

**Emergent Literacy & Technology:
The Effects of Touch Screen Interactive Devices on Learning Outcomes**

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Abstract

Technology surrounds us in our daily life and is emerging into the youngest classrooms. Many youth have access to handheld devices at home. They hold interest for young learners, making them a potential tool for increased engagement and improved skill learning. This case study observes the effects of interactive use of touch screen devices by preschool students. I take a qualitative inquiry approach through real-world observation and pre/post skill tests then utilize content analysis to triangulate shared themes within classroom documentation.

Introduction

The purpose of this case study is to evaluate how technology can increase skill development in the phonemic literacy of preschool aged students. At this stage in published research there is significant support of technology in the classroom; however, little research is documented on the benefits of technology in preschool or specifically for preschool literacy.

The goal of this research was to determine if touch screen devices with interactive screen programs could increase the amount of literacy skills retained in preschool students by observing their use of the devices and programs and performing pre and post-tests. Some resentment exists over using technology devices such as iPads in the youngest classrooms. Research may help teachers find and further develop modes of instruction that are engaging and increase learning outcomes for emergent literacy learners and support appropriate use of technology in preschool.

Literature Review

The purpose of this review is to assimilate information and research about the use of technology for the purpose of assisting learners age 3-5 years on developing their emergent literacy skills. Haugland (2000) believes that developing skills necessary to “become literate and perform competently in a literate society” begins quite early in a child’s life. There are conflicting ideals and a lack of current research on the developmentally appropriate use of technology on such young learners. Empirical evidence is necessary to support the use of current technology in the preschool classroom. The premise of this literature review is that meaningful integration of technology can potentially enhance emergent literacy for preschool children but further research is necessary.

Keywords: Technology, emergent literacy, preschool, early childhood

Young children today live in a world full of technology and interactive media. Technology tools for communication, collaboration, and networking have transformed mainstream culture. These tools have drastically changed how families run their daily lives. Many of these same tech tools are also affecting how teachers are running their classrooms. Technology and interactive media are here to stay. As children are introduced to technology earlier through their homes, it's time to consider embracing the tools of the 21st century in our early education classrooms.

The early experiences that children engage in from birth through the time when they “adopt conventional literacy skills brings meaning to reading and writing” (Koenig, 1993). Emergent literacy is defined as the experiences that create the foundation of life-long literacy, which leads to both academic and personal success (Lankshear & Knobel, 2003). These early experiences include listening and responding to oral communication, interacting with written text (holding, pretend ‘reading’), and exploring the written and verbal world by turning pages, scribbling, and talking (Koenig, 1992). Children will vary greatly in how they access, use and engage in learning materials.

Many researchers and theorists support the idea that children engage in learning in different ways (Gardner, 1983; National Association for the Education of Young Children, 2012); Jackson, 2013). This suggests that integrating new ways of teaching emergent literacy skills can increase the engagement and overall learning process for many young learners. Technology is yet another tool that can be utilized, within developmentally appropriate framework, to provide variety in instruction and student exploration.

Methodology

For this literature review, article search procedures were conducted using electronic-

based searches in the library system through the Educational Resources Information Center (ERIC), online through Google Scholar, and a manual search through journals, articles and textbooks. The majority of literature considered for further review was published since the year 2000. References to commonly supported theories or papers with a specific look at technology in the preschool classroom were included regardless of date of research. Research that involved children age 2-8 was the only research reviewed, eliminating literature with a focus on older students. Research by companies about the effectiveness of their specific programs or products was not included.

Interactive Media Use by Preschoolers

Multiple Intelligences. Howard Gardner (1987) has shown that young children exhibit a diversity of learning styles that he refers to as multiple intelligences. He believes that the optimum way for children to learn is opposite of the often-traditional teacher-directed verbal approach that we see in classrooms (Gardner, 1987). The use of technology in the young child's classroom allows us to be sensitive to the different learning approaches of children (NAEYC, 1996). Technology allows us to integrate music, visual, movement, and other 'intelligences' into the same lesson. A suggested use of technology in the pre-K classroom is to use it as a center with equal value to all other centers (NAEYC, 1996). When we utilize computers or hand-held devices, centers can be used for exploration and build upon skills taught by other means.

Developmentally Appropriate Practice. "Developmentally appropriate practices must guide decisions about whether and when to integrate technology and interactive media into early childhood programs" (NAEYC, 2012). To understand what is developmentally appropriate, we must have a clear understanding of the age of the children we are working

with, their individual differences in learning, and their personal backgrounds. Children ages 2-8 years are developmentally within Piaget's preoperational stage (NAEYC, 1996). This means they are concrete learners who are very interested in using their newly learned symbols to speak, write, draw, and use numbers (NAEYC, 2014). Children this age have a hard time sitting still, need a frequent change in learning modalities and want to continue to master their language (NAEYC, 2009). Classroom goals and implementation change with age and differ from program to program, but children's experiences with technology and interactive media are increasingly part of their lives and should be considered part of the developmentally appropriate framework (Wardle, 1999).

The appropriate use of technology in the classroom is to expand, enrich, implement, individualize, differentiate and extend the overall curriculum (Wardle, 1999). When educators integrate technology into their classrooms, equity and access are achieved when all children have opportunities to participate and learn. "Effective uses of technology and media are active, hands-on, engaging, and empowering; give the child control; provide adaptive scaffolds to ease the accomplishment of tasks; and are used as one of many options to support children's learning" (NAEYC, 2014). One of the benefits of technology is that it can easily incorporate scaffolding into the curriculum by creating different levels of difficulty for different ability levels (NAEYC, 2014). This allows teachers to use programs that are designed to be appropriate to not just a particular group, but also to different developmental levels within an age range (Haugland, 2000).

Portable Touch Screen Devices. While young children are capable of maneuvering and clicking a mouse for a computer, portable digital devices such as iPads that use touch screen technology seem to be more user-friendly for the younger learners. iPads and other touch

devices offer “innovative opportunities for early literacy learning” (Van Scoter, 2001). iPad-based literacy activities can stimulate a child’s motivation and keep them concentrating by providing a hands-on environment (Fitzgerald, 2011). Buckleitner (2011) agrees that “mobile, multitouch screens and new technologies have changed the way our youngest children interact with images, sounds and ideas.” Several apps have been developed for this age group that may “help children communicate, develop finger dexterity, learn about cause and effect and just have fun” (O’Hara and Pritchard, 2014).

Motivation & Engagement. Interactive media is capable of supporting the development of language and literacy of young children through the opportunities and motivation they provide (Kirkorian, H, Wartella, E, and Anderson, D, 2008). They have also been found to support children’s emotional development. Computers are intrinsically motivating for young children (Van Scoter, 2001). They have also been found to “enhance children’s self-concept and improve their attitudes about learning” (Lewin, 2000). Luckin (2003) found that age appropriate, interactive toys featuring fun characters helps foster a child’s emotional connection with the learning experience.

Technology can motivate and engage the learner (O’Hara and Pritchard, 2014). “The motivational elements of an interactive media product are those features that inspire children to play with them—features that make an interactive toy, book, web site or computer activity fun and engaging” (Calvert, 2006). Several motivational elements have been identified in the literature:

- Control: Children want to have control over their learning environment and see how their actions affect the outcome (Calvert, 2006).
- Action: Some research has demonstrated that action is another feature of media that

can assist preschooler's comprehension (Calvert, 2006).

- Clickables: Children love to have an interaction with clicking or touching that leads to a sound effect or animation sequence (Gilutz & Nielsen, 2002).
- Humor: Children enjoy content that is entertaining, funny and colorful (Gilutz & Nielsen, 2002).

Interactive story books. Interactive toys or books that “listen” to children have been found to support emergent literacy and affect their subsequent writing skills (Gilutz & Nielsen, 2002). Calvert (2006) found that interactive storybooks helped improve children's phonological skills and story telling abilities. Levin (2001) found that interactive storybooks that allowed children to control the story and ask for help were most effective at helping beginning readers to recognize words. Such supporting research from over 5 years and separate studies suggests that combining interactive media with handheld, touch screen devices could even further engage children and support emergent literacy.

Limitations

A common argument against introducing technology into preschool classrooms is that young children may not be developmentally capable of using it. There are also sociocultural factors like family beliefs, interaction patterns and socioeconomic status that can create a digital divide between those who support use of technology in early childhood and those who caution against it. There is also concern about the correlation between interactive media and childhood obesity (Birch, Parker & Burns, 2011). Other negative outcomes have been identified such as irregular sleep patterns, focus and attention problems, negative impact on socialization, and negative impact on language development (Cordes & Miller, 2000).

The National Association for the Education of Young Children (NAEYC, 2014)

cautions that the appeal of technology can lead to inappropriate use. Van Scoter (2001) notes that technology should follow the “same developmentally appropriate principles and practices that guide the use of all other materials and learning tools for young children.” The amount of time children spend with technology is important. How they’re spending that time should also be taken into account when determining if the technology is effective and appropriate (Vandewater & Lee, 2009).

Outcomes

Further research is needed to better understand how young children use and learn with technology and interactive media (NAEYC, 2014). Research is also needed to support evidence-based practice for the “effective and appropriate uses of technology and interactive media as tools for learning and development in early childhood settings” (NAEYC, 2009). NAEYC (2014) supports technology use in early childhood education when it’s used “intentionally and appropriately,” but they also stress “ongoing research and professional development are needed.”

Conclusion

The early years of childhood are a busy and important time for children’s cognitive, social, emotional, and physical development. As educators, we must develop our own strong and thorough understanding of media’s effects, as well as potential features, that ensure effective use and positive outcomes. All learning tools should be considered in developing skills of our youth. The successful integration of technology and interactive media means inviting it into our daily practices. Integration occurs when the use of technology and media becomes routine and transparent.

“Learning tools that, when used in intentional and developmentally appropriate ways and

in conjunction with other traditional tools and materials, can support the development and learning of young children” (Fitzgerald, 2011). It is clear from the lack of research and literature that specific research into the gains of utilizing technology to increase student’s emergent literacy skills is needed. The background, theories, and professional support are in place to support such research.

Framework

The literature reviewed included three overall themes. The use of interactive technology in pre-school aged classrooms is supported as developmentally appropriate (NAEYC, 2014) when used as an active-learning tool. Interactive technologies with touch screen capabilities can provide users with multiple modals of instruction and integrated lessons, as supported through the theory of Gardner’s Multiple Intelligences (Gardner, 1986) and constructivism ideals.

Technology and developmentally appropriate applications have been shown to hold motivational elements, supported by behaviorist theory (Shield, 2000) and Bloom’s Digital Taxonomy (Churches, 2008). When young children are engaged in quality, developmentally appropriate programs that utilize active-learning techniques, their learning engagement and motivation may be increased.

Research Question

The purpose of this case study is to evaluate how interactive technology through a touch-screen device can increase phonemic awareness in preschool aged children. At this stage in published research, the use of interactive technology with active screen time is encouraged but the level of specific preschool literacy-based subject has had limited research. Does the moderate use of touch screen interactive technology increase phonemic awareness in pre-school children?

Method

In this study on the effectiveness of touch screen based active learning on the education of phonics instruction in the preschool classroom, I take a qualitative inquiry approach. I will examine a real classroom situation without manipulating it. I take a grounded theory approach in this research (Merriam, 2009) through a case study design that is both intrinsic and instrumental (Merriam, 2009). A quantitative review of pre and post-assessments will be included to provide a well-rounded view of the use of touchscreen devices in the preschool classroom.

Participants

Participants are students ages 3-5 that currently attend the preschool program. Participants were chosen because they are already familiar with the basic use of touch screen devices and have accessed the selected applications enough to be familiar with their use, limiting the amount of program learning that will need to occur in order to gauge phonetic learning.

Materials

- Pre & post – assessment
- Observation checklist/rubric
- 3 iPads with literacy applications: ‘Interactive Alphabet,’ ‘Monkey Preschool Lunchbox,’ and ‘ABCmouse.com’

Procedure

Pre- and post- assessment

Students will all be individually tested following the same format of questions. The questions will take place prior to observations and at the end of the study. See appendix A for the test.

Observations

Observations will occur at a private preschool during the use of interactive touch screen and literacy application use. This 20-minute timeframe will occur between 10am – 11am and is part of center time so students will be observed as they rotate into the iPad station. Only morning preschool students will be utilize the touch screen technology. All students (morning & afternoon) will follow the same curriculum and have the same teacher. See appendix B for the observation protocol and appendix c for the observation rubric.

Document Analysis

A narrative and content analysis of interviews, observations and documents will be conducted. Narrative analysis is a common qualitative method to restate occurrences, experiences, and historical events in the form of interviews, journals, letters, or other collective data (Merriam, 2009). Triangulation will help look for common themes in gathered information.

Content analysis will utilize three levels of data review: basic, abstract and inferential (Merriam, 2009). The documents to be analyzed are print-outs of previously completed online-based literacy work, running records of each student's literacy progress, and teacher lesson plans outlining weekly work. Only documents from August 15-October 15 will be evaluated to keep results current. A complete document analysis protocol can be found in appendix D.

Findings

Background

My data is strongly based in observation. I observed both classes making notes on overall behavior, attention, interactions and attitudes. The next day I helped the students become familiar with the basics of touchscreen use, logging into their program and switching through the centers.

The following days of observations, I observed both classes (those with and those without devices).

Participant Background

10 students were observed in this case study. 5 students from the morning class utilized touch screen technology and 5 students from the afternoon class did not add technology to their routine. Those who did not add in a phonemic ipad activity did add in a phonemic matching game so that they were spending the same amount of class time on phonemics. There were 3 boys and 2 girls in each group, ages ranging from 3 to 5 years old. For reference and confidentiality purposes names have been omitted.

Observations

An initial observation demonstrated that students would need time to become familiar with the new technology, accessing programs and adding in a new center routine. After two sessions of familiarizing students, observations were made on their general demeanor, level of interest, and interaction both with the device and other students during their time with the touch screen device.

There was a noticeable difference between the level of attention and interest between the students using the devices and those that were not. In general, students working with the iPads were very interested in what they were working on and wanted to continue even when they're allotted 20 minutes was over.

An exciting and unexpected outcome was the social interaction that the use of interactive technology created. When a student would become excited, others would leave their centers to join in, try to help, or simply observe the student with the device. While this could become disruptive, each student in the observations was engaged with the group and device. The only

negative interaction would occur when a student couldn't suggest their solution very well and would attempt to take the device to 'show.'

Pre and Post Test

The use of a pre and post-test provided quantitative support of qualitative observation. While benefits were observed, they are additionally supported by post-test results that showed an overall 16% improvement in scores of those using devices. Students in the control group that did a phonetic literacy activity but did not use the touch screen device saw an overall improvement of 8.6%. While all students showed some improvement, those using the device had an average of nearly twice the gains that those working without devices did. A sample of the pre/post test can be seen in appendix F and results are listed in appendix G.

Document Review

The literature reviewed showed several themes regarding the use of interactive technology in the young learner's classroom. These themes supported multiple intelligence theory, developmentally appropriate practice, and motivation and engagement. The overall literature supported using interactive technology as an active-learning tool but cautioned against passive screen time.

The document analysis reviewed three documents specific to the students from the case study. The first set of documents were newsletters that included the main elements of lesson planning and communication with parents. Student reports from ABCmouse.com, a monthly online subscription education website for preschool-K basic learning, were reviewed to demonstrate average growth of learning. Student running records of overall literacy were also read.

There were three main goals for the document analysis. The first goal was to identify any current practices in the classroom to understand current learning styles and strengths of the students. A second goal was to identify patterns between current classroom work themes and those found in the literature review. The third goal was to identify patterns or themes of technology-based learning in the preschool.

The document analysis showed an overall theme of developmentally appropriate instruction that included repeated and ongoing measures of performance for assessment. The literature review supported the use of technology and interactive media as part of the developmentally appropriate framework (Wardle, 1999). The classroom has an established routine of utilizing multiple intelligences techniques to provide multiple modes of instruction and encourages inquiry-based learning. In the literature review, the use of multiple intelligences (Gardner, 1987) was supported as a natural way to integrate music, visual, movement and other intelligences into the same lesson as it can allow teachers to be sensitive to the different approaches of children (NAEYC, 1996). The current classroom has regularly scheduled times for the use of technology-based learning through centers. This provided an excellent opportunity to introduce a new interactive technology opportunity. The overall literature reviewed supported the use of the touch screen device as a learning tool that, when used in developmentally appropriate ways, can support young children's learning (Fitzgerald, 2011).

Conclusions and Recommendations

There are definite gains in utilizing technology in the preschool classroom. The use of touchscreen technology and interactive programs:

- Improves attention span to the activity during that session
- Provides additional practice of skills

- Utilizes multiple modes of instruction like music, colors and interaction to engage learners

There is overwhelming support through the observations and the testing results that interactive touch screen technology learning creates an engaging learning opportunity for preschool students. Observations showed that multiple intelligences are engaged. Results from the tests supported the observations that those utilizing the touch screen technology developed literacy skills more quickly. This knowledge, and the emerging support of my theory that the additional and engaging screen time increased gains in literacy over those students who did not use technology, encourages me to keep utilizing this technology and pursuing further research. I will consider expanding research to incorporate either more frequent use of iPads or use them for different subjects in addition to literacy.

I feel that the outcomes from this research could be applied to all ages of classrooms. It is also great support for sharing with administrators and parents to support moderate use of interactive technology and its benefits for students. This study has provided excellent support for the need for continued research in the area of technology and the younger student. Research and personal views support the idea that learning should be fun. These young learners are drawn to the current technology, so as educators we need to harness this interest and develop lessons and projects that encourage continued interest.

References

- Birch, L.L., L. Parker, & A. Burns, eds. (2011). Early childhood obesity prevention policies. Washington, DC: National Academies Press. Retrieved from:
www.iom.edu/Reports/2011/Early-Childhood-Obesity-Prevention-Policies.aspx
- Buckleitner, W. (2011). Setting up a multi-touch preschool. *Children's Technology Review* 19 (3): 5–9. Retrieved from: www.childrensoftware.com/pdf/g3.pdf
- Calvert, S.L. (2006). Media and early development. In K. McCartney & D.A. Phillips (Eds.) *Blackwell Handbook of Early Childhood Development*. Boston, MA: Blackwell. pp. 843- 879.
- Cordes, C., & E. Miller, eds. (2000). Fool's gold: A critical look at computers in childhood. *Alliance for Childhood*. Retrieved from:
http://drupal6.allianceforchildhood.org/fools_gold
- Fitzgerald, J. (2011). Child's play: Should preschoolers engage with technology or good-old fashionedf? *Preschool Matters*. Retrieved from:
<http://preschoolmatters.org/2011/06/30/child%E2%80%99s-play-should-preschoolers-engage-with-technology-or-good-old-fashioned-fun/>
- Gilutz, S. & Nielsen, J. (2002). Comparing usability for kids and adults. *Usability of Websites for Children: 70 Design Guidelines*. Fremont, CA: Nielsen Norman Group.
- Greenfield, P.M. (2004). Developmental considerations for determining appropriate internet use guidelines for children and adolescents.” *Applied Developmental Psychology*. 25 (2004): 751–62. Retrieved from
www.cdmc.ucla.edu/Published_Research_files/Developmental_considerations.pdf

Haugland, S.W. (2000). What role should technology play in young children's learning?

Young Children. 55 (1): 12–18.

Heft, T.M., & S. Swaminathan. (2002). The effects of computers on the social behavior of preschoolers. *Journal of Research in Childhood Education*. 16 (2): 162–74.

Jackson, S. (2013, February 28). Can technology be a teaching tool for toddlers, preschoolers?

Common Sense Media. Retrieved from:

<https://www.commonsensemedia.org/educators/blog/can-technology-be-a-teaching-tool-for-toddlers-preschoolers>

Kirkorian, H.L., E.A. Wartella, & D.R. Anderson. (2008). Media and young children's learning.

The Future of Children. 18 (1): 39–61. Retrieved from:

www.princeton.edu/futureofchildren/publications/docs/18_01_03.pdf

Koenig, A.J. (1992). A framework for understanding the literacy of individuals with visual impairments. *Journal of Visual Impairment & Blindness*, 86, 277-284.

Lankshear, C., & Knobel, M. (2003). New technologies in early childhood literacy research: A review of research. *Journal of Early Childhood Literacy*, 3(1), 59-82.

Levin, D. & Rosenquest, B. (2001). The increasing role of electronic toys in the lives of infants and toddlers: Should we be concerned? *Contemporary Issues in Early Childhood*, 2(2), 242-247.

Luckin, R. (2001). Designing children's software to ensure productive interactivity through collaboration in the Zone of Proximal Development (ZPD). *Information Technology in Childhood Education Annual*, 13, 57-85.

- Luckin, R. (2003). With a little help from my friends: Children's interactions with interactive toy technology. *Journal of Computer Assisted Learning*, 19(2), 165-176
- Markopoulos, P. & Bekker, M. (2003). Interaction design and children. *Interacting with Computers*, 15(2), 141-149.
- Merriam, S. (2009). *Qualitative research: A guide to design and implementation*. (2nd ed.). San Francisco: Jossey-Bass.
- National Association for the Education of Young Children [NAEYC] (1996). Position statement on technology and young children - ages three through eight. *Young Children*, 51 (6), 11- 16.
- National Association for the Education of Young Children. (2012). Effective classroom practice: preschoolers and kindergartners. Retrieved from:
<https://www.naeyc.org/content/technology-and-young-children/preschoolers-and-kindergartners>
- National Association for the Education of Young Children. (2014). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. Retrieved from:
http://www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf
- O'Hara, S. and Pritchard, R. (2014). What is the impact of technology on learning? Retrieved from: <http://www.education.com/reference/article/what-impact-technology-learning/?page=2>
- Passig, L. & Levin, D. (2000). Gender preferences for multimedia interfaces. *Journal of Computer Assisted Learning*, 16, 64-71.

- Takeuchi, L.M. (2011). Families matter: Designing media for a digital age. New York: The Joan Ganz Cooney Center at Sesame Workshop. Retrieved from:
<http://joanganzcooneycenter.org/Reports-29.html>
- Van Scoter, J. (2001). Technology in early childhood education: finding the balance. Portland, OR: Northwest Regional Educational Laboratory. Retrieved from:
<http://www.netc.org/earlyconnections/byrequest.pdf>
- Vandewater, E.A., & S-J. Lee. (2009). Measuring children's media use in the digital age: Issues and challenges." *American Behavioral Scientist* 52 (8): 1152–76. Retrieved from: www.ncbi.nlm.nih.gov/pmc/articles/PMC2745155/pdf/nihms128628.pdf
- Wardle, F. (1999). How children learn: Foundations for learning. *Children and Families*, 13 (3), 66.

Appendix A Observation Protocol

Date of observation:

- Pre-Assessment October 30/31
- Observation:
November 3 – 7; November 10-14; November 17-14; November 17-21
- Post-Assessment: November 24

Time of observation: 10am – 11am**Observer:** Lindsey Blaine**Place/Participants Observed:** Anchor Point Playschool preschool students during morning and afternoon sessions.**What will be observed?**

Students will be observed in their interaction with the touch screen device and use of literacy learning application. Notes will be kept on the attentiveness during the first 5 minutes of work, after 10 minutes of work and at end of 20-minute session. Frustration and general demeanor will also be noted.

Documents

The documents to be analyzed are print-outs of previously completed online-based literacy work, running records of each student's literacy progress, and teacher lesson plans outlining weekly work. Only documents from August 15-October 15 will be evaluated to keep results current.

**Appendix B
Rubric**

OBSERVATION RUBRIC

Student Name: _____ Date of observation: _____

	Very Attentive	Moderately Attentive	Not Attentive	Overall Attitude	Notes
	Student is actively working on device. There is physical focus on the application.	Student is actively working but somewhat distracted by others but attention returns to application.	Student is up moving around, distracted by others or otherwise not paying attention to application.	Enthusiastic Calm Frustrated Angry	
Beginning use of touchscreen device & app					
After 5 minutes of use					
After 10 minutes of use					
Completion (20 minutes) of center time					

Appendix C
Observation Analysis

Content Analysis of Observation Data

Raw Data	Common Actions	Themes	Conclusions
Focused attention on device	High overall attention on device. Sometimes loud or busy activities in other stations would attract attention off device; however, more often attention from other stations was turned to the iPad station.	<ul style="list-style-type: none"> • High level of interest • High engagement • Children helping each other 	Students generally have a high focus rate on the interactive activities. Technology encourages interaction with others as children combine to help each other or share.
Interacting with program with touch	All students took some learning and experience in the first week. From there, interaction with touch was high. Many students would use finger to interact even if the program wasn't asking them to at the time.	<ul style="list-style-type: none"> • No hesitation to explore or push buttons • Lots of movement • The greater amount of interaction the longer and more in depth the attention spans. 	Children do not hesitate to select multiple buttons and through trial and error find where they want to be in a program. This allows them to learn the device and programs in hands on manner.
Interacting with program with voice	About 50% of the students repeated words spoken in programs.		
Attitude during use	Positive attitude, interested, engaged	<ul style="list-style-type: none"> • High attention rate, do not want to stop playing 	Children enjoy using the devices.
Attitude at end of use session	Prior to established routine, students were frustrated or angry about quitting use. Once they understood it was a regular activity they left more willingly.		
Reenacting time with device through later play	Children would ask to play with the devices or use a specific app but there was no reenacting of play (i.e. playing dinosaurs outside		

Appendix D

Document Analysis Protocol

Date of analysis: Ongoing (Initial 10/15/2014)

Evaluator: Lindsey Blaine

Name of documents:

- ABCMouse.com completed lesson records
- Anchor Point Playschool lesson plans
- Running records of weekly work

High frequency words/phrases: literacy, phonics, phonetics, early childhood education

Patterns:

- Evidence-based, theory supported instructional practices
- Instruction in beginning word sound, letter sound and recognition
- Interactive touch screen devices for technology integration

Themes:

- High quality instruction
- Repeated measures of performance
- Technology integration for increased engagement

Analysis

A narrative and content analysis of interviews, observations and documents will be conducted. Narrative analysis is a common qualitative method to restate occurrences, experiences, and historical events in the form of interviews, journals, letters, or other collective data (Merriam, 2009). Triangulation will help look for common themes in gathered information. Content analysis will utilize three levels of data review: basic, abstract and inferential (Merriam, 2009).

Appendix E

Document Analysis

Name of documents:

- August 15-October 15 weekly newsletters
- ABCmouse.com monthly student reports
- Student running records

High Frequency words/phrases:

Phonics, phonetics, letter recognition, letter sound recognition

Patterns:

- Evidence-based instructional practices
- Multiple intelligences techniques for multiple modes of instruction
- Inquiry-based learning

Themes:

- Developmentally appropriate instruction
- Repeated measures of performance
- Early intervention

Conclusion:

- Prior to research there is very little internet or computer-based programs being utilized in the classroom
- Current instruction includes developmentally appropriate instruction and games that are proven to help young students learn
- Students have regularly scheduled learning times that focus on phonics and phonetics through teacher-led and small group activities and centers
- Interactive technology that integrates music, fine motor skills, and listening skills is developmentally appropriate for the preschool age group and may increase engagement in the activity by providing variety and differentiation.

Appendix F Pre and Post Test

Student's Name: _____ Age: _____

Phonemic Awareness Pre & Post Test

Phoneme Isolation of Initial Sounds

Tell the child you are going to say a word and he/she is to tell you the first sound of that word. Ask the child what the first sound is in the word *top*. The child should say /t/. Do the same with the words below and check the box if the child says the first sound correctly.

1. big /b/
2. land /l/
3. farm /f/
4. apple /a/
5. desk /d/

Phoneme Isolation of Ending Sounds

Tell the child you are going to say a word and he/she is to tell you the end sound of that word. Ask the child what the last sound is in the word *pot*. The child should say /t/. Do the same with the words below and check the box if the child says the first sound correctly.

1. Pick /k/
2. Ran /n/
3. Fill /l/
4. Bug /g/
5. Tooth /th/

Phoneme Blending

Tell the student you are going to separate all the sounds in a word and he/she is to say the whole word. Do these examples by segmenting each sound and having the student say the whole word; for example, /s/ /i/ /t/ is *sit*. Put a check in the box if the child says the whole word correctly.

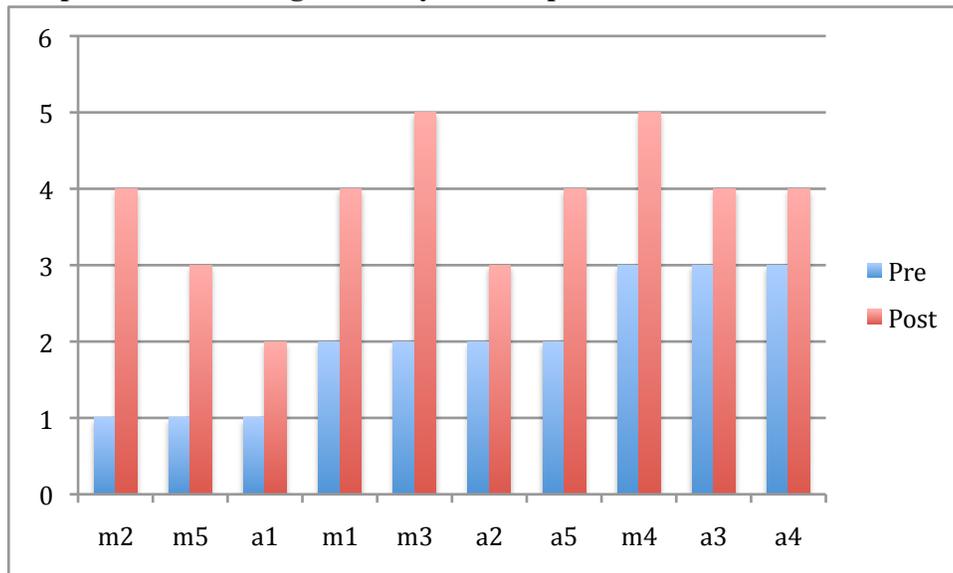
1. /m/ /e/ me
2. /b/ /e/ /d/ bed
3. /h/ /a/ /t/ hat
4. /sh/ /o/ /p/ shop
5. /m/ /u/ /s/ /t/ must

Appendix G Pre and Post Test Results

Student	Pre Test Score	Post Test Score	% Improvement on Test (15 points total)
Morning 1	2	4	14%
Morning 2	1	4	20%
Morning 3	2	5	20%
Morning 4	3	5	13%
Morning 5	1	3	13%
		Average Improvement	16%
Afternoon 1	1	2	7%
Afternoon 2	2	3	7%
Afternoon 3	3	4	7%
Afternoon 4	3	4	7%
Afternoon 5	2	4	14%
		Average Improvement	8.4%

The morning group improved their test scores 7.6% more, nearly double that of the afternoon group.

FIGURE 1: Graph of students organized by similar pre-test scores



Morning and afternoon students beginning with the same pre-test scores showed definite variance in their post-test scores. For example, morning student 2 (m2) gained 3 points versus the afternoon student's (a1) gain of 1 point.