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Action Research Plan: Using iPads to Increase Students' Letters and Letter Sounds Knowledge

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Abstract

This action research was carried out to determine if the use of an application named Phonics Island would help student knowledge of letters/letter sounds increase. The research was completed in a full day Primary Montessori classroom of 4k and 5k students. Data was gathered using teacher observation and teacher made checklists. Data on students' feelings toward learning letters/letter sounds was also assessed to see if students' thoughts about letters changed after incorporating technology. Students were given an iPad for approximately fifteen minutes per day. The letters were grouped in categories, and the researchers chose which group the student needed to complete for the day. The students did show growth over the course of the six-week study, but it is hard to determine if the growth was due only to the use of the iPads. During the six weeks, the researchers also gave many teacher-led lessons, and the students also completed many student-led, independent lessons that did not include technology. The researchers believe the outcome was due to a combination of iPad lessons, teacher led lessons, and independent lessons. More research could be conducted to test how influential the iPad lessons are by having a control group that received only iPad lessons for a few weeks.

Keywords: letters, letter sounds, iPad, technology, Montessori

Technology is a large part of children's lives; teachers have been faced with the battle of using technology in the classroom. Teachers also struggle with how much technology to use. Many researchers agree that students need to be exposed to technology in early childhood classrooms, and that it can actually improve students' knowledge in academic areas.

Technology has grown over the last fifteen years (Zucker, 2008). Schools across America are spending more and more money to incorporate technology into the curriculum (Norman, 2008). Collins and Halverson (2009) and Plowman and McPake (2013) agree that schools need to continue the trend of incorporating technology into the curriculum. Many jobs require the use of technology and students need to be ready to handle the technology requirements they will need to be successful at work. Collins and Halverson pointed out in their book that many people rely on technology as adults. Technology has changed the lives of everyone; it has changed the way we think, live, and act (Collins & Halverson, 2009). Research about using technology in schools is increasing, and school administrators are encouraging teachers to incorporate technology into the classrooms. With the push from administration to increase the use of technology in the classroom, it became evident to the researchers that there needed to be more research on how to introduce technology in a developmentally appropriate way. Age appropriateness for kindergarteners would be activities that keep students engaged and are hands on. The purpose of this study was to determine if fifteen minutes of use with an iPad would enhance and increase student knowledge of letters and letter sounds. Based on data from the primary researchers' classrooms, 48% of the five year olds scored below average on state testing and teacher made assessments for letters/letter sounds. Both researchers noted that state assessments and teacher given assessments show a large percentage of students struggling with recognizing letters and identifying letter sounds. Teacher made assessments also showed little to

no improvement from the previous year's assessments to the current year on learning letters and letter sounds overall. The issue has not been noticed to pertain to only certain letters or letter sounds; it seems to be across the board in the alphabet. Both researchers are with all of the students daily and notice that a large percentage of students are not retaining the letters and letter sounds from day to day. Many strategies to help with retention of letters and letter sounds have been implemented in the classroom, such as sandpaper letters, games with letters where students point to the letter the teacher says, and matching objects and pictures to letter sounds.

In the past, both researchers tried multiple methods to teach letters and letter sounds, including, flashcards, special actions/motions associated with each letter sound, pocket charts with letters, poems and songs. In a small group, students traced sandpaper letters, matched upper/lowercase letters, matched objects to beginning sounds, and completed alphabet puzzles. Over the past few years, the researchers noticed that students were struggling to retain letter sounds. The classroom and standardized testing confirmed the concern that students needed extra help retaining letters and letter sounds.

The researchers met and brainstormed ways that could possibly help students retain letter sounds. Prior to the research, administration shared the desire for researchers to incorporate more technology into instruction. Each kindergarten teacher was issued a total of nine iPads for classroom use. This is what pushed the researchers to implement the use of the iPads into action research. Since the use of technology was being strongly suggested, the researchers wanted to be sure it was beneficial to the students. The biggest need for extra practice at the time was letters and letter sound retention so the action research project was developed to help with this need. The iPads were a method that neither researchers had tried before. Both were curious to test technology directly related to student learning.

The research was conducted in a rural public school in South Carolina. The school has five primary Montessori classrooms (4-k and kindergarten), two lower elementary classrooms (first-third grade), one conventional kindergarten, two conventional first grade, and three to four conventional classrooms from second to eighth grade. Each Montessori class averages 24 children. The student population is 867 and there are 47 teachers employed. The school has a large percentage of children coming from low income homes; 62% of the students receive free/reduced lunch. For this research project, twenty-six 5k students were involved. One classroom has thirteen kindergarten aged children. There are four boys and nine girls. Four students are on free/reduced lunch. Three students (boys) receive speech therapy. One boy has been diagnosed with autism; he has a shadow, receives speech, occupational therapy and physical therapy. He is in the classroom all day (other than therapy). The second classroom also has thirteen kindergarten students. There are five girls and eight boys. Five students are on free lunch. Two students receive speech therapy. All twenty-six students speak English as their primary language; all but two were in a pre-kindergarten program.

Both classrooms have a lead teacher and an assistant. One class has an applied behavior analysis (ABA) therapist (a shadow for the special needs child) for the entire day. The ABA therapist serves as an educational assistant who works directly with the student with autism. The kindergarten program consists of eight hours a day with lunch and special area classes (music, PE, and computer lab) given for the last hour of every day. There are two researchers in this study and both have experience as Early Childhood teachers, and have been in a primary Montessori classroom for two years.

Literature Review

The literature addresses the importance of letters and letter sound knowledge for success in reading. Some specific areas covered in this review include: (1) letter and letter sound recognition and how it relates to reading; (2) the rise of technology use in schools; (3) problems with reading (including, but not limited to, letter sounds, reading, letter identification) in classrooms and strategies the teachers used to solve the literacy problems; (4) using technology in appropriate ways to ensure children are learning from it; (5) studies showing the cons of using technology in the classroom.

Letter and letter sound recognition and learning to read

Letter and letter sound recognition are key elements for early readers. Children must know letter sounds before learning to read. When children know letter sounds, they can blend letters and, as a result, read (Dodd & Carr, 2003; Dougherty, 2014).

In the article *Young Children's Letter Sound Knowledge*, Dodd and Carr (2003) state that letter recognition is an important and necessary skill that enables children to learn how to read. Dodd and Carr explain how teaching letters to young children can be difficult because letters are abstract and up until this point in children's lives have not been important. They also say that letter sound knowledge requires different skills than the skills required to identify letters. According to these authors, economic status seems to affect the experiences children have entering kindergarten. For example, when children come from low-income backgrounds, many times parents are stressed and cannot spend as much time talking and playing with the children. Children need to have many forms of communication in their young lives, and when parents are working many hours a day, the communication children receive is limited. Also when parents are working a lot and are stressed, their children do not have as many experiences that build their

background knowledge. Dougherty (2014) also noted that learning letters can be difficult for young children. In his article, he discussed how some letters are more challenging than other letters and teachers need to be aware of this when teaching young children. Knowing that letters are an abstract, unimportant concept for most children means it is important to use appropriate strategies to teach letter sounds so that students can be successful in letter/letter sound recognition (Dodd & Carr, 2003).

Dougherty (2014) gives the following strategies for teaching students to read: exposing children to print around the room and in daily lessons and teaching students the letters in their names first. Dodd and Carr (2003) state that teachers need to be aware of letter formation and group letters together based on this. Block and Duke (2015) indicated that teachers need to have some background knowledge of the English language before successfully teaching letters, including that some letters make different sounds and paired letters can make different sounds in different words. They also stated that teachers need to interchange letter sounds with letter names instead of only teaching letter names. Just teaching one can confuse the children because they often say the wrong sound for the name.

The rise of technology use in schools

The use of technology has changed dramatically over the last 15 years. There has been a rise in government owned online schools and the use of technology in classrooms has increased tremendously (Zucker, 2008). Norman (2008) specified that two million computers were placed in US schools from 1998-2008. They both agree that technology has and will be on the rise in public schools, but how teachers use it will determine if students will gain knowledge from the use of it (Norman, 2008; Zucker, 2008).

Collins and Halverson (2009) and Plowman and McPake (2013) believe schools need to

continue the trend of incorporating technology into the curriculum. Many jobs require the use of technology and students need to be ready to handle the technology requirements they will need to be successful at work. Plowman and McPake (2013) also pointed out in their book how many people must rely on technology as adults.

How others have tried to solve literacy problems in the classroom

Educators have used technology to improve student learning of reading skills. Many had struggling readers and wanted to see if technology could help their students. They incorporated technology into their curriculum to see if it made an impact. Garcia (2016), Jones (2016), Beschorner and Hutchison (2013), Patchan and Puranik (2016) and Morgan (2013) all concluded that technology, as a supplement, can help students learn letters and literacy related components of reading. Blachowicz et al. (2009) agree that technology for at risk children can improve student learning.

Garcia (2016) noticed that over the years her students had struggled to retain letter/letter sound identification. She also noted that she had a large number of children living in poverty in her classroom. She thought it would be interesting to see if the use of a SmartBoard would help students with letter retention. She separated letters into two different groups according to the formation of the letters. She taught one group using only technology and one group using only teacher directed lessons. She noted that the teacher directed lessons yielded a higher result than the SmartBoard lessons. She concluded by saying she still believes technology can help students in the classroom, but it needs to be supplemented with teacher directed lessons, instead of used as the only method of teaching (Garcia, 2016).

Jones (2016) conducted a study using technology lessons that paralleled Montessori lessons to see if they would increase student engagement with literacy work. She worked in a

classroom that was considered to have “at risk” students. She observed students before she conducted her study and compared results to after technology was incorporated into the classroom. She used the SmartBoard and iPads to give students extra lessons on different literacy components including letter and letter sound identification. She used Starfall.com and ABCMouse.com for six weeks and kept documentation of student progress. By the end of the six-week period, her students’ knowledge of letters/letter sounds and the number of literary works completed by the students had increased (Jones, 2016).

Blachowicz et al. (2009) conducted a study of incorporating technology into the literacy curriculum in eighteen first grade classrooms. They found that the students and teachers both felt positive about the integration of technology. They used computer curriculum materials created by Innovations for Learning. They concluded that the students and teachers enjoyed the program and the literacy knowledge of the students improved over the course of the study. The results from the spelling subtest of the Standardized Illinois Snapshot of Early Literacy showed that the students with technology infused into their curriculum scored higher than students in classrooms that were not using the literacy technology based curriculum. Students in the technology-based literacy curriculum scored an average of 20.36 while the students with no technology infusion scored an average of 18.93. The teachers also noted that the students were transferring data from their technology to class lessons.

D’Agostino, Rodgers, Harmey, and Brownfield (2016) conducted a study with six and seven-year-old struggling readers that were in Reading Recovery programs. They used an iPad app called Letter Works. Their study concluded that the app did help the struggling readers and they improved significantly on their post assessments. They also believe that technology is a necessity in the classroom. They go a step further to say that the rise in technology is especially

beneficial for struggling readers. Morgan (2013) agrees that struggling readers need some motivation and technology could provide that needed motivation.

Stearns (2012) compared different studies that had been done about technology in the classroom and found that technology had a positive impact when used. Many of the studies she reviewed showed that technology had as much impact as the teaching. Huber et al. (2016) conducted a study that said students can transfer what they learn on a touchscreen device to other types of learning. For example, they learned how to solve a problem on a tablet and could transfer what they learned to solve the problem using physical objects.

Lee (2016) conducted a study amongst low income preschool children. She utilized digital media including the use of iPads. The teachers in the study used the iPads in group sessions and concluded it helped with social communication between students and teachers and also students with other students. In conclusion, Lee stated,

As a result, questions related to young children's uses and favoritism of digital media is not a matter of if or not early childhood classrooms should use such technologies anymore. Instead, early childhood professionals should think of appropriate but proactive pedagogical approaches that can be developed for young children's learning and their play with digital media. (p. 949)

Using technology in appropriate ways to ensure children are learning from it

There is much research stating that technology is a great asset for the classroom, but there seems to be just as much research stating that for children to learn from it, it needs to be used appropriately and as a supplement instead of a teaching guide (Lee, 2015; NEIR*TEC, 2004; Northrop & Killeen, 2013; Patchan & Puranik, 2016; Blachowicz et al., 2009).

Incorporating technology appropriately into the young child's classroom can be difficult.

Teachers need to be aware of how and when to use it with young children. Northrop and Killeen (2013) list some important facts to remember when using technology to increase literacy skills in young children. For example, some steps for teaching letter-name phonics while integrating an iPad include: teach the concept first without using the iPad, model exactly how to use the App, have guided practice with the children using the App, and allow the child to have independent practice with the App. It is important to use technology in ways that are going to benefit children. The authors also warn teachers to be aware of the limitations of using technology. For example, technology is not going to teach students, it should be used as a supplement to what teachers have already taught (Northrop & Killeen, 2013).

More research stating that technology should be used appropriately is found in an article published by NEIR*TEC. They also believe that teachers need to first teach and then use technology as a supplement. They quoted, "Knowledgeable and dedicated teachers are the critical element in successful reading instruction programs" (p. 2). They go on to say that technology is a great add-on in the classroom, but could never replace qualified teachers (NEIR*TEC, 2004).

Studies showing the cons of using technology in the classroom

Bonilla (2011) starts out his article by stating how technology has benefited many, including himself. He also lists potential risks of using it in the classroom. He lists six potential negative effects for technology integration:

- 1) Limiting pedagogy in teaching for cultural competence;
- 2) Reinforcing the Digital Divide;
- 3) Constraining the potential for holistic, humanistic education;
- 4) Privileging one style of communication while limiting broader approaches;
- 5) Transforming teaching into a form of sensory deprivation;
- and 6) Diminishing standards of academic excellence in the classroom (p.

28).

The sensory effect is one that may concern early childhood teachers. Clay (2001) also lists this as a concern in his book. He states that children need to use all of their senses when learning. Bonilla (2011) points out that an iPad is not engaging all of the senses of a child. Another concern is that low income students will not have access to technology outside of school. This will create stress when schools turn to mainly technology-based lessons. He is also concerned that students will not communicate with others when, for the majority of the class, they are focused on completing tasks that are on a screen. Students need to analyze and discuss information with each other to learn from each other. One major fear of Bonilla is that money directed toward technology could be used to improve other diminishing areas of schools. Ten billion dollars a year is being spent on providing technology in public schools (Koonce, 2018). This push for technology is causing teachers to teach in ways that they are not comfortable with (Bonilla, 2011).

In the book *Taking Sides: Clashing Views on Educational Issues*, more cons of incorporating technology into classrooms are provided. Herold (2015) was concerned with the amount of money spent and the lack of proof showing that the rise in technology has increased scores and student knowledge. Students need higher order thinking and need to learn how to solve problems without relying solely on technology to help them (Herold, 2015).

Pre-reading skills of letter and letter sound identification are important for later reading success of young children (Dodd & Carr, 2003; Dougherty, 2014). With the rise of technology, teachers are beginning to incorporate it into the classrooms to see if student learning will increase (Zucker, 2008). Several researchers/educators have used technology in their classrooms to see if their students' knowledge would increase. Among these researchers are Garcia (2016),

Jones (2016), Beschoner and Hutchison (2013), Patchan and Puranik (2016), and Morgan (2013). They all used technology in their classrooms as a supplement and concluded that it was beneficial in helping students learn different literacy components, including letters and letter sounds (Garcia, 2016; Jones, 2016; Beschoner & Hutchison, 2013; Patchan & Puranik, 2016; Morgan, 2013).

While there are studies that conclude technology is successful in classrooms there are still some critics, such as Bonilla (2011), who fear that technology will not allow students to have a holistic teaching approach. Clay (2001) stated that technology does not allow students to use all of their senses while learning. Many educators/researchers also have the fear of losing the holistic approach to teaching and encourage teachers to use technology in developmentally appropriate ways; including, using it as a supplement to teacher given lessons and to model how to complete the lessons (Northrop & Killeen, 2013).

Research shows that positively including technology into the young readers curriculum, can improve their literacy knowledge. Students seemed to improve when they were able to interact with the technology. Teachers have to be conscious of how children use technology to ensure that students will benefit. For example, if students are watching movies, they will not learn, but if the lessons are very specific and planned out by the teacher, students will yield better results. This project will focus on using an app called Phonics Island on an iPad for 15 minutes a day to see if students' knowledge of letters/letter sounds increase.

Action Research Question

Will the use of a literacy application (Phonics Island) on an iPad for fifteen minutes a day in a Montessori primary classroom increase students' knowledge of letters and letter sounds?

Description of Research Process

Once the researchers felt prepared and ready, the proposal was submitted to the school administrators. Administrators reviewed the proposed action research and granted approval to begin the project in the two classrooms. Letters were sent home to the parents of the children in both classrooms, giving them the option to opt their children out of the research. The parents were given two weeks to opt out; all parents agreed to allow their children to participate.

The purpose of this study was to determine if the use of iPads would increase student knowledge of letters and letter sounds. The goal was to raise the percentage of letters and letter sounds that the students knew. By the end of six weeks the researchers planned to increase the percentage to 58% olds being average or above average on the state testing and teacher made assessments for letters/letter sounds. This goal was determined from Kindergarten standards and the scores that the students should score on a district wide assessment called The Developmental Reading Assessment 2 (DRA2) to be on grade level. DRA2 is given three times a year, with the option for researchers to give it more frequently if needed. Kindergarten students should recognize all letters and be able to say all letter sounds by the end of Kindergarten per the South Carolina Literacy Standards. The teacher-made letter checklists were given every two to three weeks; this was to meet protocol requirements for kindergarten at the researchers' school.

Hendricks discussed the topic of credibility, "Collecting multiple forms of data and triangulating them will help increase the credibility of your findings, and this will ultimately affect the validity of your study" (2013, p.90). The researchers worked hard to have a research process that would be valid and credible. The first part of the research involved a pre-assessment to establish a baseline for student knowledge of uppercase letters, lowercase letters, and letter sounds. Hendricks (2013) explains, "Baseline data are collected before the implementation of an

intervention, and they are used to make comparisons of participants before and after the intervention occurs” (p. 119). The researchers used a checklist to check off how many letters and letter sounds the students knew in a spreadsheet with three columns and twenty-seven rows (see Appendix A). Across the top the columns are labeled "upper case letter recognition" (the letters are under this label), "before iPad intervention", "three weeks into iPad intervention", and "post iPad intervention." The post iPad intervention assessment was six weeks after the start of iPad use. The reason for having the pre-assessment, midway assessment, and post assessment all on the same page was so that progress, or lack of, could easily be seen and noted. The researchers also assessed lowercase and uppercase letters following the same format (see Appendix B). Tally marks were used to track how many students knew each letter and letter sound.

Prior to iPad use, the researchers asked the students to complete an attitude scale which provided information about each student's feelings toward learning letters (see Appendix C). Hendricks shared the importance of this data, “If you wish to determine ways in which an intervention affects achievement or attitudes, you will need to measure these constructs before beginning the implementation phase of your study” (2013, p.119). The first question was, “Do you like learning about letters and letter sounds?” The students answered with one of the following: ‘yes’, ‘no’, or ‘not sure’. The students colored a face that matched their feelings. Under each question there was a smiley face which represented ‘yes’, a face with no expression that represented ‘not sure’, and a sad face represented ‘no’. The second question was, “Are learning about letters and letter sounds easy or hard?” The students colored a smiley face that represented ‘easy’, a face with no expression for ‘not sure’, or a sad face for ‘hard’. The researchers read the questions and answer choices to the students. The researchers also observed to make sure each student only colored one answer choice.

Two weeks before the research start time, pre-assessments were completed over a one week time frame. The researchers started two weeks early to ensure time to finish all assessments. Due to many absences with the flu and other sickness, it took the full two weeks to complete the assessments. Students were assessed in the afternoon during four-year old rest time. The researchers assessed each student individually while the other students were working on activities in the classroom. There was some background noise. However, this was how the students were usually assessed and they were focused on their assessments while they were given.

Next, the iPad intervention began. The researchers taught letters/letter sounds in the groups and order laid out in the Montessori language album. The groupings are as follows: SMAT, PCFR, BLIGN, DHJK, WOUV, YZXQE. The researchers started with lowercase letters, then introduced uppercase letters. The app the researchers chose to use on the iPads also grouped letters in this order. This ensured a direct correlation of typical Montessori letters and letter sound practice and iPad usage. The researchers chose the set of letters the students needed more work on, based on the pre-assessment results. The students received daily lessons on the sets of letters they needed through small group and the iPad. The researchers pre-made flashcards for the students so they could be utilized during work cycle or early morning work. All students reviewed the sets of letters they needed in the mornings when they entered the room. This was accomplished by working with a friend who knew the letters or with the researcher. The students really enjoyed working with friends and usually reviewed letters three to four times each day as part of chosen work. The researchers also used sandpaper letters, letter matching cards and popsicle sticks, alphabet puzzles, and beginning sound pictures to match to the beginning letter with the picture. The small group lessons were also done every day. Students received small

group lessons at least twice a day. During large group, the students sang ABC and letter sound songs. Large group instruction was not limited to certain letters because all of the students practiced different sets of letters according to their needs. The purpose of large group letter and letter sound practice was to provide a review of all letters.

The iPad lessons were completed daily for fifteen minutes each afternoon. The only exception was when a child was absent. Absences were noted on the lesson logs which provided the dates and amount of time each student used the iPad (see Appendix D). During the first two days the researchers spent time introducing the application on the iPad and showing the students how to navigate the app. The next two days were spent observing the students to ensure they had a clear understanding of how to use the application. The researchers observed the students for the remainder of the six weeks, but also gave the students more independence to practice on the application as they pleased. The researchers chose the set of letters for each student to practice on the application. The application provided the following activities: upper and lowercase match, letter memory game, letter tracing, listen to the letter sounds, and view the correct formation of the letters. This activity was completed in the afternoons near the end of the day. The researchers kept an observation log of how involved and engaged the students were each day as they completed the work on the iPad (see Appendix E). Hendricks explained why observations are crucial in action research. "Artifacts can help you decide whether an intervention has had an impact, observational data can help determine why an intervention was successful or unsuccessful and how the context of the setting affected the study" (Hendricks, 2013, p.100). The document had a box for each child, labeled student a, b, c, etc. No student names were written on any document to ensure confidentiality. For each student, the researcher marked if the students were 'eager' or 'resistant' to begin iPad time and if students completed the iPad work

'independently' or 'needed teacher support.' The researchers also observed to see if students were only engaged for five minutes or ten minutes of the iPad usage. Other notes or observations helpful to the research were also noted on the observational logs.

The students continued working in small groups, large groups, and working with the iPads for six weeks. After three weeks, the researchers completed a mid-project assessment to see how much, if any, improvements were made. Students were assessed the same way as the pre-assessment to ensure validity. The researchers used the same checklist (Appendix A) and pointed to letters as the students said the name and sounds. Uppercase, lowercase, and letter sounds were assessed. The researchers spent one hour for three days assessing students. The researchers used the letters and letter sounds midway assessment to determine if any changes needed to be made to the iPad usage. The researchers also used this time to reflect and study the information gained so far to be sure they were collecting adequate data. After the midway assessments, the daily iPad usage continued for another three weeks. At the end of the six weeks, the students were given the same assessment (Appendix A); this also took approximately three hours. The students were assessed in the afternoon while the four-year old students rested.

Data Analysis

This research explored the effects of using an iPad in the classroom for fifteen minutes a day for six weeks. Four different types of data resources were used throughout this study. The researchers used paper/pencil lists to check the students progress/attention throughout the project.

# of uppercase letters identified	Pre-assessment (number of students)	Midway assessment (number of students)	Post-assessment (number of students)
0	0	0	0
1-5	4	2	0
6-10	8	6	3
11-15	2	4	2
16-20	3	3	3
21-26	9	11	18

Table 1: Results of pre-assessment, midway assessment, and post-assessment of uppercase letters.

For this assessment the researchers made a table to show how many letters students knew (See table 1). Then, researcher A and researcher B grouped the students based on the amount of letters and letter sounds they knew. The pre-assessment data served as the baseline and showed the following results: four students correctly identified one to five letters, eight students correctly identified six to ten letters, two students correctly identified eleven to fifteen letters, three students correctly identified sixteen to twenty letters, and nine students correctly identified twenty-one to twenty-six letters.

On the midway uppercase letter recognition assessment, all students improved from their pre-assessment score. Two students correctly identified one to five letters, six students correctly identified six to ten letters, four students correctly identified eleven to fifteen letters, three students identified sixteen to twenty letters, and eleven students identified twenty-one to twenty-six letters. The average increase for uppercase letter recognition at the mid-point of the study was 15%.

Table 1 also shows on the uppercase letter recognition post assessment, all students improved from their midway score. At the point in the school year when the post assessment was

given, the students must correctly identify at least sixteen letters to be considered on kindergarten level. Even though all twenty-six students did not score at the on or above kindergarten level range, every student still showed growth and progress. Three students correctly identified six to ten letters, two students correctly identified eleven to fifteen letters, three students correctly identified sixteen to twenty letters, and eighteen students correctly identified twenty-one to twenty-six letters. The average increase for uppercase letter recognition from the midway assessment to the post assessment was 12 percentage points. The overall average increase for uppercase letter recognition from the pre-assessment to the post assessment was 27 percentage points. The average percentage of students on or above kindergarten level for uppercase letter recognition are as follows: pre-assessment: 54% (knew eleven or more) midway assessment: 69% (knew eleven or more), and post assessment: 81% (knew sixteen or more).

# of letters identified	Pre-assessment (number of students)	Midway assessment (number of students)	Post assessment (number of students)
0	0	0	0
1-5	3	1	0
6-10	7	5	2
11-15	2	2	2
16-20	3	5	5
21-26	11	13	17

Table 2: Results of pre-assessment, midway assessment, and post-assessment of lowercase letters.

Table 2 shows the pre-assessment data, for lowercase letters, served as the baseline and displayed the following results: Three students correctly identified one to five letters, seven students correctly identified six to ten letters, two students correctly identified eleven to fifteen

letters, three students correctly identified sixteen to twenty letters, and eleven students correctly identified twenty-one to twenty-six letters.

On the midway lowercase letter recognition assessment, all students improved from their pre-assessment score. One student correctly identified one to five letters, five students correctly identified six to ten letters, two students identified eleven to fifteen letters, five students identified sixteen to twenty letters, and thirteen students identified twenty-one to twenty-six letters. The average increase for uppercase letter recognition at the mid-point of the study was 10 percentage points.

Table 2 also shows the lowercase letter recognition post assessment, all students improved from their midway score. At the point in the school year when the post assessment was given, the students must correctly identify at least sixteen letters to be considered on kindergarten level. Even though all twenty-six students did not score at the on or above kindergarten level range, every student showed growth and progress. Two students correctly identified six to ten letters, two students correctly identified eleven to fifteen letters, five students correctly identified sixteen to twenty letters, and seventeen students correctly identified twenty-one to twenty-six letters. The average increase for lowercase letter recognition from the midway assessment to the post assessment was 16 percentage points. The overall average increase for lowercase letter recognition from the pre-assessment to the post assessment was 26 percentage points. The percentage of students on or above kindergarten level for uppercase letter recognition are as follows: pre-assessment (11-15, 16, 20, and 21, 26): 59%, midway assessment (16-20 and 21-26): 69%, and post assessment (16-20 and 21-26): 85%.

# of letters identified	Pre-assessment (number of students)	Midway assessment (number of students)	Post assessment (number of students)
0	0	0	0
1-5	5	2	0
6-10	5	1	0
11-15	3	5	3
16-20	2	3	6
21-26	11	15	17

Table 3: Results of pre-assessment, midway assessment, and post-assessment of letters sounds.

Table 3 shows the assessments for the letter sounds checklist given over the course of the six weeks. On the pre-assessment, five students knew one to five letter sounds, five students knew six to ten letters, three students knew eleven to fifteen letters, two students knew sixteen to twenty letters, and eleven students knew twenty-one to twenty-six letters.

On the midway letter sound assessment, all students improved from their pre-assessment score. Two students knew one to five letter sounds, one student knew six to ten letter sounds, five students knew eleven to fifteen letter sounds, three students knew sixteen to twenty letter sounds, and fifteen students knew twenty-one to twenty-six letters. The average increase for letter sounds at the mid-point of the study was 7 percentage points.

On the letter sound post assessment, all students improved from their midway score. At that point in the school year, the students needed to know at least sixteen letter sounds to be considered on kindergarten level. Only three students scored below the on-level score for letter sounds; however, those three students were very close to the on-level score.

Three students knew eleven to fifteen letter sounds, six students knew sixteen to twenty letter sounds, and seventeen students knew twenty-one to twenty-six letter sounds. The average increase for letter sounds from the midway assessment to the post assessment was 19 percentage

points. The overall average increase for letter sounds from the pre-assessment to the post assessment was 26 percentage points. The percentage of students on or above kindergarten level for uppercase letter recognition were as follows: pre-assessment (eleven-fifteen, sixteen, twenty, and twenty-one, twenty-six): 62%, midway assessment (sixteen-twenty and twenty-one –twenty-six): 69%, and post assessment (sixteen-twenty and twenty-one-twenty-six): 88%

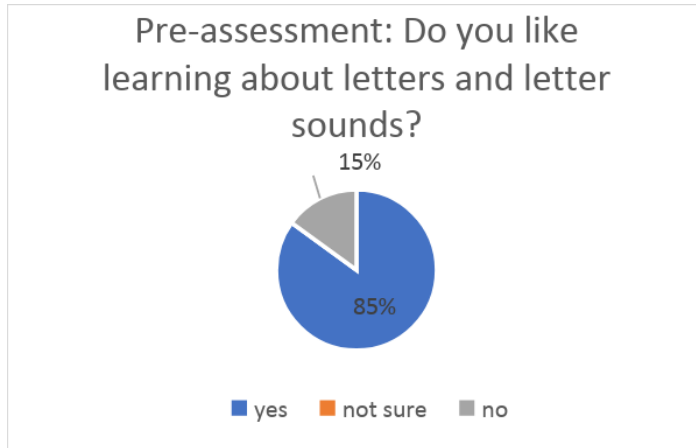


Figure 1: The pre-assessment percentage of students' feelings about learning letters/letter sounds.

Before the project began, the students were asked how they felt about learning letter sounds. Figure 1 shows 85% of the students answered that they enjoyed learning about letter sounds. Twenty two of the twenty-six students interviewed said that learning letters was fun. Two boys and one girl said they did not like learning about letters and letter sounds. Two of the students that said they did not like learning about letters were below average students; while two of the students were at/above grade level.

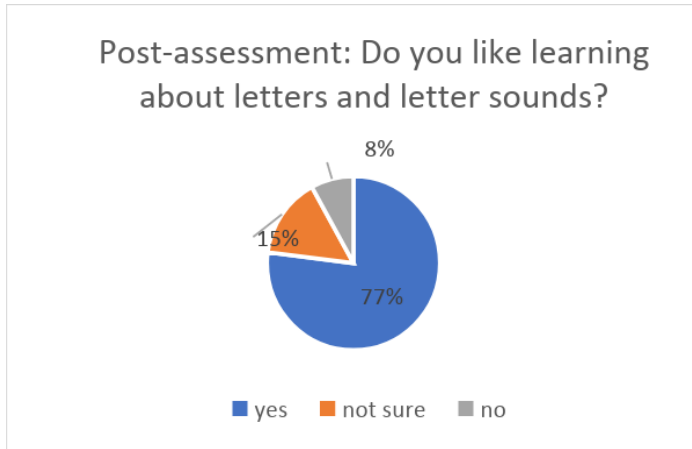


Figure 2: Post-assessment percentage of students' feelings about learning letters/letter sounds.

For the post-assessment, students were asked again if they liked learning letter sounds. Figure two displays that 72% said they did; there were a mix of high, low, and average students. While 15% said they were not sure, and 8% said they did not like learning about letters/letter sounds.

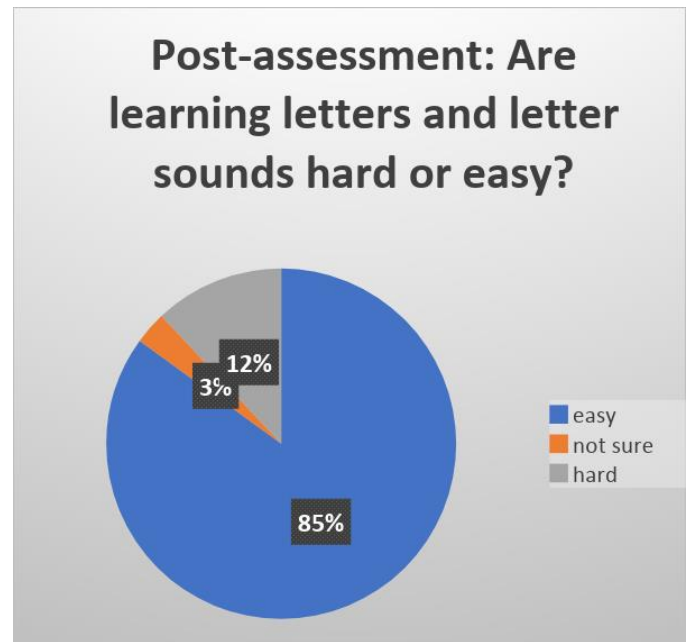
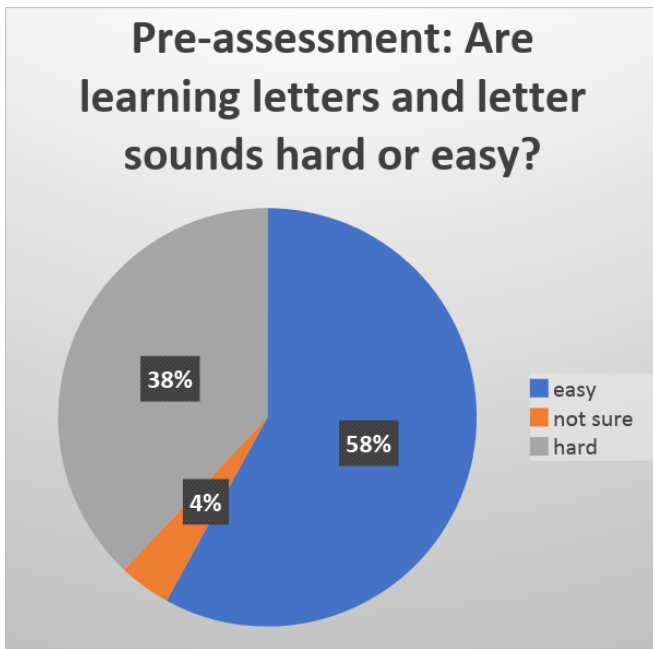


Figure 3 and 4: Pre and post assessment of students' feelings about learning letters and letter sounds.

Before the project, the students were asked if learning letters were hard or easy for them. Figure 3 demonstrates that fifteen students said that learning letters was easy for them. One child said they were unsure if it was easy or hard. Ten children (38%) said that learning letters and letter sounds was hard. Figure 4 displays if the students felt that learning letters and letter sounds were easy or hard; 85% (twenty-two) students said learning letters/letters sounds was easy. While 3% (eight) said they were unsure, and 12% (three) said it was hard. Overall, student feelings towards learning letters and letter sounds became more positive at the end of the study.

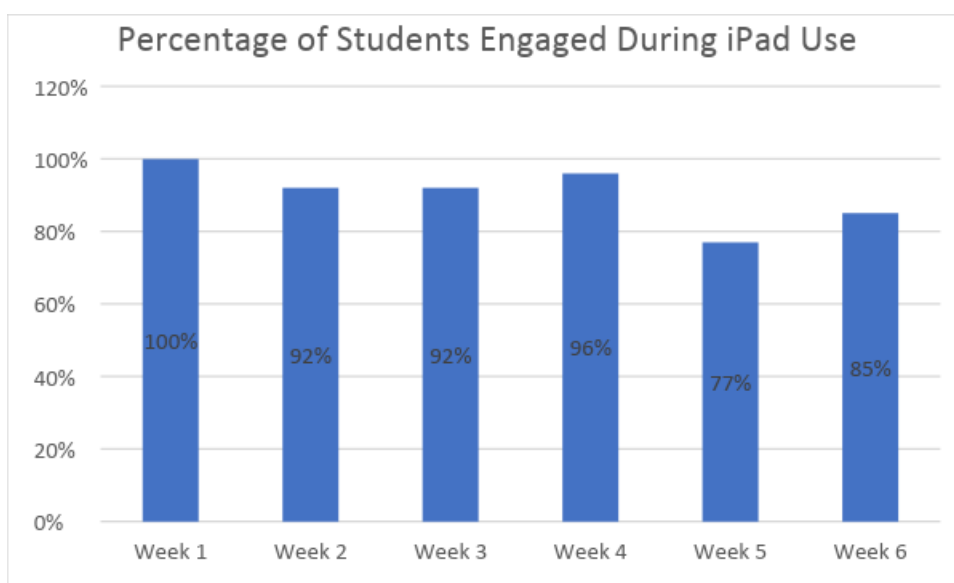


Figure 6: Percentage of how many students were engaged during the use of the iPad.

To be counted as engaged during iPad use, the student had to be engaged for at least ten of the fifteen minutes. The researchers noted that students needed teacher assistance for certain parts of the iPad practice, but it still counted as engaged time. For example, 65% of the students had difficulty tracing the letters correctly on the iPad screen. If the student's finger did not slide perfectly on the letter outline, the application would not move to the next step. (See Figure 6 for a breakdown of students that were engaged over the six-week period).

The goal of this study was to have 65% of the students on or above grade level overall in all three levels. At the start of the project, 41% of children were under grade level. On grade level meant that the student knew twenty-one to twenty-six of letter sounds. When the study began, six students were under grade level for lowercase letters and twelve students were under grade level for uppercase letters. Six were also under grade level for letter sounds. For the mid-assessment, six students were under grade level for lowercase letters and seven students were under grade level for uppercase letters. Three were also under grade level for letter sounds. For the post-assessment, four kids were under grade level for lowercase letters and five students were under grade level for uppercase letters. Three were also under grade level for letter sounds. By the midway assessment, the students under grade level decreased to 21%. By the post-assessment, the percentage moved down to 15%. Eighty-five percent of the children were on grade level at the end of the project. The researchers concluded that when the first goal of 65% was met, they did not take into consideration that the project would be done so far into the school year; by January, the start of the project, many students were closer to mastery of letters/letter sounds than they were in October when the researchers decided to study this topic. Many at the point of the study had moved on to blending sounds to read. The researchers also concluded that the combination of teacher led, student led, and technology driven lessons all played a role in the students' increased knowledge of letters and letter sounds.

All students showed growth over the six week period. The researchers noticed that around week three and four, students began to lose interest in using the application on the iPad. The researchers inferred that the students grew weary of using the same app, and the students may have been more interested if there had been a variety of choices. The students could complete different groups of letters, but it was the same activities with each group of letters.

The students asked if they could do a different activity on the iPad; the researchers concluded it may have been beneficial to use more than one application on the iPad next time this study is conducted.

Overall, the students made a tremendous amount of growth; the researchers could not conclusively say it was only because of the iPads. Researcher A and researcher B believed the iPads helped and engaged students, but there were many other lessons that influenced the students' growth in knowledge. If the researchers conducted this study again; they would have a control group that did not use the iPads and one that did use the iPads. To maximize the results of the study, the researchers would divide the students into equal academic levels for the two groups.

Action Plan and Conclusion

This action research validated the benefit of using iPads and technology to enhance student letter and letter sound knowledge. Researcher A and researcher B anticipated the iPads would increase the students' knowledge over the course of the six weeks. The students' knowledge did increase, but the researchers cannot conclusively say that the iPad is the reason behind the students' increase in knowledge because there were many teacher led and student led independent activities that happened over the course of the six weeks. If the researchers repeated this study, they would include two groups; one that used iPads and one that did not. Then the data could be compared to see how much just the iPad usage increased the students' knowledge versus the teacher and student led activities.

The researchers noticed that after two weeks of the students using the same application on the iPad, the students were not as excited about it as they were to begin with. The researchers

noted that it would have been a good idea to use several different applications that reviewed letters and letter sounds instead of only using one.

The study showed that technology was a great resource to use along with teacher led lessons to motivate students to learn. The students enjoyed using the iPads and were eager to use it to learn. The researchers were concerned that the students would focus their concentration on iPad time which would hamper interest in teacher and student led activities in the classroom. However, the students quickly adjusted to the schedule and the iPad did not cause problems for the other language works. The students continued to enjoy teacher led and student led lessons just as much as the iPad activities.

Another benefit of this action research was the excitement students showed regarding iPad use for learning. The majority of the students in this study used some type of technology at home. Examples are videos, songs, and games. Researcher A and researcher B shared the name of the application used so that parents can use it at home if they chose. Along with the application used during this study, the researchers provided parents with a collection of free learning applications. Both researchers are hopeful that this information will increase parent involvement and family discussions about what their children are learning at school.

Before this study, both researchers were apprehensive and reluctant to use iPads in a Montessori classroom. Several veteran Montessori teachers shared their concern that technology was unnecessary and possibly harmful as such a young age. However, researcher A and researcher B were relieved to see results which showed the opposite. This study showed the researchers that technology can be incorporated into early childhood classrooms appropriately and yield benefits for the students. The researchers are certain that they will continue to use technology to enforce what they are already teaching. The researchers believe it is important for

students to be introduced to a topic before completing lessons using technology, but technology can be a useful tool for students. Also, by using technology, the researchers discovered another method for teaching towards different learning styles of students.

The results of this study will impact future teaching for researcher A and researcher B. The observational data taken during iPad use showed the need for more than one application to practice letters and letter sounds. All of the students were not interested in doing the same application every day. Both researchers plan to model using a different application on the iPad two or three times a week. After a few weeks, the students will have a large selection to choose from when using the iPad for practice. Since the study proved that iPad use was effective and appropriate, both researchers also plan to extend the iPad use to other content areas. Some ideas for the remainder of the school year are as follows: number identification, addition, subtraction, labeling plants and animal parts, and continent exploration. With the use of the iPads and technology, the options are endless. Another thought provoked by this action research is what influence on learning the iPads would have if they were utilized less than every day. Future research could involve tracking the progress and increase in letters and letter sound knowledge with different amounts of usage. There could be a group of students to use the iPads none, three times a week, and every day. Because the researchers of this project noticed a waning interest in the iPad usage over the duration of the project, both researchers agree frequency of iPad use should be studied further. Both researchers agree that the topic lends itself to more action research exploration.

Student learning was impacted positively in many ways throughout this action research. Student's letters and letter sounds knowledge increased and the students also received appropriate practice with technology. This directly benefits the students because their school is in

the middle of a vast technology initiative. The constructive and organized iPad use introduced students to iPads if they had never used one before and it also provided basic iPad use practice for students who had previously been given the opportunity to use iPads. Both researchers look forward to new technology in the future and new opportunities for action research.

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Appendix A

Letter Sound Checklist

We will keep a record for each student in our files. For this sheet, we will tally to see how many students know each letter sound.

Letter Sound	Before iPad Intervention Starts	3 weeks into iPad Intervention	Post iPad intervention (6 weeks after start)
a			
b			
c			
d			
e			
f			
g			
h			
i			
j			
k			
l			
m			
n			
o			
p			
q			
r			
s			
t			
u			
v			

w			
x			
y			
z			

Appendix B
Lowercase Letter Recognition Checklist

We will keep a record for each student in our files. For this sheet, we will tally to see how many students recognize each letter.

Lowercase Letter Recognition	Before iPad Intervention Starts	3 weeks into iPad Intervention	Post iPad intervention (6 weeks after start)
a			
b			
c			
d			
e			
f			
g			
h			
i			
j			
k			
l			
m			
n			
o			
p			
q			

r			
s			
t			
u			
v			
w			
x			
y			
z			

Uppercase Letter Recognition Checklist

We will keep a record for each student in our files. For this sheet, we will tally to see how many students recognize each letter.

Uppercase Letter Recognition	Before iPad Intervention Starts	3 weeks into iPad Intervention	Post iPad intervention (6 weeks after start)
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			
M			

N			
O			
P			
Q			
R			
S			
T			
U			
V			
W			
X			
Y			
Z			

Appendix C
Attitude Scale

Color the face that matches your feelings.

Before iPad use:

1. Do you like learning about letters and letter sounds?



Yes Not sure No

2. Are learning letters and letter sounds easy or hard?



Easy Not sure Hard

Following iPad use:

1. Do you like learning about letters and letter sounds?



Yes Not sure No

2. Are learning letters and letter sounds easy or hard?



Easy Not sure Hard

Appendix D

Lesson Log

Week of _____

X means 15 minute use of iPad that day

If less than 15 minutes, it will be noted.

Students	Monday	Tuesday	Wednesday	Thursday	Friday
Student A					
Student B					
Student C					
Student D					
Student E					
Student F					
Student G					
Student H					
Student I					
Student J					
Student K					
Student L					
Student M					
Student N					

Appendix E

Observational Record Form

Observational Record Form Week of _____

Notes on student engagement, eagerness/resistance, and level of completion (independent or needing help) during iPad use.

<p>Student A</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student H</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student B</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student I</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student C</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student J</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student D</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? 	<p>Student K</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time?

<ul style="list-style-type: none"> ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<ul style="list-style-type: none"> ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student E</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student L</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student F</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student M</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?
<p>Student G</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time? 	<p>Student N</p> <ul style="list-style-type: none"> ● Eager or resistant to begin iPad time? ● Engagement to iPad work: <ul style="list-style-type: none"> ○ 5 min ○ 10min ● Complete iPad work independently or needed help to complete iPad work? ● Eager or resistant to end iPad time?

