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The Effects of Technology on Students' Retention of Letters and Sounds

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An Action Research Report

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The Effects of Technology on Students' Retention of Letters and Sounds

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Abstract

This action research was conducted to determine if the use of technology, specifically the interactive SMART board, would lead to higher student assessment scores on the district tests for letter identification and letter sound recognition. The research was completed in a full-day traditional public school transitional kindergarten (TK) class. Data was collected using district-wide alphabet assessments, teacher observation journals, student conferences, and student checklists used by a classroom instructional assistant. Letters of the alphabet were divided into two equal groups based on letter formation and level of difficulty identified through research. One group of letters and sounds was taught using only lessons using technology, and the other group of letters and sounds was taught using only lessons with classroom materials and no technology. For most students, final assessment data showed the teacher driven lessons using classroom educational materials produced an overall higher growth rate than the technology driven lessons using the SMART board. It is possible that the use of technology as a teaching tool stimulated interest to the point that teacher driven lessons were more effective than in previous years when used alone. Therefore, results suggest that a combination of technology driven lessons and teacher driven lessons could be the best course of action for future practice. Further research could measure the effect on learning when presenting all the letters using both teaching methods.

Keywords: alphabet, letter identification, letter sounds, transitional kindergarten, technology, SMART board

The expectation for student achievement in kindergarten classes across the United States has greatly increased in the twenty-first century. The focus in these early childhood classrooms has shifted from creative play to an academically rigorous environment and an increase in technology-based learning. In many states, students are expected to begin reading by the end of kindergarten. Without a strong foundation in letter recognition and letter sounds, students can struggle to master reading standards in kindergarten and subsequent grades. In my years as a Transitional Kindergarten (TK) teacher, where children are readied for Kindergarten, I have found the acquisition of letter names and letter sounds to be among the most challenging standards for my students to master within a school year. My ability to teach this standard effectively and efficiently greatly impacts my students' ability to acquire early literacy skills. My current school district encourages the use of technology at all grade levels. Students in my TK class have access to an interactive SMART board, laptop and desktop computers, Apple TV, and iPads. This emphasis on technology and the extensive research I have read on technology use in the classroom led me to believe that technology-based learning could help my students acquire alphabet letters and alphabet sounds at an accelerated rate.

In California, the Kindergarten Readiness Act of 2010 led to the creation of transitional kindergarten (TK). This 2010 state law changed the kindergarten entry date from December 2 to September 1 so that students would be five years old at the start of kindergarten. TK was implemented for students whose birthday fell between September 2 and December 2. Research showed these younger students typically struggled socially, emotionally, and academically and needed an additional year to mature before entering kindergarten. TK is considered the first year of a two-year kindergarten program that

provides students with the foundational skills they need for future academic success

(Early Edge California, 2012).

Based on data from my 2014-2015 and 2015-2016 TK classes, students showed a

low percentage of overall growth in the first trimester for uppercase and lowercase letter

identification and letter sound recognition. In the first trimester of both school years, 58%

of students recognized 4-7 uppercase letters, 4-7 lowercase letters, and 0-5 letter sounds.

While four letters and four sounds is the first trimester benchmark set by my school

district, students who met this benchmark, but were not above it, struggled to

comprehend second and third trimester reading standards such as beginning and ending

sounds, rhyming, and blending. Students who only reached the district benchmark for

letter identification and letter sound recognition in the first trimester did not meet second

and third trimester benchmarks for other reading standards.

Throughout my teaching career, I have relied on the same direct-teaching methods

to introduce students to the alphabet. I used flashcards that contain each uppercase and

lowercase letter as well as a picture of a person, place, or thing that corresponds with that

letter and letter sound. I also taught the hand motions and actions used for each letter and

letter sound from the Zoo-phonics curriculum (Zoo-phonics.com, 2016). In small,

teacher-directed groups, students also practiced tracing each letter using the Montessori

sandpaper letters, writing each letter with paper and a pencil, identifying objects that start

with each letter from a labeled letter tub, and matching corresponding uppercase and

lowercase letter cards. Students practiced saying the letter name and the letter sound

while working on each of these activities. These small group activities are all done after

the presentation of the letter cards. Given that my assessment data was similar from one

year to the next, I began to wonder if there was a gap in my teaching methods that was causing the students' inability to retain a higher number of letters and sounds in the first trimester.

I began researching other methods of teaching that utilized technology because several technology resources were readily available in my classroom. The dramatic increase in technology use over the last decade and the number of technology based toys being marketed to children has made technology familiar to students. This led me to believe that incorporating technology based lessons could increase student engagement and thus lead to a higher student retention rate of letter names and letter sounds in the first trimester of the school year. My investigation into this problem and my search for a new way of teaching led to the development of my action research question. "What effects will SMART board technology lessons in a transitional kindergarten classroom have on letter identification and letter sound recognition assessment scores?"

When I first began this research, my intention was to see if technology driven lessons would produce the desired assessment scores that the "old-fashioned" traditional forms of teaching I had been using did not produce. What data revealed was a possible synergy between technology driven lessons and teacher driven lessons, because even the teacher driven "old fashioned" methods which were previously not achieving the desired outcomes, were now being successful. There was no change in the way these lessons were being delivered, the only added intervention being the lessons using the SMART board. In the study, taken separately, both teaching methods were successful, with the teacher driven "old fashioned" method producing a higher overall retention rate. The researcher has concluded that the two teaching methods implemented in conjunction with

each other in this study proved to result in the most successful outcome as opposed to that achieved by using one individual teaching method. Both methods kept students engaged, and all students retained some letters and sounds taught with each method. Engagement in the lessons using classroom materials was higher than in previous years, indicating that the motivation and engagement exhibited by students in the technology lessons could have carried over to the teacher driven lessons.

My action research was carried out in a traditional public school transitional kindergarten class. The school is for grades TK-fifth grade and has a total student population of 502. Many of the students at the school come from low-income families with 73% of the student population qualifying for free and reduced lunch. There is one transitional kindergarten class with 20 students, and TK is a full-day program. All students began the school year between the ages of 4.9-4.11 years old and turned 5 years old by the start of the second trimester. Ten of the students were female, and ten students were male. Ten students were Hispanic, seven were African-American, one was East Indian, one was Asian/Laotian, and one was Caucasian. Fifty percent of the students are English language learners. Spanish was the primary language of 40% of the students, while 5% spoke Punjabi, and 5% spoke Russian. Three students received small group pullout speech and language services twice a week, thirty minutes per session, from a Speech and Language Pathologist. Before entering TK, thirteen of the twenty students attended a traditional public pre-school, and the other seven students had no previous school experience.

I was the only teacher in the classroom. I had one part-time instructional assistant who worked in the classroom 3.5 hours of the six-hour school day. I have taught

transitional kindergarten for three consecutive years. Prior to teaching TK, I worked as a lower elementary (multiage classroom 1ˢᵗ-3ʳᵈ grade) Montessori guide (teacher) for three years. I have incorporated some of the Montessori teaching methods and materials into my traditional TK classroom to enhance student learning. Students used the Montessori sandpaper letters and worked in small teacher guided groups when needed for support.

Review of Literature

Understanding letter-sound relationships is one of the key skills children must acquire to become fluent readers and writers (Cecil, 2007; Neuman, 2006; Cassady & Smith, 2004). Children use their knowledge of letters and letter sounds to segment, isolate, and blend sounds into meaningful words. Many experienced educators recommend these skills are taught and developed as early as possible, preferably in the pre-school years (Cecil, 2007). The degree to which beginning readers are aware of individual sounds in spoken language can be a sign of future reading level success. Mastering letter-sound relationships is also an important part of listening comprehension. It helps children to understand subtle meaning differences related to stress, pitch, and intonation in speech (Cecil, 2007).

When planning and designing early literacy skill lessons, it is important to understand how the brain acquires and processes this type of information. Some experts consider reading to be the most difficult task for a young brain to process and retain (Sousa, 2011). Genetic hardwiring has made acquiring spoken language skills relatively easy for many children, but written language is not a natural skill for the human brain to learn (Sousa, 2011). The brain sees letters of the alphabet as abstract symbols. There are more than 44 different sounds in the English language, but there are only 26 letters to

represent these sounds. This means that some letters represent more than one sound, and some sounds represent more than one letter (Cecil, 2007; Sousa, 2011). Research has shown that making the transition from spoken to written language is a daunting task for 50% of children (Sousa, 2011). Researchers are of the opinion that, for 20 to 30% of those 50% of students, this transition is the most difficult cognitive task of their lives (Sousa, 2011).

Research has demonstrated that there is no specific order that one needs to follow in order to teach letters and sounds as children are different and have a variety of learning styles. There are, however, some key ideas to consider when planning alphabetic principle lessons. Many educators break the letters into six groups based on letter frequency within words (Seldin, 2006) and/or how the letter is formed (Montgomery, 2013).

Technology Integration in Schools

In recent decades, interactive media and technology have been integrated into children's daily lives. School districts across the United States have spent millions of dollars to equip classrooms and teachers with the newest technology. In California, for example, voters approved a $42 million bond initiative that equipped every student in the Coachella Valley Unified School District with an iPad during the 2013-2014 school year (Walker, 2016). Research has shown that incorporating technology into the classroom had a number of positive effects. Walker noted the success experienced by a primary teacher in Minnesota who allowed English language learners (ELL) students in her class to use an iPad during reading and language lessons. These students were able to log into apps that enhanced their understanding of vocabulary and comprehension skills needed

for the lesson. The teacher witnessed a greater increase in these students' reading scores than in previous years when the iPads were not used. She also observed these students increase their level of confidence and be fully engaged in lessons (Walker, 2016).

Student Engagement Levels

Research shows that interactive technology can positively affect student engagement levels (Calvert, Strong, & Gallagher, 2005). In a study of 53 preschool-aged children, computer technology was used to help teach pre-literacy skills (Calvert, Strong, & Gallagher, 2005). Researchers found student engagement levels increased when students were allowed to have some or complete control over the experience, as opposed to students whose experience was controlled by the adults. Students were split into two groups, one being the "student control group," where students were allowed to have some control over the computer and the lessons. In the "adult control group," students were not given any control over the computer or the lessons. Students in the "student control group" who were given control of the computer mouse showed higher levels of interest and engagement than students in the "adult control group" who were given no control and watched the adult interact with the computer. Engagement levels in the student control group remained high throughout each session, whereas engagement levels in the adult control group saw a steep decrease by the end of the study. The results of this study suggested that user control has a significant impact on student interest and engagement levels. Lessons in which only the adult controls the technology may not be as effective (Calvert, Strong, & Gallagher, 2005).

Immediate Feedback

Using interactive technology devices to teach literacy lessons can also provide

immediate feedback for students and teachers (Hess, 2012; Sherman, Kleiman, & Peterson, 2007; Ybarra & Green, 2003).   Computers can accept a variety of input from students including mouse clicks, touch screen movements, and speech recognition. The computer can instantly correct students' mistakes and send assessment data to teachers. Teachers can then use this instantaneous assessment data to scaffold lessons to better meet students' needs (Hess, 2012; Sherman, Kleiman, & Peterson, 2007; Ybarra & Green, 2003). Some computer programs and apps can be set to scaffold lessons automatically. Computers can immediately evaluate a student's response and design preceding questions for the student's level. This individualized instruction helps keep students engaged, gives them ownership of their learning, and in some cases, can have a positive effect on self-esteem (O'Hara & Pritchard, 2014; Sherman, Kleiman, & Peterson, 2007; Ybarra & Green, 2003).

Many researchers have found interactive technology in the classroom can help facilitate student collaboration (Haugland, 2000; Kneas & Perry, n.d ; Sherman, Kleiman, & Peterson, 2007; Siraj-Blatchford & Siraj-Blatchford, 2000; Ybarra & Green, 2003). Technology can act as a tool to increase verbal communication and encourage children to take turns. Students may be more likely to share or offer answers and ask questions when using technology devices in small groups rather than whole class lessons. Activities requiring students to work together provide a stronger cognitive challenge for young children than computer activities that require them to work alone (Haugland, 2000; Kneas & Perry, n.d ; Sherman, Kleiman, & Peterson, 2007; Siraj-Blatchford & Siraj-Blatchford, 2000; Ybarra & Green, 2003).

Technology Designed for Phonics

Some computer programs, such as Starfall, ABC Ya! and ABC Mouse, contain lessons and activities that are geared specifically toward phonemic awareness and phonics. These programs are designed for young children and contain visually attractive presentations that integrate sound, text, and moving images in order to maintain student engagement levels. The software incorporates a number of activities including matching games in which students match a sound with pictures of objects that begin with that sound, students match letters to letter sounds, and students match spoken words to written words (Sherman, Kleiman, & Peterson, 2007). Several studies have yielded positive results when similar technology was used in reading intervention groups (Sherman, Kleiman, & Peterson, 2007). Beginning readers in the Netherlands, for example, showed significant improvement in rate and accuracy of word identification after using interactive software with speech recognition capabilities (Sherman, Kleiman, & Peterson, 2007). A similar study done with pre-school children found children's spelling improved. Indications were that these students had a greater awareness of letter and sound association (Sherman, Kleiman, & Peterson, 2007). Similarly, a study of Dutch kindergarteners found that children who used computer software designed to teach blending and phonemic awareness were able to identify letters more readily and read more words than their peers who did not use the software (Sherman, Kleiman, & Peterson, 2007). At a school in Eugene, Oregon, students used an MP3 player to listen to podcasts of the teacher reading a story (Allen, 2008). They were also given supplemental activities including songs and scripts to target letter and sound recognition. All of these students showed significant progress within six weeks. (Allen, 2008).

Technology to Teach Phonics

Some computer software allows the teacher to create and design interactive instructional programs. This type of software was used in a study involving two kindergarten students who were unable to identify any letters in the alphabet consistently (Connell & Witt, 2004). Students were observed and assessed in eight areas: (1) matching uppercase letters to spoken letter names, (2) matching lowercase letters to spoken letter names, (3) matching uppercase letters to spoken letter sounds, (4) matching uppercase letters to lowercase letters, (5) matching lowercase letters to uppercase letters, (6) matching lowercase letters to spoken letter sounds, (7) selecting uppercase words, and (8) selecting lowercase words (Connell & Witt, 2004). Students received training sessions for tasks 1-3. Tasks 4-8 were completed by the students with no additional training. Results showed that Student One completed tasks 1, 5, and 6 with 96% accuracy and tasks 2, 3, 4, 7, 8 with 100% accuracy. Student Two was able to complete all eight tasks with 100% accuracy by the end of the study (Connell & Witt, 2004). A similar study compared students in two separate kindergarten classes. One class had access to a computer-based reading program, whereas the other class did not have access to this technology. The students who used the computer-based reading program in conjunction with teacher directed lessons showed faster acquisition of phonological awareness than students who did not use this technology. The students who used technology maintained their advantage through the end of the school year (Cassady & Smith, 2004).

Technology in the New Millennium

While many of the studies cited in this research focus on computers, recent

decades have seen the evolution of an even greater interactive tool, the SMART Board.

SMART Board technology allows teachers to use a variety of multi-media on one device.

The large, interactive whiteboard has a touch-sensitive screen and acts as an extension of

a computer. The SMART board can communicate with the computer to show videos,

access the internet, and run software. Students can use their finger or an interactive pen

to control applications and write or move digital objects or letters around the board

(Campbell & Mechling, 2009; Wolfe, 2010). The SMART Board comes with software

that includes a library of images and interactive activities that can be used to enhance

lessons (Wolfe, 2010). Some educators claim this type of technology helps them to think

differently about teaching and appeals to the visual and digital intelligences of students

(Rochette, 2007). Some teachers who have used the SMART Board in a primary level

classroom say the technology prompted students to take a more active role in their

learning and ownership over their work. Students were motivated by the interactive

aspect of the technology to participate in lessons, stay on-task, and collaborate effectively

with peers (Baker, 2014).

A 2009 study used this multi-faceted technology device to increase letter and

sound recognition with a small group of kindergarten students with learning disabilities

(Campbell & Mechling, 2009). Each student was given a different set of six target letters

and sounds. The SMART Board allowed students to simultaneously see, say, hear, and

touch the letter sounds. The study found that all three students retained some of each

other's target letter sounds in addition to all of their own target letter sounds. Student

One was able to name 16.7% of other students' target letter sounds prior to small group

instruction and 83.3% after small group instruction. Student Two named 33.3% of other

students' target letter sounds prior to small group instruction and 83.3% after instruction. Student Three named 25% of other students' sounds before instruction and 58.3% after instruction. SMART Board technology allows teachers to present information using features such as animation, sound, and interaction on a large screen that can be viewed by small groups or the entire class. In this study, students were able to efficiently master letter sounds when the interactive SMART board was used during instruction (Campbell & Mechling, 2009).

Negative Effects of Technology

Some experts warn educators of the use of technology in the early childhood classroom, saying that it can have negative effects. Sousa (2011) argued that technology, if not used correctly, could be a distraction when learning language skills rather than an asset. The brain is only capable of focusing on one task at a time. Computer programs and digital media are often loaded with information, causing the brain to constantly alternate between tasks. For example, a program may show students multiple pictures at the same time with letters popping up on the screen and an automated voice reciting letters as they appear. The brain is quickly working to process the sounds being spoken, the pictures being shown, and the letters appearing on the screen. This constant shift in attention can result in a loss of information being stored in the brain (Sousa, 2011, pg. 31).

Kneas and Perry made a similar argument in the article *Using Technology in the Early Childhood Classroom.* They said the human brain and communication evolved through social interactions. Many modern day technologies are very passive. This does not provide children with the amount of social, emotional, or cognitive experiences and

interactions they need during the prime window of development. Children need real-time social interactions, but technology can prevent this from happening (Kneas & Perry, paragraphs 1-5).

Monke (2004) echoed this notion saying face-to-face conversation is crucial in the development of verbal and written communication skills. Children must generate their own images when conversing with another person. This provides connections to the language they hear. Technology, however, does not require anything more than passive acceptance of images presented on a screen (Monke, 2004, pg. 320). No specific research was found on the negative effects of the use of the interactive SMART Board per se.

Technology Use Guidelines

While many experts (Wardle, 2007; The National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College, 2012; Kneas & Perry, n.d.) agree that technology in the classroom can have a positive impact on student learning, those who do not say teachers should consider the following guidelines when incorporating technology lessons into an early childhood classroom (Wardle, 2007; The National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College, 2012; Kneas & Perry, n.d.). Children in the early childhood classroom require social interaction to develop communication skills. Technology lessons should include more than just visual presentations and be interactive to have the greatest benefit for children. Teachers should screen and monitor all programs, apps, and software before and during use to ensure they are appropriate for the early childhood classroom and are not misused by students (The National Association for the Education

of Young Children and the Fred Rogers Center for Early Learning and Children's Media

at Saint Vincent College, 2012; Kneas & Perry, n.d.; Wardle, 2007). It is also

recommended technology exposure not exceed a total of 30 minutes in half day programs

and 60 minutes in full day programs (The National Association for the Education of

Young Children and the Fred Rogers Center for Early Learning and Children's Media at

Saint Vincent College, 2012).

Conclusion

Research has shown that the use of technology to teach early literacy has yielded

primarily positive results for students and teachers. Lessons that incorporated technology

have shown increased student engagement levels, provided immediate feedback, and

increased student performance and assessment scores. Students showed the greatest level

of growth when interactive technology was used. This study will focus on the use of the

interactive SMART board and its effects on student letter identification and letter sound

recognition assessment scores.

Description of Research Process

The school's principal granted permission for data collection before the six-week

study began. At a face-to-face meeting the second week of school the researcher notified

parents and students of the research being conducted and all participant expectations.

Families were given the option to opt out of the research project and not have their

child's data used in the study by signing and returning a passive consent form. No action

was required if parents agreed to having their child's data included. No families chose to

opt out.

Data Collection began in the form of a pre-assessment. All students were assessed using a district-wide alphabet letter identification and letter sound recognition assessment (See appendix A). The assessment was three pages long with three boxes on each page. The first page contained three boxes with all 26 uppercase letters in random order. The second page contained three boxes with all 26 lowercase letters in random order, and the third page contained three boxes with all 26 letters in lowercase form to record letter sound recognition. The oral assessment was administered in a one-on-one format. The student was given a copy of the assessment sheet, and a second assessment sheet was used for teacher tracking and notes. The assessment began with uppercase letter recognition. The teacher pointed to each letter in the box on the student assessment sheet and asked the student to identify the letter name. If the student correctly identified the letter, the teacher placed a check mark on the teacher assessment sheet. If the student did not identify the letter correctly, the letter was circled on the teacher assessment sheet. These steps were repeated for the lowercase letter identification assessment. For the letter sound recognition assessment, students were shown a card with the uppercase and lowercase form of each letter. Students were then asked to identify the sound of each letter. If the student correctly identified the letter sound, the teacher placed a check mark on the teacher assessment sheet. If the student did not identify the letter sound correctly, the letter was circled on the teacher assessment sheet. Directions and expectations during the assessment were explained to each student before the assessment began.

All pre-assessments were completed in four hours over the course of two days. Students were called to a back table to complete the assessment during center time. Students not being assessed at the time were working on activities in small groups with

various manipulatives. This created some unavoidable background noise during testing

periods, however this is the typical environment in which I assess my students. An ideal

testing environment would be a quiet location with minimal noise and distractions.

To determine when and in which order each letter and sound would be taught, and

how they would be divided between technology driven lessons and teacher driven

lessons, the researcher looked at data from previous two classes and research from the

review of literature. Thirteen letters and their corresponding sounds were taught using

only technology driven lessons with the SMART board, and the other thirteen letters and

their corresponding sounds were taught using only teacher driven lessons with classroom

materials. Both groups contained letters considered to have various levels of difficulty.

How the letter is formed, how often the letter appears in words, and how similar a letter

sound is to another letter sound were factors in determining each letter's level of

difficulty. The following letters were taught using technology driven lessons: Cc, Tt, Ss,

Hh, Jj, Ll, Dd, Ee, Nn, Qq, Vv, Yy, and Zz. The letters Mm, Aa, Rr, Ii, Pp, Bb, Ff, Oo,

Gg, Uu, Ww, Kk, and Xx were taught using teacher driven lessons. Two to four letters

from each group were taught every week for six weeks to all the children in the class.

The lessons were taught four days per week for six weeks and lasted

approximately 45 minutes per day. Technology lessons and teacher-directed lessons were

both taught all four days each week. The first lesson each week was the technology

lesson. The SMART board program *Notebook* was used to access the online interactive

gallery tool. In the gallery, I clicked on interactive media and searched for the letters in

uppercase and lowercase form that would be taught that week using technology lessons. I

then clicked on each letter to have them appear on the SMART board Notebook page.

The interactive letters selected contained a small speaker button in the bottom left corner. This button speaks the letter name when pressed. This portion of the lesson was prepared before students arrived at school each day.

All students sat on the carpet facing the SMART board for the technology driven lessons. The preloaded letters were each pointed to on the SMART board Notebook page. The students were told the name and sound of each letter one at a time. Students were asked to say the name and sound of each letter with me after this had been modeled three times. Three to four students were selected to come up to the SMART board and press the button of a certain letter. For example, the first week, the letters C and T were taught using technology. A student was asked to press the button for letter C. Another student was asked to press the button for letter T. This process continued until each letter had been pressed twice.

The letter songs for each technology letter taught that week were accessed after the SMART board activity was completed. The letter songs were produced by *Have Fun Teaching* (see Appendix B). These songs were accessed via YouTube on the classroom desktop computer and streamed onto the interactive SMART board. Before playing the videos, students were encouraged to sing along, repeat the letter sound in the video, and write the letter in the air when prompted. The three-minute videos were played consecutively. After all the letter videos had played, students were asked to raise their hand if they could tell the class which letters we learned in the videos. Three to five students who were raising their hand without talking were called on to answer. A blank notebook page on the interactive SMART board was then accessed, and 4-5 students were called on to come up to the SMART board to write each letter we learned that day

during the technology lesson, using the SMART board pen. Students who were sitting on the carpet were asked to write the letter in the air as the student with the pen wrote the letter on the SMART board. Students who struggled with writing letters on the board were given step-by-step verbal instructions, and how to write each letter was modeled. At the conclusion of the technology lessons, students participated in a think, pair, share activity. Students were asked to turn to their partner and tell him/her which letters and sounds we had learned in the lesson. Think, pair, share partners were assigned before the study began. Students had assigned seats on the carpet, and partners were determined by proximity. The researcher recorded short-hand observation notes on student engagement levels, common mistakes students made, and the number of students who participated in the lesson while students were watching the *Have Fun Teaching* videos and writing letters on the SMART board. I used my prep time and lunch to fill in my observation notes with more details (See appendix C). The classroom aide recorded observation notes and selected five to six students each lesson to monitor. She marked whether students knew some letters and sounds from the lesson, all letters and sounds, or no letters and sounds (See appendix D).

The teacher driven lessons were taught immediately following or immediately before the technology lesson depending on the day. I began the teacher-directed lessons by showing students an 8 ½ x 11 size flashcard with the uppercase and lowercase letter and a corresponding image pictured. For example, the letter Aa card contained an image of an alligator since this animal name begins with the letter A. Students were then told the letter name and letter sound and the hand motion or movement that corresponds with this letter from the Zoo-phonics Language Arts Program was modeled. Students were

then asked to show the Zoo-phonics motion while saying the letter and sound with me. This step was repeated five times for each letter presented in the teacher-directed lesson.

Students were then broken into three groups. Two groups contained 7 students and the third group contained 6 students. One group practiced writing the letters from the teacher-directed lesson on an individual size whiteboard. The flashcards were displayed at the front of the room for students to reference when writing. Another group used the Montessori sandpaper letters to practice tracing the letters from the teacher-directed lesson with their finger. The sandpaper letters are a set of 26 tablets in which each letter has been cut out of sandpaper and pasted onto a thin board. Consonants are printed against pink boards, and vowels are printed against blue boards to help students distinguish between them (Seldin, p. 170). This Montessori material is available in uppercase and lowercase letter form. Sandpaper letters provide a tactile and visual way for children to learn the alphabet (Seldin, p. 170). Kinesthetic activities appeal to many students at this age and can help further develop the senses (Seldin, p. 60-73).

The third group worked with me where I presented letter tubs for each letter in the teacher-directed lesson. Each letter tub contains 6-8 items that begin with the letter pictured on the front of the tub. For example, the letter Aa tub contained an apple, angel, apron, alligator, ants, and an anchor. Each tub also contained a plastic uppercase and a plastic lowercase replica of the letter. I began my presentation by saying the letter name and sound for students. I then asked students to repeat the letter name and sound with me. Each student could pick one item from the tub. Once all students had selected an item, students were asked to say what they had selected and the first letter in the item's name. Students shared their answers with the group and placed the item back in the tub. If

students were unsure of the name of their item or the correct letter, they could pick a friend in the group to help. The teacher presented any items that were left over in the tub after all students had made their selection.

Each letter tub lesson lasted approximately five minutes. At the end of each letter tub lesson, I rang a bell for students to rotate to the next group. This rotation continued until all students had worked at each center. The total time for students to rotate through all three centers was approximately 15 minutes each day. Once all centers had been completed, students were asked to find their think, pair, share partner on the carpet and tell him/her which letters we learned in the teacher-directed lessons that day. I used transition time between center rotations to record short-hand observation notes. I used my prep and lunch to add more details to my observation notes. My aide recorded observation notes and selected five to six students each lesson to monitor. She marked whether students knew some letters and sounds from the lesson, all letters and sounds, or no letters and sounds.

At the end of each week, seven students who were pre-selected before the study began, were interviewed one-on-one during a student conference. These seven students were selected based on beginning of the year TK assessment scores and were of various academic levels to reflect diversity. No other criteria was used in determining students who would participate in student conferences. In the conference, students were asked which alphabet lesson(s) they enjoyed most that week. A picture of each lesson was provided as a prompt for students. Once students identified their favorite lesson(s), they were asked to explain why the lesson(s) they chose were their favorite. Finally, students were asked if they could identify the letters and letter sounds we learned in their favorite

lesson(s). Student answers were recorded on a student conference sheet next to the corresponding question (See appendix E).

The process of lessons and center rotations was repeated four days per week for six weeks for each group of letters. At the end of the third week, a mid-study assessment was administered. The mid-study assessment was the same assessment given as a pre-assessment. Students were given the same instructions and teacher recording procedures remained the same. The mid-study assessments were completed in three hours over the course of one day. Students were assessed during center time and free choice time. A final assessment was given at the end of the sixth week. The final assessment was the same assessment given as a pre-assessment and mid-study assessment. The final assessment was completed in three hours over the course of two days. Students were assessed during center time with testing conditions similar to those during the pre and mid-study assessment.

Data Collection and Analysis

The purpose of the study was to determine if the use of technology would raise student assessment scores to 50% correctly identified uppercase letters, 50% correctly identified lowercase letter, and 50% correctly identified letter sounds by the end of the first trimester. The 50% benchmark was determined using data from two previous classes. Students from these classes who were able to correctly identify at least 50% uppercase and lowercase letters and 50% of the letter sounds in the first trimester also met second and third trimester reading standards. Students who were unable to identify 50% of the letters and letter sounds by the end of the first trimester did not meet all second and third trimester reading standards.

Data was collected using four different data sources:

First data source: A formal district-wide assessment was administered three times throughout the study to monitor student progress. A pre-assessment was administered and used as baseline data. The same assessment was administered at the end of the third week to track student progress at the mid-point of the study. The final assessment was administered at the end of the six-week study.

Second and third data sources: My classroom aide and I collected observational data.

a. My observational data tracked student engagement levels during each lesson, participation levels, and common student mistakes. Student engagement level was recorded using the following criteria: Were students participating in the lesson? Were students using the materials in the lesson correctly? Were students engaging peers in conversation related to the study at appropriate times? Were students trying to figure out answers with appropriate think-time or immediately giving up? Letters and sounds students had a hard time recalling during the lesson and letters and sounds students mixed up frequently were also recorded in observation notes.

b. My aide's observational data tracked which individual letters and letter sounds students recalled during a check for understanding and which letters students did not recall.

Fourth data source: Student conferences were conducted at the end of each week with a group of seven students. These students were selected based on beginning- of- year assessment scores. The seven students selected were of various academic levels ranging

from no prior knowledge of any transitional kindergarten (TK) standards to advanced

levels in more than one academic area.

To make data analysis of assessment scores manageable, I created a percentage

range rubric. Range groupings were in ten percent increments (see table 1).

Table 1

Pre-Assessment Rubric Placement

Percentage Range	Correctly Identified Uppercase Letters (Number of Students)	Correctly Identified Lowercase Letters (Number of Students)	Correctly Identified Letter Sounds (Number of Students)
0%	6	9	14
3%-10%	2	3	2
11%-20%	4	2	2
21%-30%	1	2	2
31%-40%	1	0	0
41%-49%	1	2	0
50% or above	5	2	0

On the mid-term uppercase letter recognition assessment, all students improved

from their pre-assessment score. Four students scored between 3% and 10%, one student

scored between 11% and 20%, four students scored between 21% and 30%, two students

scored between 41% and 49% and nine students scored 50% or higher. The average

increase for uppercase letter recognition at the mid-point of the study was 15% (see table

2). On the mid-point lowercase letter recognition assessment three students made no

improvement and did not identify any lowercase letters correctly. Three students scored

between 3% and 10%, one student scored between 11% and 20%, two students scored

between 21% and 30%, two students scored between 31% and 40%, two students scored

between 41% and 49% and seven students scored 50% or higher. The average increase

for lowercase letter recognition at the mid-point of the study was 21% (see table 2).

Letter sound recognition showed the highest increase in student assessment scores at the

mid-point of the study. Three students met the goal of 50% or higher. Three students

recognized between 31% and 40%, five students recognized between 21% and 30%,

seven students recognized between 11% and 20%, one student recognized between 3%

and 10%, and one student did not identify any letter sounds correctly. The average

increase for letter sound recognition was 22% (see table 2).

Table 2

Average Pre and Mid-Point Assessment Results

Academic Standard	Average Pre-Test Baseline Knowledge	Average Mid-Test Results	Percentage Increase
Uppercase Letter Recognition	28%	43%	15%
Lowercase Letter Recognition	17%	38%	21%
Letter Sound Recognition	6%	28%	22%

On the pre-assessment students knew an average of three uppercase letters

designated as letters to be taught using technology lessons and an average of four

uppercase letters designated as letters to be taught using direct teaching lessons without

the use of technology. By the mid-point assessment, students knew an average of four

uppercase letters taught using technology lessons and six uppercase letters using teacher

driven lessons. The teacher driven lessons showed an average growth of two letters or

16%. The technology driven lessons showed an average growth of one letter or 7%.

Overall the teacher driven (or solely direct teaching) lessons had a greater increase by

nine percent (See tables 3 and 4). On the lowercase letter pre-assessment students knew

an average of two letters designated as technology letters and two letters designated as

direct teaching letters. By the mid-point assessment students knew an average of four

lowercase letters from the technology lessons and five letters from the teacher driven

lessons. Technology lesson letter knowledge had a 15% increase while the teacher driven

lessons had an increase of 23%. The teacher driven lessons showed a higher level of

growth by eight percent (see tables 3 and 4). The letter sound pre-assessment showed

students knew an average of one letter sound designated to be taught using technology

lessons and one letter sound designated to be taught using teacher driven lessons. At the

mid-point assessment both methods of teaching produced the same results. Students knew

an average of three letter sounds or 23% from the technology lessons and the teacher

driven lessons (See table 3 and 4).

Table 3

Technology Lessons Average Growth

Academic Standard	Average Pre-Test Baseline Knowledge	Average Mid-Test Results	Percentage Increase
Uppercase Letter Recognition	3 letters	4 letters	7%
Lowercase Letter Recognition	2 letters	4 letters	15%
Letter Sound Recognition	1 letter	3 letters	16%

Table 4

Direct Teaching Lessons Average Growth

Academic Standard	Average Pre-Test Baseline Knowledge	Average Mid-Test Results	Percentage Increase
Uppercase Letter Recognition	4 letters	6 letters	16%
Lowercase Letter Recognition	2 letters	5 letters	23%
Letter Sound Recognition	1 letter	3 letters	16%

At the end of the six-week study, the final assessment showed that students recognized an average of 17 total or 65% uppercase letters. Students averaged 61% or eight uppercase technology lesson letters and 69% or nine direct teaching letters. The direct teaching lessons yielded a higher growth rate by eight percent. The final assessment also showed students recognized an average of 53% or 14 lowercase letters. Students recognized on average of 46% or 6 lowercase letters from the technology lessons and 61% or eight letters from the direct teaching lessons (see figure 1).

In letter sound recognition the final average was 17 letters or 65%. Students recognized an average of 61% or eight letter sounds taught through technology lessons and 69% or nine letter sounds taught through direct teaching lessons. All three categories produced a slightly higher assessment result with the direct teaching methods without the use of technology, by the end of the study (see figure 2).
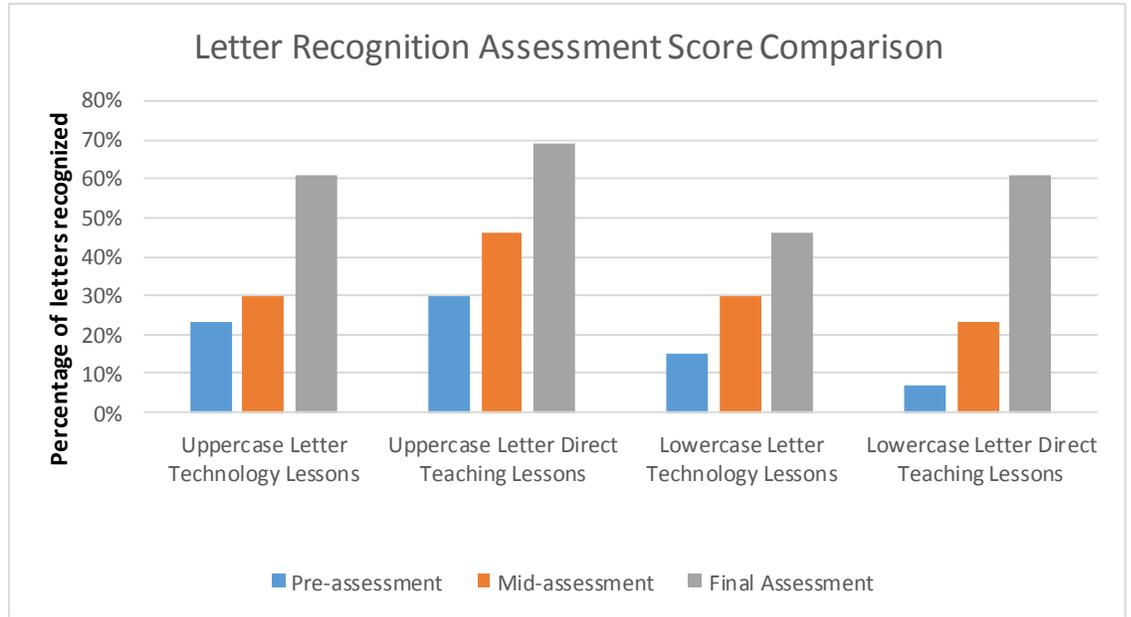
Figure 1. A comparison of student assessment scores for letter recognition from technology lessons and teacher directed lessons.
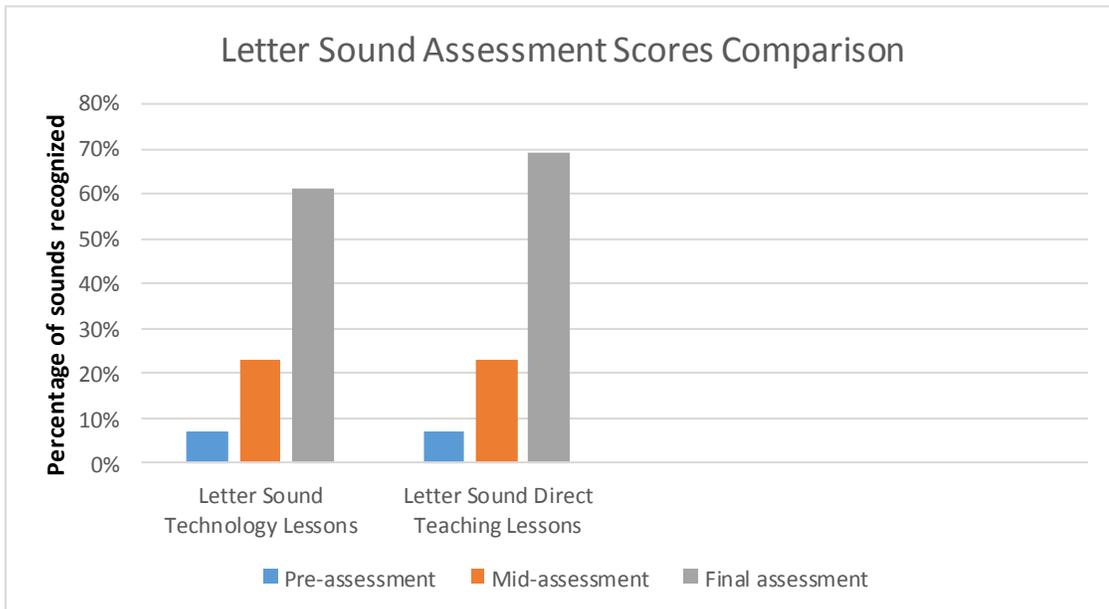

Figure 2. A comparison of student assessment scores for letter sound recognition from technology lessons and teacher directed lessons.

The class averages for total uppercase and lowercase letters and letter sounds recognized was above the goal of 50% set before the study began. Seventy-five percent of students reached or passed the 50% benchmark for uppercase letter recognition, 65% reached or passed the 50% benchmark for lowercase letter recognition, and 75% reached or passed the 50% benchmark for letter sound recognition. Only 30% of students reached the 50% benchmark in all three areas by the end of the first trimester in previous classes. Forty-five percent more students reached the 50% benchmark in this study. Previous years data also demonstrated that 58% of students only knew between 4-7 letters and letter sounds by the end of the first trimester, which is far below the 50% benchmark desired. A far fewer number of students, 15% of students, in this study only knew between 4-7 letters and letter sounds by the end of the six weeks. This indicates that more students reached the 50% benchmark than in any previous year. The researcher's conclusion is that the combination of technology driven lessons and teacher driven lessons is what produced the desired assessment scores.

Analysis of individual student data revealed most students showed a higher level of growth with the teacher driven lessons. Sixty percent of students recognized more letters and sounds with the teacher driven lessons, 15% of students recognized more letters and sounds with the technology lessons, and for 25% of students the teaching method and type of lesson had no effect on their assessment scores. These students recognized the same number of uppercase letters, lowercase letters and letter sounds from each teaching method category. All students who recognized more technology lesson letters were English language learners (EL). Six EL students reached the 50% benchmark in each category.

While assessment data showed teacher driven lessons to be the most effective, student conferences and observational data did not support the implementation of one teaching method over the other. In the 42 student conferences conducted, student interest in and recollection of technology driven lessons and teacher driven lessons was even. Each of the seven students cited a different type of lesson as the most engaging for them every week. Students also recalled the same number of letters taught via technology driven lessons as teacher driven lessons each week. When students cited a technology driven lesson as the most engaging in the week, they cited their ability to use the same technology programs at home as their reason for selecting those lessons as their favorite. Students said in the conferences they were able to access the *Have Fun Teaching* letter songs on computers and tablets at home. One student also noted that she was able to write letters with her finger on a tablet at home similarly to our writing activities on the SMART board.

When students cited a teacher driven lesson as the most engaging for the week, they cited their ability to practice the Zoo-phonics motions at home as one of their reasons for selecting that lesson as their favorite. All of the students I conferenced with also made a connection between the objects in the letter tubs and toys they had at home. For example, the letter R tub contained a racecar. Two students said they enjoyed the letter R tub because they have racecars in their toy box at home. Another student said she liked the lesson with the letter A tub because it contained an apron, and she wears an apron when she cooks with her mom.

Observational data recorded revealed that more than 50% of students consistently mixed up the letter sounds for U, W, and Y during lessons. Students would often make

the Y sound for U and W even though the letter Y was taught using technology driven

lessons and U and W were taught with teacher driven lessons. Students also frequently

confused the letter sounds for K and X. Letters K and X were both taught using teacher

driven lessons. Students confused the letter sounds for S and Z frequently and both

letters were taught using technology driven lessons. Each of these letters was identified

through research as being more difficult letters to learn and were split up evenly between

the technology and teacher driven lessons. One method of teaching did not produce a

higher level of retention for these letters over the other. Extra time was spent during each

of these lessons for teacher modeling of the sounds and student practice. Six of these

letters were taught in the last three weeks of the study, and one letter was taught in week

two. Students struggled with more letters in the last half of the study than the first half of

the study (see table 6).

Table 6

Frequently Mixed Up Letter Sounds

Mixed-Up Letters	Week(s) Taught	Teaching Method Used
U, W, Y	Weeks 4, 5, 6	Teacher Driven Technology
K, X	Week 6	Teacher Driven
S, Z	Weeks 2, 6	Technology

Observational data also revealed that lessons in which students seemed the most

engaged in were lessons that contained a noticeable pattern. In the *Have Fun Teaching*

letter song videos, each song contains a specific pattern, and each verse of the song is

repeated multiple times. The songs begin with the letter name and states whether the letter is a vowel or consonant. The letter sound is then modeled followed by words that contain the letter and sound featured in the video. Finally, students are asked to draw the uppercase and lowercase letters in the air with their finger. As students started to memorize this pattern within the song, they could anticipate what came next and would "act out" the next verse. For example, by the fourth week of the study many students would begin trying to draw the letter in the air a few seconds before the video encouraged students to do so.

In the teacher driven lessons, observational data proved a similar result with the Zoo-phonics letter card lessons. In these lessons the letter name and letter sound were modeled by the teacher followed by the name of the animal associated with the letter and a specific movement or motion associated with the animal on the letter card. For example, in week one, students learned letter A for Allie Alligator. The motion for letter A is an alligator mouth opening and closing. After students heard the letter name, letter sound, and animal name, many of them began trying to guess what the motion would be for each card. In week six, for example, several students predicted the motion for letter K, Kayo Kangaroo, would be a jumping motion. When I asked students why they made this prediction, three students said, "because kangaroos hop". While the students' prediction for letter K was not correct, observational data showed students were consistently engaged in these lessons and continued to look for patterns and make predictions.

Conclusion and Action Plan

This action research demonstrated the importance of using multiple teaching methods to address the needs of all students. I expected the technology driven lessons to

produce a higher level of growth for student assessment scores than the teacher driven lessons. I had only used teacher driven methods in previous classes, and these lessons alone did not produce the assessment scores desired. The results of this study showed the technology driven lessons were beneficial to student learning in that the combination of technology and teacher driven methods produced a higher overall level of growth. Most students showed a greater level of growth with the teacher driven lessons, but a few students did have a greater level of growth with the technology driven lessons. All students recognized some letters taught using each teaching method. Creating all lessons using the same teaching method repeatedly may not fully address students' needs. No two learners are exactly the same, a consideration to be kept in mind when designing lessons for all academic standards.

This study also demonstrated the positive impact that using multiple teaching methods had on student engagement levels. All students were engaged in technology lessons and teacher driven lessons throughout the study. The student conferences revealed that students appreciated and enjoyed change rather than the same type of lesson repeated for each letter and sound. Some students showed higher levels of participation with the technology driven lessons whereas other students showed higher levels of participation with the teacher driven lessons. Using multiple teaching methods encouraged more students to participate regularly and fostered richer class discussions. Students also shared the lessons they felt were the most engaging with friends and family at home. This allowed families to be more involved in student learning.

The results of this study will change my practice in that I will teach standards using a combination of technology and teacher driven lessons. Before this study, I taught

letter identification and letter sound recognition primarily using the hand motion

techniques from the Zoo-phonics curriculum, Montessori sandpaper letters and the

alphabet letter tubs. Now, I will include the use of multiple interactive technology

devices and online apps to supplement teacher driven lessons. This change will allow me

to meet the needs of all students and incorporate multiple learning styles. For example,

the *Have Fun Teaching* songs I used in the technology lessons benefited my EL students

in that they incorporated vocabulary words in addition to the letters and sounds. These

same students also benefited from the teacher driven lessons in that the small group

instruction allowed them to converse with peers and practice letter name and letter sound

pronunciation with the teacher. The combination of technology and teacher driven

lessons may help support students who mixed up certain letter sounds during the study.

By using both methods of teaching for each letter and letter sound, students can hear me

pronounce the sound and practice the pronunciation with a partner. The technology apps

will support and reinforce this skill by giving students more practice and allow them to

work on the standard independently. Technology apps also allow students to select the

letters and sounds they need to work on individually rather than the letters and sounds the

majority of the class needs to practice.

This change to my teaching practice also allows me to expose my students to

avenues of learning they may not get at home. While some of my students have access to

the internet and technology devices at home, many of them do not. By providing

technology in the classroom, I am broadening their horizons and exposing them to

materials outside their regular environment. This hopefully encourages them to become

life-long learners and begins to prepare them for the technology-driven twenty-first century workforce and education model.

In my previous classes, approximately 30% of students reached the 50% benchmark for letter identification and letter sound recognition at the end of the first trimester. After this study, 75% of students reached the 50% benchmark for uppercase letter identification and letter sounds, and 65% of students reached the 50% benchmark for lowercase letter recognition. This will impact student learning in that students will be better prepared for second and third trimester reading standards such as blending sounds, identifying beginning and ending sounds, and rhyming. If students know at least 50% of the letters and sounds they have begun to understand how language works and that symbols have meaning. As students acquire more letters and sounds they begin to understand the complexities of language. Understanding how language works is a beginning reading skill needed to understand all other components of reading.

Student learning will also be impacted in that students are exposed to different learning methods, resources, and stimuli. While students may favor one learning style over the others at this point in their academic career, consistent exposure to lessons that incorporate multiple approaches and styles can help them become more versatile learners. Students can further develop their visual, auditory, and kinesthetic skills. Students will also learn how to access multiple resources on their own which is beneficial to future learning.

Each year brings new advancements in technology, resulting in the likelihood of potential further action research on this subject. My current study focused on whole class technology lessons and the use of the interactive SMART board. As students move

through the grade levels, my school district strongly encourages students to use more individual technology devices and programs. A possible future action research study in my classroom would be to examine the effects of individual or small group technology lessons versus the effects of whole class technology lessons. How would placing students on individual laptops or tablets affect assessment scores? Would exposing students to these devices in an early childhood education class better prepare them to use these devices in the upper grades? In this study different letters were taught using one of the two methods. Another possible future action research would be to actually combine teacher driven and technology driven lessons for all the letters to see if this would be even more effective.

Technology continues to have a growing presence in schools across the country, and I have found it to be an effective tool in my classroom. Further research in this area would be beneficial to my teaching and my students. While technology can never replace teachers, it can revolutionize the way we teach.

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Appendix A
Letter and Sound Identification

Name:_____

<u>UPPERCASE LETTER RECOGNITION</u>
Have the student identify the letters they know using the
assessment sheet and record their correct responses below.

M	S	F	L	R	N	H	V	W	Z
B	C	D	G	P	T	J	K	Y	X
Q	I	O	A	U	E				

Date:_____   **Correct:**_____   **/26**

M	S	F	L	R	N	H	V	W	Z
B	C	D	G	P	T	J	K	Y	X
Q	I	O	A	U	E				

Date:_____   **Correct:**_____   **/26**

M	S	F	L	R	N	H	V	W	Z
B	C	D	G	P	T	J	K	Y	X
Q	I	O	A	U	E				

Date:_____   **Correct:**_____   **/26**

LOWERCASE LETTER RECOGNITION
Have the student identify the letters they know using the assessment sheet and record their correct responses below.

m	s	f	l	r	n	h	v	w	z
b	c	d	g	p	t	j	k	y	x
q	i	o	a	u	e				

Date:_____   Correct:_____/26

m	s	f	l	r	n	h	v	w	z
b	c	d	g	p	t	j	k	y	x
q	i	o	a	u	e				

Date:_____   Correct:_____/26

m	s	f	l	r	n	h	v	w	z
b	c	d	g	p	t	j	k	y	x
q	i	o	a	u	e				

Date:_____   Correct:_____/26

Letter Sound Identification Recording Sheet
Using the Letter Sound Assessment sheet have students say
which sound each letter makes.

/m/ /s/ /f/ /l/ /r/ /n/ /h/ /v/ /w/ /z/

/b/ /c/ /d/ /g/ /p/ /t/ /j/ /k/ /y/ /x/

/q/ /i/ /o/ /a/ /u/ /e/

Date:_____   Correct:_____ /26

/m/ /s/ /f/ /l/ /r/ /n/ /h/ /v/ /w/ /z/

/b/ /c/ /d/ /g/ /p/ /t/ /j/ /k/ /y/ /x/

/q/ /i/ /o/ /a/ /u/ /e/

Date:_____   Correct:_____ /26

/m/ /s/ /f/ /l/ /r/ /n/ /h/ /v/ /w/ /z/

/b/ /c/ /d/ /g/ /p/ /t/ /j/ /k/ /y/ /x/

/q/ /i/ /o/ /a/ /u/ /e/

Date:_____   Correct:_____ /26

Appendix B
Letter T Song

Letter T Song

T is a consonant, a letter in the alphabet

/t/, /t/, /t/, /t/ (T Sound)

I took a train
With my teacher
To a town
To take a test

/t/, /t/, /t/, /t/ (T Sound)

I saw a turtle
Playing tennis
With a tiger
And a turkey

/t/, /t/, /t/, /t/ (T Sound)

Write an uppercase T in the air
Write a lowercase t in the air

/t/, /t/, /t/, /t/ (T Sound)

T is a consonant, a letter in the alphabet

Appendix C
Observational Data Journal

1. Which alphabet lessons did students seem the most engaged in?

2. How many students volunteered answers and participation during today's technology lesson? Was it more or less students than the teacher-directed lesson?

3. Are the same students participating over and over again? If so, what are the other students doing during the lesson?

4. What successes and challenges did students have during letter identification and letter sound recognition today?

5. Did I observe anything new that may be interesting or useful to my research?

Appendix D
Observation Checklist

Topic: Alphabet letters and sounds Student Name	Identifies all letters in lesson correctly	Identifies some letters in lesson correctly	Does not identify letters in lesson correctly	Identifies all sounds in lesson correctly	Identifies some sounds in lesson correctly	Does not identify sounds in lesson correctly	Comments

Appendix E
Student Conference Record Sheet

1. Which alphabet lessons did you like this week? (Students may point to one or more pictures provided by the teacher of each lesson if student is not able to verbalize this right away or needs a reminder of lessons taught this week).

2. What did you like about these lessons? (If students only identify one lesson they enjoyed, question would be in singular form).

3. Which letters did we learn in these lessons?