This test determines if a data set is well-modeled by a normal distribution and how likely it is for a random variable underlying the data set to be normally distributed (Field, 2013). An assumption of linearity checks whether homoscedasticity is given (Field, 2013). An assumption of bivariate normal distribution is a distribution in which both curves have the same mean and standard deviation (Field, 2013). A homogeneity-of-slope shows that both dependent variable and any covariates should have the same slopes (Field, 2013).

The researcher utilized descriptive statistics to summarize a given data set that may represent either the entire population or a sample of it, \((M, SD)\). The inferential statistics are number \((N)\); number per cell \((n)\); degrees of freedom \((df \text{ within/} df \text{ between})\), which is the number of values in the final calculation of a statistic that are free to vary (Field, 2013); observed \(F\) value \((F)\), which is the value obtained by running an ANOVA test to find out if the means between two populations are significantly different (Field, 2013); significance level \((p)\), which states that the null hypothesis is rejected if the p-value is less than a predetermined level. The p-value was set at \(p < .05\) and the null hypothesis was rejected if \(p < .05\) (Field, 2013); effect size is a simple way of quantifying the differences between two groups and emphasizes the size of the difference rather than confounding with the sample size (Field, 2013); and power, which refers to the probability of rejecting a false null hypothesis (Field, 2013).
CHAPTER FOUR: FINDINGS

Overview

In this chapter, the results of the data analysis are presented. The data were collected over a six-week period and then processed in response to the research questions presented in Chapter One. Two goals drove the collection of the data and the subsequent analysis of that data: to determine if the utilization of tablet apps in reading instruction had a positive effect on test scores and to identify if there was a difference in the test scores based on gender. The findings presented in this chapter have the potential for affecting change in instructional practice.

Research Questions

RQ1: Is there a difference among the composite literacy scores (CPAA) of first-grade students who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

RQ2: Is there a difference among the composite literacy scores (CPAA) of first-grade students, based on gender, who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores?

Null Hypotheses

H₀₁: There is no statistically significant difference in the composite literacy scores on the CPAA of first-grade students who use tablet applications during reading instruction and those who do not use tablet applications during reading instruction when controlling for pretest scores.

H₀₂: There is no statistically significant difference in the composite literacy scores on the CPAA of first-grade students based on gender, who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores.
Descriptive Statistics

The researcher derived data in this study from the use of the CPAA (Northwest Evaluation Association, 2012). The researcher utilized a pretest/posttest design by administering the CPAA to first-grade students on September 1, 2017. The students in the experimental group received treatment, and the researcher administered the CPAA again at the end of the first quarter on October 13, 2017. Of the 78 students who participated in the study, 35 were female, and 43 were male. The descriptive statistics (Table 2) below shows the number of participants at each school; and also presents the unadjusted posttest means, and the standard deviations.

Table 2. Descriptive statistics

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>44</td>
<td>37.07</td>
<td>13.80</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>37.35</td>
<td>13.58</td>
</tr>
<tr>
<td>Male</td>
<td>24</td>
<td>36.83</td>
<td>14.26</td>
</tr>
<tr>
<td>MP</td>
<td>34</td>
<td>33.41</td>
<td>10.02</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>35.56</td>
<td>7.85</td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>31.50</td>
<td>11.50</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>35.47</td>
<td>12.35</td>
</tr>
</tbody>
</table>

The tests of normality (Table 3) showed that the standardized residuals for the interventions were normally distributed, as assessed by Kolmogorov-Smirnov & Shapiro-Wilk's test ($p > .05$). The Shapiro-Wilk’s test was also run because it is often used with sample sizes less than 50. The
researcher also conducted a visual inspection of the standardized residuals plotted against the predicted values (Figure 1).
Table 3

Tests of Normality

<table>
<thead>
<tr>
<th>School</th>
<th>Statistic</th>
<th>$df$</th>
<th>$p$</th>
<th>Statistic</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>.081</td>
<td>44</td>
<td>.200</td>
<td>.986</td>
<td>44</td>
<td>.873</td>
</tr>
<tr>
<td>MP</td>
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<td>34</td>
<td>.200</td>
<td>.964</td>
<td>34</td>
<td>.318</td>
</tr>
</tbody>
</table>

Standardized Residual for Posttest

Standardized Residual for PP_Change

Figure 1. Standardized residuals plotted against posttests.

While homogeneity of variance is preferred, transforming a variable when there is differential variability between the groups can create other problems. The researcher ran Levene’s test of Equality of Error Variances with and without outliers (Table 4) to assess the equality of
variances between the groups in the study. Both tests yielded a $p$-value of .000, however the ANCOVA is robust to some violation of assumption of homogeneity of variance. The researcher tested the homogeneity of regression slopes, and the interaction term was not statistically significant, $F(1, 74) = 46.602$, $p = .379$. This result confirms that the ANCOVA should yield valid results.

Table 4

Levene’s Test of Equality of Error Variances

<table>
<thead>
<tr>
<th>Dependent Variable: PP_Change</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16.826</td>
<td>1</td>
<td>74</td>
<td>.000</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Pretest + School

Results

The box and whisker plot (Figure 2) shows a similar distribution between the two participating schools. It also identifies two students (one from each school) who are considered outliers because they scored lower on the posttest than they did on the pretest. The outliers were determined by looking at the z-scores of both participating groups. Typically, a z-score greater than $|3|$ is considered an outlier. Although outliers were statistically identified, the researcher chose to retain all data in subsequent analyses.
The first null hypothesis: There is no statistically significant difference in the composite literacy scores on the CPAA among first-grade students who use tablet applications during reading instruction and those who do not use tablet applications during reading instruction when controlling for pretest scores, addresses the independent variable of the classroom instructional mode on the dependent variable of test scores.

An ANCOVA was conducted to test whether a significant difference exists between the pretest and posttest scores of the control group and the experimental group. After adjustment for pretest scores (Table 5), there was a statistically significant difference in posttest scores between schools, $F(2, 75) = 118.56, p < .001$, partial $\eta^2 = .613$. 

Figure 2. Standardized residuals for the posttest.
Table 5

Test of between subjects effects

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F$</td>
<td>$p$</td>
</tr>
<tr>
<td>Pretest</td>
<td>118.56</td>
<td>.000</td>
</tr>
<tr>
<td>School</td>
<td>15.49</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. School: group 1 = BB; group 2 = MP

The ANCOVA also determined the effect of tablet applications on posttest scores after controlling for pretest scores. There is homogeneity of regression slopes since the interaction term was not statistically significant, $F(1,74) = 46.602, p = .379$. Standardized residuals for the interventions and for the overall model were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There exists homoscedasticity of variance, as verified by visual inspection of a scatterplot but not homogeneity of variances as assessed by Levene's test of homogeneity of variance ($p < .000$).

The Pairwise Comparison test (Figure 3) compared the scores of the groups at each school. After adjustment for pretest scores, posttest scores were higher for BB/group1 (38.54 ± 1.17) compared to MP/group2 (31.51 ± 1.33). This difference was statistically significant, $F(2, 75) = 15.494, p < .001$, partial $\eta^2 = .171$. Posttest scores were statistically significantly greater in the experimental group when compared to the control group ($M_{diff} = 7.032, 95\% CI [3.473, 10.592], p < .001$).
Figure 3. Pairwise comparisons.

The second null hypothesis: There is no statistically significant difference in the composite literacy scores on the CPAA of first-grade students based on gender who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores, addresses the second independent variable of gender on the dependent variable of test scores. An ANCOVA was run by school, with sex as the independent variable, posttest scores as the dependent variable and the pretest as the covariate.

There is homogeneity of regression slopes since the interaction term was not statistically significant for BB/group1, $F(1,41) = .501, p = .483$ or MP/group2, $F(1,31) = .082, p = .777$. Standardized residuals for male and female students at both schools were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There exists homoscedasticity of variance, as verified by visual inspection of a scatterplot and homogeneity of variances as assessed by Levene's test of homogeneity of variance for both groups (BB/group1 $p = .278$ & MP/group2 $p = .384$).

For those who used tablet applications (BB), there was no effect of gender, $F(2, 41) = 1.259, p < .268$, partial $\eta^2 = .030$. For those who did not use tablet applications (MP) there was also no effect of gender, $F(2, 31) = 0.030, p < .864$, partial $\eta^2 = .003$. This lack of statistical
significance results in a failure to reject the second null hypothesis. See Table E for full ANCOVA results.

Table 6

Test of between subjects effects by school

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted</th>
<th>Adjusted</th>
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<tr>
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Note. BB = experimental; MP = control
CHAPTER FIVE: CONCLUSIONS

Overview

This chapter addresses the results of the study as to whether the use of tablet apps positively impacts early reading instruction. The researcher reviews the conclusions of this study as they relate to each research question. Additionally, the researcher presents implications for further use in education. Finally, the researcher shares the limitations of this study as well as recommendations for future research.

Discussion

The purpose of this quasi-experimental nonequivalent control group, pretest/posttest design study, was to examine whether the use of two tablet apps, Aesop’s Quest and Sight Words Learning Games and Flash Cards, positively affected early reading instruction. Tablet apps were utilized during reading instruction by the experimental group in the fall of 2017. Both groups were administered the CPAA as a pretest in September 2017. The control group did not utilize tablet apps during reading instruction. After six weeks of instruction (in October 2017), both groups were given the CPAA as a posttest. This study addressed two research questions. A discussion of the results ensues according to each hypothesis.

Null Hypothesis 1

The first null hypothesis for this study is: There is no statistically significant difference in the composite literacy scores on the CPAA among first-grade students who use tablet apps during reading instruction and those who do not use tablet apps during reading instruction when controlling for pretest scores.

The data showed that the use of tablet apps during reading instruction had a statistically significant impact on student achievement. Buckenmeyer (2010) was one of the first researchers
to suggest that technology implementation in the learning process triggers major changes in the classroom activities that are most likely to affect the performance of students. This researcher’s study also supports the work of Mansbach (2015), who found that effective use of technology in the learning environment can have a positive impact on both the learning ability and educational performance of students. Those effects centered on student engagement and a better connection with the subject content in the lesson. Isaacson (2014) also believed that the use of technological devices, like tablets and apps, are exceptionally significant in facilitating teachers and students in the overall learning process of the 21st century. Other researchers have found benefits of tablet integration in various other levels of education – for special education (McClanahan et al., 2012), in high school level math tests (Hu, 2011), and on high school exit tests (Harmon, 2012). This researcher’s study differs from the studies above in that attention is focused on early elementary literacy. These studies support Mayer’s (2005a) cognitive theory of multimedia learning, which says that multimedia learning occurs when students build mental representations from words and pictures with which they interact.

**Null Hypothesis 2**

The second null hypothesis for this study is: There is no statistically significant difference in the composite literacy scores on the CPAA of first-grade students based on gender, who use tablet applications during reading instruction and those who do not use tablet applications for reading instruction when controlling for pretest scores. The data indicated that although girls scored higher on both the pretest and posttest, the change between the two test scores was less for females than for the male students. The ANCOVA confirmed that there was no statistical difference between males and females on posttest scores regardless of tablet use. Lenhart et al. (2015) stated that both boys and girls are using tablets at almost identical rates. Higher scores by
females supports extensive literature published on the differences in test scores based on gender. Typically, girls tend to score higher than boys in reading (National Literacy Trust, 2012). In addition, the National Literacy Trust (2012) found that boys’ attitudes toward reading and writing, along with the amount of time they spend on these skills are poorer than those of girls. This study showed that males could make academic gains in early literacy that are just as significant as their female counterparts.

**Implications**

This study contributes to the body of research regarding the use of tablets in education. Because tablets are relatively new from a historical context, this study examined their use in instruction at an elementary level. Previous studies investigated tablets in special education, high school math, and exit exam scores, but the researcher found minimal data that examined early literacy skill development. According to Flewitt (2013), the use of a tablet in elementary classes can increase children’s motivation and concentration and offers rich opportunities for early literacy as well as collaborative interaction and independent learning. Select results of this dissertation study were statistically significant with first-graders and showed that students can increase their CPAA test scores by using tablet apps. Although the improvement in reading comprehension is the ultimate goal when teaching early literacy skills, there are many factors that combine to help a child read (vocabulary, phonemic awareness). This study provides a starting point for future consideration of research to conduct that will fill the gap in the literature of these two areas. Literally, thousands of different educational apps are available for use on the tablet. The key is to find a high-quality app that reinforces that academic skills that the teacher desires the students to master.
Limitations

This study contains several limiting factors. First, the main threat to internal validity of a nonequivalent control group experiment is the possibility that the group differences on the posttest are due to preexisting group differences rather than to the treatment effect (Gall et al., 2007). Second, the internal validity of this study was pretest sensitization. Because students took the pretest, it is possible that test impacted the students’ responses on the posttest. Third, when considering the threats to external validity, the population must be considered. The researcher utilized a sample from two independent schools in the southeast. The small sample size from two independent schools limits the capacity to generalize to the entire population of both public and private school students. Fourth, similarly to the internal threat to validity, an external threat to validity exists due to the interaction of the pretest with the treatment. The results of this study may not generalize to the non-pretested population. Likewise, the same selection threat due to self-selection in electing to consent to participate could impact this study’s ability to generalize to the population, as the type of student who consents to participate may not be representative of the typical student in the population.

Recommendations for Future Research

Further research on the impact of tablets in early literacy would be beneficial for students and teachers. The researcher conducted this study in independent schools in the southeast. A study conducted in public schools from across multiple regions that incorporates a broader variety of teacher, and an increased socio-economic and racial diversity would also add validity to the results. Having both independent and public schools participate in the study would help ensure that the data results come from a diverse sample that is more generalizable to the overall student population. Additionally, this study utilized CPAA as the pretest and posttest instrument.
The findings of this study would also be validated if researchers utilized a different testing instrument for the pretest and posttest.

Additionally, this study examined the differences in CPAA test scores between males and females. The National Literacy Trust (2012) established that boys’ underachievement in reading is a significant concern for schools. The research conducted in this study showed that boys scored lower than girls on the CPAA, but it also revealed that gains between the pretest and posttest were larger for boys than for girls. Additional study in this area should focus on why boys do not score as highly as their female counterparts in early elementary school.

This study approached the use of tablets in literacy instruction as it relates to Mayer’s (2005a) cognitive theory of multimedia learning. Conducted this study by examining another theoretical construct, would also lend to the validity of the study. The researcher identified two specific theoretical constructs that may be worth considering in future research that centers on tablet use in educational instruction: Rogers’ (2003) diffusion of innovations and Sweller’s (1988) theory of cognitive load.
REFERENCES


Flewitt, R. (2013). Early literacy: A broader vision. *Association for the Professional Development of Early Years Educators, (a).*


Handbook of Multimedia Learning, New York: Cambridge University Press.

Mayer, R. E. (2008a). Applying the science of learning: Evidence-based principles for the design 

Merrill Prentice Hall.


McKnight, Lorna & Fitton, Daniel. (2010). Touch-screen technology for children: Giving the 
right instructions and getting the right responses. 238-241. 10.1145/1810543.1810580.

McKenney, S., Kali, Y., Markauskaite, L. & Voogt, J. (2015). Teacher design knowledge for 
technology enhanced learning: an ecological framework for investigating assets and 


Milman, N. B., Carlson-Bancroft, A., & Boogart, A. V. (2014). Examining differentiation and 
utilization of iPads across content areas in an independent, prek - fourth grade elementary


Appendix A: Permission to Use CPAA

From: NWEA Specialty Accounts <specialty.accounts@nwea.org>
Subject: Data Usage at Brainerd Baptist School
Date: June 12, 2017 at 3:09:06 PM CDT
To: "scorcoran@brainerdbaptist.org" <scorcoran@brainerdbaptist.org>

Greetings,

The CPAA data used for Brainerd Baptist School is the property of Brainerd Baptist School. The School may also authorize users to utilize, access, and view the CPAA data as they deem fit. This also includes the use of the testing software for research purposes.

In Partnership,
Jessica

Specialty Accounts Team
Jessica Lyons, Nancy Barber, Brenda West, Richard White
Account Managers | NWEA™
DIRECT 844.469.1212 | TECH SUPPORT 877.469.3287 | Email Tech Support
Resource Padlet for Small Schools  Password: Resources
Appendix B: IRB Approval

July 14, 2017

Sean M. Corcoran
IRB Approval 2907.071417: The Effect of Digital Tablets’ Applications on Reading Achievement of First Graders in Two Private Schools

Dear Sean M. Corcoran,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

Liberty University | Training Champions for Christ since 1971
Appendix C: School Permission Letters

7/14/2017

To Whom it May Concern:

This letter is to confirm that Sean Corcoran, a graduate student in the School of Education at Liberty University, has my permission to conduct his research as part of the requirements for a Doctoral degree in Educational Leadership. I can be reached at Rpierce@mountpisgahschool.org if anything else is needed from me.

Sincerely,

Ruston Pierce
Head of School

Mount Pisgah Christian School
July 12, 2017

To Whom it May Concern:

This letter is to confirm that Sean Conoran, a graduate student in the School of Education at Liberty University, has my permission to conduct his research as part of the requirements for a Doctoral degree in Educational Leadership. I can be reached at [insert email address] if you have any questions.

Sincerely,

[Name]
Academic Counselor
Appendix D: Parental Permission Form

The Liberty University Institutional Review Board has approved this document for use from 7/14/2017 to 7/13/2018
Protocol # 1807.071417

CONSENT FORM

The Effect of Digital Tablets’ Applications on the Reading Achievement of First Graders in Two Private Schools

Sean M. Corcoran
Liberty University
School of Education

Your child is invited to participate in a research study that is examining the use of tablet applications during literacy instruction. Your child was selected because he/she is in the first grade and, at this level, spends a significant amount of time each day on literacy instruction. I ask that you read this form and ask any questions you may have before agreeing for your child to participate in the study.

This study is being conducted by Sean M. Corcoran, Education Doctoral Candidate at Liberty University.

Background Information:
The purpose of this study is to better understand if the use of tablets (like the iPad) have an impact on students’ learning of reading. Tablets have been implemented at many schools and are being used daily by teachers. I will seek to discover whether or not the use of tablets has a positive impact on student achievement.

Procedures:
If you agree to allow your child to participate in this study, he/she will be involved in the following ways:
1. Your child will, with all other first graders, be given the Children’s Progress Academic Assessment (CPAA) test at the beginning of the study. The test takes approximately 10 to 15 minutes to complete depending on the student.
2. Once the CPAA (pretest) is completed, and if your child is placed in the experimental group, the teacher will utilize the tablet (iPad) in reading instruction each day for a period of six weeks. This will include using the tablet to read books, and students will also utilize learning applications (apps) on the iPad during center time each day.
3. At the end of this period, the students will once again take the CPAA (posttest), and their scores will be recorded. This will complete the research portion of this study.
4. Students participating in the control group will be given the CPAA test (pretest) at the beginning of the study as well. They will then work through a unit of reading instruction that does not utilize tablet (iPad) applications and will take the CPAA (posttest) to compare with the experimental group.

Risks and Benefits of being in the Study:
The study has minimal risks. Risks are no more than the student would encounter in everyday life. In the event that I become privy to information that triggers the requirement for mandatory reporting, I am obligated to disclose that information to administrators. Such information would include child abuse, and the intent to harm self or others.

The group of students participating in the experimental group may receive the direct benefit of improved reading acquisition and higher scores on the CPAA exam. There may also be benefits to teachers and the future instruction of students if the findings show that tablet use during literacy instruction has a positive effect on student learning.

Compensation:
Your child will not receive compensation for participating in this research.
Confidentiality:
The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify any subjects. Research records will be stored securely and only researchers will have access to the records. All student and participant data will be stored on the researcher’s computer which is password protected. The data must be retained for three years. After that time, the data files will be deleted and all documents relating to the study will be shredded.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect your current or future relations with Liberty University, [redacted]. If you decide for your child to participate, you are free to have them withdraw at any time without affecting those relationships.

How to Withdraw from the Study:
If you wish to withdraw your student from the study, please email scorcoran@brainerdbaptist.org, or call (423)991-3850.

Contacts and Questions:
I, the researcher conducting this study, am Sean M. Corcoran. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at Brainerd Baptist School, (423) 622-3873, scorcoran@brainerdbaptist.org. I am a student at Liberty University under the direction of Dr. Connie Pearson, who can be contacted at cpearson@liberty.edu or (423) 505-1683.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Institutional Review Board 1971 University Blvd, Suite 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please contact the researcher if you would like a copy of this information to keep for your records.

Statement of Consent:
I have read and understood the above information. I have asked questions and have received answers. I consent for my child to participate in the study.

Signature of Parent or Guardian

Date

Signature of Investigator

Date
Appendix E: Participant Recruiting Form

August 16, 2017

Dear Parent:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctoral degree in Educational Leadership. The purpose of my research is to study the impact that tablets like the iPad can have on literacy instruction. Our children have increasingly been exposed to tablets and smart devices and their use in education has been significant. This study will seek to determine if the use of tablets in literacy instruction is having a positive impact on student learning. I am writing to invite your child to participate in my study.

If you are willing to allow your child to participate, he or she will be asked to participate in one of two reading groups. One will primarily use tablets during reading instruction, and the other will receive literacy instruction that does not involve the use of tablets. All students will take the Children’s Progress Academic Assessment at the beginning and end of the study. It should take approximately 6 weeks for your child to complete the study. Your child’s name will be requested as part of his or her participation, but the information will remain confidential.

For your child to participate, complete and return the consent document to your child’s teacher. If you have additional questions, please contact me at 423-991-3850 or at scorcoran@me.com.

A consent document is attached to this letter. The consent document contains additional information about my research. Please sign the consent document and return it to child’s school/teacher.

Sincerely,

Sean Corcoran
# Reading Lesson Plan

**Class:** 1A/1B  
**Date:** 9/12/17

## Warm-up:
The students will gather on the carpet and we will have our morning meeting. During this time we will review calendar, weather, pattern, and pattern statements. We will go over the various centers and free choice activities. Center time will end with a review activity that covers the letter blends that we are working on.

## Lesson/Work time:
The students will divide into 3 different centers with 4 students in one group, and 5 in the other two groups. They will rotate through the three centers set up for the class. The first center is a teacher-guided center where the students will work in small groups through leveled readers. The three groups are divided by their reading levels. Each group will work through a book that is focusing on the phonemic blends of “ir” and “u” words. The second group will be working on tablets utilizing the Sight Cards app. Students are trying master 100 sight words by the end of the K5 year. When the student launches the app the various sight words pop up and the app pronounces the word. The student then works through the app completing each word. Once complete, the student goes over the words again and the app does not pronounce the word. The third group will also utilize tablets using the app called AesopsQuest. This app has many children’s stories built into the app. The students work through each story reading the stories. The app will help the student pronounce any words that they are not familiar with. At the end of the story, there are questions that go over the story to review the story to make sure that the student is comprehending what they are reading.

## Closing:
The students in each group will spend the final five minutes of each center reviewing the lesson. In the guided reading center the students will answer comprehension questions (short answer) from the teacher. The other two groups will end their centers by clicking through the review section of the app.