ABSTRACT

THE EFFECT OF THE POWERTOUCHTM LEARNING SYSTEM TOY ON EMERGENT LITERACY SKILLS

By Judith Ann Wilson

This thesis reports on a study of the effects of a technology enhanced toy on emergent literacy skills of young children. The effects of a technology enhanced toy on emergent literacy skills were assessed with Head Start children in a Midwestern state. Forty-one children were randomly assigned to the technology enhanced toy, PowerTouchTM Learning System, or literacy books. Each participated in weekly 25 minute sessions over a period of six weeks. The Test of Early Reading-Third Edition assessed emergent literacy skills including alphabet knowledge, conventions of print, and construction of meaning. There were no significant findings regarding an increase in literacy skills. More time was spent by the technology enhanced toy group than the books only group in the sessions.
THE EFFECT OF THE POWERTOUCH™ LEARNING SYSTEM TOY ON EMERGENT LITERACY SKILLS

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CHAPTER I
Introduction

During the first years of young children’s lives, children learn about reading and writing (Clay, 1991; Sulzby & Teale, 1991; van Kleeck, 1990). Learning to read is one of the most important skills for a young child (National Institute of Child Health and Human Development [NICHHD], 2000). Research about emergent literacy offers a broad view of literacy development (Clay, 1991; Teale, 1987; Teale & Sulzby, 1989). It reflects the child’s task of discovering the structure of oral and written language. Children acquire these skills gradually before formal literacy instruction. Emergent literacy has become more important as research has shown significant relationships with tasks involving emergent literacy skills as predictors of later reading ability (Clay, 1991; Sulzby & Teale, 1991; van Kleeck, 1990). Children’s interactions with their environment promote their understanding of reading.

The environment of children is rich in technology, which provides an abundance of emergent literacy opportunities. Literacy is multidimensional and tied to the child’s natural environment (Teale & Sulzby, 1998). Children become familiar with technology at a young age through computers, phones, and toys. Technology and play are important to young children’s development. Many companies market technology enhanced toys as “educational toys” to parents and educators. It is important for parents and educators to provide our children with the best foundation for learning in this information and communication age. This involves employing the tools and resources of a technology enhanced literacy environment and investigating the future implications of these tools.

There are several studies on computer technology and literacy but few empirical studies have been done to evaluate technology enhanced toys and literacy skills. The National Reading Panel (2000) states that knowledge about literacy has increased; however, further research is needed. The use of technology enhanced toys may increase children’s emergent literacy skills. Further research is essential if educators are to address the effect of technology enhanced toys in the acquisition and the development of literacy skills. By expanding our knowledge of emergent literacy and technology enhanced toys, we may also add to the information known about children’s learning.
Purpose of the Study

The purpose of this study is to examine the effect of the PowerTouch™ Learning System toy on emergent literacy skills in young children. This study will investigate whether the use of a technology enhanced toy would increase the emergent literacy skills of preschool children.

Hypotheses. Based on current research literature, it is hypothesized that:

1. After exposure to the PowerTouch™ Learning System toy, there will be a difference in the posttest TERA:3 reading quotient scores between participants in the technology enhanced condition and the participants in the books only condition.

2. There will be a difference between the time participants spend engaging in activities for the PowerTouch™ technology enhanced condition than PowerTouch™ book only condition.

3. There will be an increase in the print awareness skills on the posttest TERA:3 scores.

4. There will be an increase in alphabet knowledge skills on the posttest TERA:3 scores.

5. There will be an increase in construction of meaning from print subtest on the posttest TERA:3 scores.
CHAPTER II
Review of Literature

This review discusses emergent literacy skills development in young children. Approaches to literacy development and other factors influencing emergent literacy including play, toys, and social/cultural environmental factors are explored. Finally, this review discusses Head Start, technology as a literacy tool and the PowerTouch™ Learning System toy.

Importance of Emergent Literacy

Children begin the process of learning to read before they enter formal schooling (Sonnenschein, Brody, & Munsterman, 1996; Teale & Sulzby, 1989). The term “emergent literacy” was coined by Marie Clay (1991) to emphasize the continuous nature of literacy that begins at birth and continues across the lifespan. Teale and Sulzby (1989) describe emergent literacy as encompassing all of the attitudes, behaviors, knowledge, and skills that are believed to be precursors to formal reading and writing. It is a concept that is deeply embedded in and dependent on natural and ongoing interactions with real life practical goals (van Kleeck, 1990).

Senechal, LeFrevre, Smith-Chant & Chant (2001) referred to emergent literacy as composed of two parts: conceptual and procedural knowledge. Conceptual knowledge is the children’s self perception of reading and their awareness of the functions of print. Procedural knowledge is the mechanics of reading and writing that the children have acquired (Senechal et al, 2001). Literacy emphasizes a continuum between emergent behaviors and reading achievement later in development (Teale, 1987).

Emergent literacy often does not resemble our views of traditional reading and writing. Literacy skills develop through active participation in meaningful and functional experiences everyday in a child’s life (Teale, 1987). Observing others and participating in literacy activities develop emergent literacy skills. Children construct their knowledge of print literacy through exposure to print and experimentation with reading sources. In these interactions the focus is to foster the child’s development of the literacy process rather than the “right” answers (Clay, 1991).
Research has shown that specific skills acquired by many children during the preschool years are significant during emergent literacy (Whitehurst & Lonigan, 1998; van Kleeck, 1990). Two longitudinal studies involving children in Head Start have identified important preschool predictors of elementary school reading success (e.g., Lonigan, Burgess, & Anthony, 2000; Whitehurst & Lonigan, 1998). Both studies assessed cognitive, linguistic, and pre-reading skills in children during the preschool period and followed those children into elementary school. In both investigations, specific pre-reading skills such as knowledge of print, phonological awareness, and writing were found to be strong predictors of reading success well into elementary school. Several researchers have identified specific skills in early literacy development that are associated with success in reading as phonological awareness, letter knowledge, print awareness, and vocabulary development (Adams, 1990; Wagner, Torgesen, & Raschotte, 1994; Lonigan, Burgess, & Anthony, 2000; Whitehurst & Lonigan, 1998).

*Phonological awareness.* Phonological awareness is an important component of emergent literacy. Phonological awareness is the ability to reflect and manipulate the different sounds of speech. Research has shown that phonological awareness taught during preschool or kindergarten improves later reading achievement (e.g. Adams, 1990; National Research Council, 1998). Failing to attend to phonological awareness in the preschool years may increase risk factors associated with young children learning to read. Phonological awareness is composed of syllable awareness, rhyme awareness, and phonemic awareness.

Phonemic awareness refers to a child’s understanding and awareness that speech is composed of a series of individual sounds or phonemes (Yopp, 1992). Phonemic awareness helps children understand how spoken language relates to written language. Phonemic awareness is a better predictor of reading achievement than intelligence, vocabulary or listening comprehension (Stanovich, 1994).

*Alphabet knowledge.* Research has shown a relationship between alphabet knowledge and reading achievement (Adams, 1990). Learning to associate the alphabet letters with their appropriate sounds is an important part of developing literacy skills. According to Adam (1990), letter knowledge can be developed by involving children in a variety of reading activities, such as; pointing out and naming letters in books or playing
games using the alphabet. Several longitudinal studies indicate that knowledge of the alphabet is a significant predictor in reading achievement (Adams, 1990; Fugate, 1997; Honig, 1996). Fugate (1997) conducted a study on first graders and found that an increase in letter naming speed positively affects the development of early reading skills. Young children gradually begin to link letters with sounds and enter into an alphabetic phase of reading and spelling (Fugate, 1997).

**Print awareness.** Children learn about print from many sources. They develop an understanding that print differs from speech and conveys messages just like speech (Morrow & Rand, 1991). Print awareness is the ability to attend to the conventions and formats of print. Children should know the parts of a book and their functions. Children should understand that the print represents the words that can be read aloud. When children are read to aloud, there is the modeling of reading and fluency.

Reading aloud is an important in building a foundation for enjoyment and success in reading (Teale & Sulzby, 1989). Reading aloud from various texts exposes children to different vocabulary, stimulates their thinking, language and reading concepts, and facilitates in the learning to read and fosters a desire to read (Neuman & Roskos, 1992; Teale & Sulzby, 1989).

**Vocabulary development.** Vocabulary development is necessary for reading comprehension (Yopp, 1992). Vocabulary refers to the words one must know to communicate effectively. Penno, Wilkinson, and Moore (2002) investigated intervention strategies to improve young children’s vocabulary and found that the greatest gains came from a combination of contextually relevant direct instruction and incidental learning (Penno, Wilkinson, & Moore, 2002). They found that this effect was tied to the frequency of readings. Children who heard repeated readings of stories made the most significant vocabulary gains.

**Approaches to Literacy**

There are a number of approaches to literacy development. The two approaches discussed in this research study are the constructivist and direct instruction approaches.

**Constructivist Approach.** The conceptual framework for this study builds on the work of Vygotsky and Piaget. Both offer a framework for learning, social practices, and literacy. These perspectives have significantly impacted the theory development of
emergent literacy. Learning is social and grounded in specific sociocultural situations. Learning is founded on interaction. The emergent literacy perspective is based on constructive, functional and interactive processes (Clay, 1991; Roskos & Neuman, 1993; Morrow & Rand, 1991). The constructivist view incorporates the importance of learning basic skills and building more advanced skills to organize and synthesize information and experiences as the child interacts with the world. According to Piaget (1965), children construct knowledge through interactions with their environments. Through active involvement with various materials, ideas, and events, young children construct their own understanding of reading and writing. Children are capable of constructing knowledge with the assistance of an adult or a more able partner (Vygotsky, 1978). Technology may serve as a guide in literacy development in young children. Teale and Sulzby (1989) describe young children as learning the functions of literacy through observing and participating in real life experiences in reading and writing.

Direct Instruction. Another approach to literacy is through direct instruction. Direct instruction is based on behavior learning theories. It emphasizes the use of small group, face to face instruction by teachers using lessons in which cognitive skills are broken down into small steps (Burns, 2000). The students are given steps to complete and then they are given the problems to solve on their own. Research supports direct instruction. Stallings and Kaskowitz (1974) in Project Follow Through evaluated the effects of different instructional models on the basic, cognitive, and affective skills of elementary disadvantaged students. The study examined models based on direct teaching and child directed construction of knowledge. The study found that students in the program based on the direct instruction model had increased achievement in reading and math when compared to traditional and montessori programs (Stallings & Kaskowitz, 1974).

Other Factors Influencing Emergent Literacy

There are several other factors, which influence the development of emergent literacy skills in young children. These factors include play, toys, social and cultural environmental factors.

Play. Play is a critically important activity for young children. Play is believed to be a significant influence in language and cognitive abilities (Vygotsky, 1978). Lewis &
Rosenblum (1973) found in a study of kindergarteners that children who played imaginatively had significantly high scores in a picture interpretation task and vocabulary. Roskos & Newman (1998) suggest a relationship between play and emergent literacy skills. For example, when young children play with language thinking or analyze the meaning of literacy and its medium. They discover the meaning from print. Play promotes the development of psychological, cognitive and social development in young children (Piaget, 1965).

Children are actively involved and gain a sense of control through play. Piaget emphasized that learning experiences should be self directed and autonomous. Through play children can construct new knowledge by incorporating it into prior experiences.

Play helps children engage in pretending and symbolic representation. Reading and writing are forms of symbolic play. Piaget (1965) suggested that the ability to handle symbolic information has potential for promoting literacy development. According to Piaget (1965), symbolic representation is a child’s ability to use one thing for another. Through play, children have experiences with imagination that leads to an understanding of their own mental state. Isenberg and Quinsberry (1983) state through “symbolic play, the process of transforming an object or oneself into another object, person, situation, or event through the use of motor and verbal actions in a make believe activity, provides an important source of literacy development” (p.36).

Play environments need to focus on the young child’s interests to encourage the development of literacy skills (Saracho, 2001). Children’s acquisition of literacy emerges when their play experiences nurture their understanding about the purposes and characteristics of print (e.g. Christie & Enz, 1992; Morrow & Rand, 1991; Neuman & Roskos, 1990; Pellegrini & Galda, 1993). According to Roskos (1989), children apply reading and writing to substantiate their pretend play, express themselves and gather information with play events. Neuman and Roskos (1989) suggests that children apply the functions of literacy when they are exploring their environment, interacting with others, expressing themselves, confirming incidents, and transacting with text.

Toys. Toys are tools, which children actively engage with as part of a sociocultural practice. Mann (1996) in describing tools of learning for young children states:
“Toys are learning instruments. They are objects that stimulate the children’s imaginations and help them develop socially and intellectually”.

Toys have been used as social markers that induct children into rituals, myths, and values of a given society (Sutton-Smith, 1986; Agamben, 1993). Many technology enhanced toys are being introduced as contributing to student learning. Moll, Amanti, Neff, and Gonzalez (1992) cited that educators should seek opportunities to investigate toys with families and determine the “fund of knowledge” which children and parents develop from engaging with the toys.

The role of play and toys in supporting the child’s learning can be explained in terms of scaffolding. Scaffolding is a term coined by Wood et al (1976), which developed from ideas of Vygotsky’s zone of proximal development. The zone of proximal development is the difference between the child’s actual level of development and the higher level of potential development that is possible under the guidance of a more competent peer. The supportive role which technology enhanced toys provide is a form of scaffolding. The toy provides the needed support for the child, shifting control until the child exhibits independence. According to Vygotsky (1978), the zone of proximal development also involves the assistance from a more able partner. In this study, we present the partner as the technology enhanced toy. Children learn by interacting with partners who model and reinforce literacy functions.

**Social/Cultural Environment Factors.** Emergent literacy is highly influenced by the social and cultural environment in which children reside. During the preschool years, many children acquire knowledge incidentally and informally. According to Lonigan, Elber, and Johnson (1998), children raised in improvised situations and experienced English as a second language have an increased risk for difficulties. Preschool environments can provide opportunities for exploration and play that promote emergent literacy skills (Morrow & Rand, 1991; Teale & Sulzby, 1986). Morrow & Rand (1991) identified elements in children’s environments that encourage the development of literacy, such as; the ready availability of books and writing materials, opportunities to observe others engaging in reading and writing, and adult-child interactions.

Socioeconomic status differences have been related to literacy achievement in schools. Snow, Brown, and Griffin (1998) recommended that children who have been
identified as at risk for reading difficulties should have access to quality early childhood environments that promote language and literacy development. Children who are not prepared to enter school, or have limited experiences with language and text, and limited reading interactions are more likely to develop problems when they enter school (Snow et al., 1998). Various experiences and exposure with the print of reading helps to develop specific print skills, which are an important part in the development of learning to read.

Children who grow up in literacy rich environments enter school with a more advanced understanding of underlying reading concepts (Adams, 1990). Several studies have demonstrated that young children from low socioeconomic families are read to less frequently than children from higher socioeconomic families (Neuman & Roskos, 1992; Pellegrini & Galda, 1993) Other studies have found differences between lower and middle socioeconomic family groups in children’s exposure to experiences that support the development of emergent literacy skills (Neuman & Roskos, 1990).

Neuman and Celano (2001) conducted a study of access to print in two low income and two middle income neighborhoods in Philadelphia. The study examined the availability of print and focused on the resources that are considered to impact the beginning development of reading and writing. The results of the year long analysis indicated middle income children have a large variety of literacy resources to choose from whereas low income children have more restricted resources found in public institutions; such as, preschools and public libraries. Experiences with print help preschool children develop an understanding of the convention, purpose, and function of print.

Whitehurst, Arnold, Epstein, Angell, Smith, and Fischel (1994) conducted a study of parents reading with preschoolers. The middle class parents reported a frequency of shared book reading with preschoolers of approximately seven times per week compared with a frequency of about once a week reported by parents of children attending Head Start in the same location. The interactive reading style was found to be effective (Whitehurst, Arnold, et al., 1994). To prevent the development of reading difficulties it is important to provide various supports and experiences during the preschool years.

Head Start. In 1964, Project Head Start began as an experimental program offering a preschool curriculum to 3 to 5 year old children from low socioeconomic
families that lacked the skills necessary to successfully enter school. Head Start is the first nationally sponsored approach to focus on preschool children living in low socioeconomic and familial low literacy environments. The role of preschool is changing from preparing children for literacy to structuring the environment and guiding the child’s present literacy learning (Clay, 1991; Neuman & Roskos, 1993).

Technology as a Literacy Tool

Children are growing up with technology in their homes, schools, and communities. According to Vygotsky (1978), culture and society provide the artifacts for development. These artifacts include computers, educational toys, internet access, and other multimedia tools. Technology is impacting children’s development through the use of electronic tools and information that is used to communicate with each other.

Technology may be integrated into the preschool classroom and be used as a tool for learning to “improve the quality of education in all subject areas” (Panel on Educational Technology, 1997). The Panel on Educational Technology (1997) investigated the use of technology to strengthen kindergarten through twelfth grade education in the United States. Two strategic recommendations made by the Panel on Educational Technology (1997) to make an impact in the schools were:

1. Focus on learning with technology, not about technology.
2. Initiate a major program of experimental research.

A further suggestion was made that pairing appropriate literacy activities with technology may provide interesting, activity based experiences for children.

Research examining the effect of computerized technology on literacy and other cognitive skills has primarily focused on the effect of desktop computers and software. Seymour Papert (1993) described children as active in constructing knowledge in his studies with computers in learning. Papert (1980) conducted studies with his computer LOGO software to teach geometric concepts to children. He suggests that when children use the software as a problem-solving tool with the child in control, the computer was an effective learning tool. Computer technology introduces an individualized approach to learning. The software allows the child to progress at their own pace and the computer technology is more like an assistant to the teacher. The technology acts as a guide or facilitator to meet the needs of the child. According to Haugland & Shade (1994),
Computer software creates opportunities for children with active exploration, problem solving and decision making. Furthermore, the interactive software provides experience with sounds of language and print.

Spencer and Baskin (1997) noted that the computer can be used as a tutor to present concepts, information, or skills that are usually presented through traditional teaching methods. Their study found that four to five year old children learned the alphabet, learned to count, and learned how to discriminate between similar and different objects. The children were interacting with a computer programmed to present information, receive responses, and offer new information based on the children’s responses.

A number of studies investigated computer software and the relationship with literacy. Liang and Johnson (1999) introduced preschool children to different kinds of literacy computer software and showed improvement in spelling and story writing. According to their study, the children considered the most “at risk” had the largest improvement. Foster, Erickson, Foster, Brinkman, & Torgeson (1994) conducted two different studies evaluating the effectiveness of Daisy Quest interactive software with children in preschool and kindergarten. Daisy Quest is an interactive game designed to teach phonological sensitivity. The study demonstrated significant improvements in preschool and kindergarten children exposed to the Daisy Quest software. The children exposed to the Daisy Quest computer game produced a significant improvement in their phonological awareness and word recognition skills. The computer based approach was also found to be more effective than regular instruction (Foster et al, 1994).

Technology enhanced toys and electronic books are becoming more popular and marketed as educational resources. Electronic books combine reading, writing, listening, and speaking as part of a child’s literacy development. Research indicates electronic books have been found to motivate children to read and enhance their achievement in analyzing words, recalling details of stories, and acquiring a sense of story structure (Kinzer & McKenna, 1999). According to McKenna (1998), electronic storybooks hold the potential to help children extend their vocabulary, word knowledge, and concepts about print, and story comprehension. The computerized technology puts the child in control of their environment.
Electronic books have the ability to develop and strengthen the beginning of reading development (McKenna, 1998). Electronic books McKenna (1998) identified three areas of reading development. First, there is guidance. Electronic books offer support to the child that is similar to what the teacher may provide during oral reading. Secondly, there is child control. The electronic books place the decision to read on the child. Children can explore the books with the aid of technology. Thirdly, there is the development of a positive attitude about reading.

Research supports that children may benefit from technology enhanced activities and electronic books that promote literacy skills. Electronic books allow emergent readers to follow along with a story even if they can not independently read the text. McKenna (1998) reviewed several studies conducted by the National Reading Research Center to investigate the effectiveness of phonics lessons that were embedded in electronic books. Children who clicked on an unfamiliar word while reading were given a digitized pronunciation of the word and a rhyming word. The repeated readings with the electronic book led to substantial gains in the number of sight words beginning readers acquired (McKenna, 1994; McKenna & Watkins, 1996). Electronic books help children in decoding by simultaneously presenting written information and spoken words.

*The PowerTouch™ Learning System Toy.* Newer technology enhanced toys combine the interactive technology of a computer with a toy. In July of 2003, Fisher Price introduced the PowerTouch™ Learning System to further develop a young child’s early literacy development. PowerTouch™ Learning System answers questions, plays games, and allows the child to use their fingertips to activate a touch sensitive screen. The interactive “hands on” approach touch toy is designed to develop skills by advancing through four different technology enhanced levels. The first level is Story. The child is able to listen to the story as it is read aloud. The second level is Words. The child is able to touch and hear the words. The third level is Phonics. The child touches a word and the system will sound it out. Fourth level is Spelling. The child touches a word and learns how to spell it. This approach to literacy is an attempt to combine the playful interaction suggested by Piagetian and Vygotskyian theories with the focus on skills suggested by direct instruction. From this perspective, the role of the PowerTouch™ toy is to facilitate and extend child imitated learning (Vygotsky, 1978). The PowerTouch™ provides the child
with opportunities for interactions that are guided but move at the pace of the child. The PowerTouch™ may act as a scaffold for learning when one-on-one adult interaction is not available.

There are many questions regarding the effect of technology enhanced toys have on emergent literacy skills in young children. As discussed above, research has demonstrated the benefits of early literacy experiences with computers (Papert, 1981; Haugland & Shade, 1994). Research has also shown the importance of play in constructing literacy skills (Roskos & Neuman, 1998). Computer based literacy research has concluded it is effective in developing basic skills of literacy with young children (Haugland & Shade, 1994). However, little research has been done to examine if technology enhanced toys can affect emergent literacy.

**Purpose of the Study**

Conducting a study that examines the effect of using the PowerTouch™ technology enhanced toy with young children will provide useful knowledge for educators and parents regarding the development of literacy skills. These questions must be answered if educators and parents are to utilize this technology as a tool in enhancing emergent literacy skills.

The purpose of this study is to examine the effect of the PowerTouch™ Learning System toy on emergent literacy skills in young children. The study will investigate whether use of the PowerTouch™ toy would increase the emergent literacy skills of preschool children.

**Hypotheses.** Based on current research literature, it is hypothesized that:

1. After exposure to the PowerTouch™ Learning System toy, there will be a difference in the posttest TERA:3 reading quotient scores between the participants in the technology enhanced condition and the participants in the books only condition.
2. There will be a difference between the time participants spend engaging in activities for the PowerTouch™ technology enhanced condition than PowerTouch™ book only condition.
3. There will be an increase in alphabet knowledge skills on the posttest TERA:3 scores.
4. There will be an increase in conventions of print on the posttest
TERA:3 scores.

5. There will be an increase in construction of meaning from print on the posttest TERA:3 scores.
CHAPTER III
Method

Participants

The sample of participants was taken of preschool children enrolled in a federally funded Head Start classroom in a midwestern state. Although 63 participants initially existed in the sample, the population was reduced to 41 subjects (25 females and 16 males). This drastic reduction in sample size was primarily due to a loss in transportation of the students. Busing for the preschool program was removed towards the end of the experiment. Many of the children previously enrolled in Head Start at the start of the experiment withdrew when transportation was removed.

The Head Start program is a federally funded low-income program. The ages of the children ranged from three to five years old. All of the students were members of families within a socioeconomic range making them eligible for Head Start. Approximately one third of the sample was primarily Spanish-speaking students enrolled in the Head Start program. A letter describing the experiment was distributed to teachers of participating classrooms (see Appendix A).

Informed consent was gained from the parents of the participants as well as verbal consent from the participants themselves (see Appendices B and C). After consent, an experimental method was used, and each participant randomly assigned to an experimental condition stratified to maintain equivalency of gender, ethnicity, and classroom membership between conditions.

Participants were divided into a control group, consisting of 23 subjects, and an experimental group, consisting of 18 subjects. Children assigned to the experimental group were exposed to the interactive, technology enhanced PowerTouch™ Learning System, along with the books that accompany the system. Children in the control group were exposed only to the PowerTouch™ books during the experimental conditions.

A subsample of the children for this research was used in supplemental research investigating differences in literacy development between English and Spanish speaking preschoolers. This sub-sample made up 13 of the 41 participants and consisted of children living in the homes in which Spanish was the primary language.
Materials

*Fisher Price PowerTouch™ Learning System Toy.* Twenty Fisher-Price PowerTouch™ Learning Systems technology enhanced toys were used with the participants in the experimental group. Each technology enhanced system contains five PowerTouch™ toy storybooks including Sesame Street, Ernie’s Neighborhood, Clifford, Blues Clues, and Dora the Explorer. These systems were donated by Fisher-Price to be used in researching their technology enhanced literacy system.

The PowerTouch™ Learning System toys are battery operated and self contained. The inside base of the toy allows the user to touch the alphabet letters or with the insertion of the book they may utilize the accompanying storybooks to access other possibilities for the system. With the book, the user may choose to work with phonemes, word recognition, or reading functions. The user need only touch the page of the book or the letters on the system base to activate technology enhanced play. At the conclusion of the study, the literacy systems were donated to the participating Head Start classrooms.

*Literacy Books.* Literacy books were presented to the participants in the books only condition for the same duration that the PowerTouch™ technology enhanced toy was presented to the technology enhanced condition. These children were presented with the books that are included with the Power Touch™ system, including Sesame Street, Ernie’s Neighborhood, Clifford, Blues Clues, and Dora the Explorer. The books were used without the technology enhanced base system, providing no reinforcement or interactive technology. The experimenters spent equivalent amounts of time with both groups of participants.

*Test of Early Reading Ability: Third Edition (TERA:3).* To assess literacy skills, the Test of Early Reading Ability-Third Edition (TERA:3) was used. Participants were administered the TERA:3 as pre- and posttest for the technology enhanced and books only conditions in October. Although Spanish versions of the TERA:3 are available, it was administered in English to all participants, as the skills being assessed are related to performance in an English-speaking environment. The TERA:3 was used again in January as a posttest.

The TERA:3 is a direct measure of the reading ability of young children ages 3 years 6 months and 8 years 6 months. It is used for early reading interventions, identify
strengths and weaknesses, and monitor changes in performance due to intervention. The three subtests of the TERA:3 measure early developing reading skills such as alphabet, conventions of print, and the construction of meaning from print. It was last normed in 2000 (n=875) and stratified by age relative to geography, gender, race, residence, and ethnicity (Reid, Hresko, & Hamill 2001). New studies show the absence of gender, racial, disability, and ethnicity bias. New items have been added to this edition to reduce ceilings and floor effects for the upper and lower ages. According to the test publishers, the TERA:3 has validity for the general population as well as a variety of subgroups. Reliability in 30 of the 32 coefficients are consistently high reportedly approach or exceed .90. Concurrent validity assessed using the Basic School Skills Inventory was found to be in the .55 range. There are two forms of the test (Form A and Form B). Form A was used in the pretest in October and Form B was used in the posttest in January. It required individual administration and took approximately 20 minutes.

Teacher Letter. A letter to the Head Start teachers was distributed to explain the study. The classroom teachers assisted in recruitment of preschool children by sharing information about the study with parents (see Appendix A).

Parent Questionnaire. In conjunction with the informed consent form and parent letter (see Appendices B and C), a parent questionnaire was distributed to parents of the children in the sample population. The questionnaire inquired as to the reading behaviors of the subject at home, their access to technology enhanced literacy toys, and their developmental history. Parents were also asked the relative amounts of English and Spanish that are spoken in the home and the primary language of the parent. questionnaires were sent in both Spanish and English (see Appendix D).

Protocol. Structured protocols were used by the experimenters to ensure the reliability and validity of results. These protocols included standardized instructions to that were read to the subjects along with appropriate responses to participant questions, break requests, lack of interest, failure to play with the toy, and requests to terminate the session early (see Appendix E).

Observation Sheet/ Fidelity Checklist. The observation coding sheet was used by the experimenters to support consistent and operationally defined sessions of observations. Information regarding the duration of the session, specific books selected,
and other detailed behaviors were recorded. This form was also used as a fidelity checklist to ensure standardization of procedures (see Appendix F).

*Procedures*

Approval was received from the Parent Advisory Council for the Head Start program, and participants were recruited from pre-existing classroom groups within the county. After obtaining consent from parents or guardians, the sample was finalized. The parents were asked to complete a questionnaire regarding the primary language spoken in the home, literacy skills of their child, and the child’s exposure to reading and other literacy toys. The subjects were randomly assigned, within each classroom to the technology enhanced or the books only groups. The TERA:3 was administered to both the experimental group and the control group as a pretest assessment of their literacy skills.

The primary experimenters were three graduate students previously trained in the protection of human subjects. They completed training sessions on protocol use and observation coding. In order to enhance standardization of procedures, all three experimenters observed together during the first week of research. All experimenters thoroughly completed the observation sheet/fidelity checklist to ensure all appropriate steps were followed. Additional student assistance was occasionally needed in observation and data collection. These experimenters were trained similarly on protocol use and observation recording. They also attended IRB training and used the methods outlined in this proposal.

During the exposure phase, participants in the technology condition had controlled exposure to the PowerTouch™ toy, beginning with training from the experimenters. Each child in the experimental group was individually removed from his/her classroom for one 25-minute session twice per week for six to twelve weeks. During the session, the experimenter spent five minutes at the start of the session interacting with the child, according to the protocol, while using and introducing the PowerTouch™ toy. During the next twenty minutes, the child received no interaction from the experimenter and was observed playing with the technology enhanced toy. Protocol was followed as to standardized responses to questions from the children. On the occasion that the child wanted to stop playing with the PowerTouch™ technology
enhanced toy prior to the end of the session, the experimenter provided one prompt. If the child still wished to end the session, they were allowed to return to their classroom (see Appendix E).

Participants in the books only condition were exposed to the books without the interactive technology enhanced base for the same amount of time per week and with the five minutes of interactions and twenty minutes of solitary involvement with the books. Similar procedures were used according to the protocol.

At the end of the six week period, the TERA:3 was readministered as a posttest to both experimental conditions. Throughout the study, human subjects were protected. A parental consent form, including an experimental disclosure explaining potential risks, was used to assure informed consent and allow the parents a choice in their child’s participation. No deception was involved and the potential risk of detriment to the child due to missed class time was minimized, for both the experimental conditions, by the additional practice of literacy skills occurring during research sessions. To compensate with any gains made solely by the interactive participants, a PowerTouch™ Learning system was donated to each participating classroom upon completion of the study.

Further participant protection in the form of confidentiality was maintained throughout the experiment. Participant names were not included on any data recordings, but rather a participant number corresponding to the number heading their signed consent form identified them. These forms were stored separately from all experimental data. Additionally, the children themselves were asked for verbal assent for their participation, assuring that their rights were protected and they were not hostile participants.

Data Analysis

To analyze the data collected, a series of ANCOVA analyses were used. This was used to examine the differences in the mean change in performance on the TERA:3 between the experimental and control groups. The structured observations were quantified and used to make correlations as to time spent with the technology enhances toy and the storybook only choice. All hypothesized relationships were analyzed with a Pierson t-test. Probability was set at the .05 significance level.
Chapter IV

Results

An analysis of covariance (ANCOVA) was used for between group treatments (technology enhanced toy versus books only). The ANCOVA conducted used the scores from the posttest of the Test of Early Reading Abilities, Third Edition (TERA:3) reading quotient, alphabet knowledge, conventions of print, and construction of meaning. The pretest Scores of the TERA:3 were used as covariates. The dependent variable were the TERA:3 subtest scores and time spent in engagement. The independent variables were the PowerTouch™ learning system toy and the literacy books. Each subtest of the TERA:3 measures different aspects of literacy development. The alphabet knowledge subtest assesses a child’s knowledge and use of the alphabet and letter-number differentiation. The conventions of print subtest of the TERA:3 assesses a child’s knowledge of conventions of print or print awareness (e.g., the direction in which print is read, how to hold a book, and when to turn a page). The meaning subtest measures a wide variety of ways in which a child comprehends and constructs meaning of print (e.g., signs, logos, and print). The results of an ANCOVA indicated that there were no significant differences between the technology enhanced group than the books only group. Table 1 presents TERA:3 pretest and posttest means scores and standard deviations.

Hypothesis One: There will be a difference in TERA:3 reading quotient scores between participants in the technology enhanced (experimental) condition and the participants in the books only (control) condition.

An ANCOVA revealed there was no significant difference between the TERA:3 reading quotient scores in the technology enhanced condition and the books only condition. The TERA:3 scores of the participants in the technology group were higher than those of the participants in the books only group ($M_{technology}=91.28$; $M_{books only}=86.48$), $F(1,40)= 0.96$, $p= .335$ (see Table 1).
Table 1
TERA:3 Reading Quotient posttest mean performance scores

<table>
<thead>
<tr>
<th>Experimental Condition</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>91.28</td>
<td>12.07</td>
<td>18</td>
</tr>
<tr>
<td>Books Only</td>
<td>86.48</td>
<td>13.76</td>
<td>23</td>
</tr>
</tbody>
</table>

Hypothesis Two: There would be a difference in the amount of time spent between participation in the technology enhanced condition and participants in the book only condition.

An ANCOVA revealed that there was a greater amount of time spent engaged in interaction with literacy materials during experimental conditions by the technology enhanced group than the books only group. The technology enhanced group spent a total of 87.28 minutes, while the books only group spent 38.9 minutes ($F(1,40)=35.45$, $p=.001$). A large effect size (.518) was found.

Hypothesis Three: There will be an increase in alphabet knowledge skills on the posttest TERA:3 score.

The results do not support the hypothesis that there would be an increase in alphabet knowledge skills on the posttest TERA:3 scores (see Table 2). However, alphabet knowledge did approach significance with the experimental group being the group with higher measures. An ANCOVA revealed that no significant difference between groups for the alphabet subtest ($F(1,40)= 3.04$, $p=.09$). The scores of the experimental group reported on the alphabet knowledge pretest subtest ($M_{technology}=7.11$, $SD=1.56$) did not increase significantly more on the posttest alphabet knowledge ($M_{technology}=8.61$, $SD=2.48$) than the increase between the control group pretest alphabet knowledge ($M_{books only}=7.13$, $SD=2.03$) and the posttest ($M_{books only}=7.69$, $SD=2.29$).
Table 2

Pretest and posttest scores for TERA:3 subtests

<table>
<thead>
<tr>
<th></th>
<th>Technology Enhanced PowerTouch™</th>
<th>Books Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F (1,40) M SD</td>
<td>M SD</td>
</tr>
<tr>
<td>TERA:3 Posttest Scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Quotient</td>
<td>91.28 12.06</td>
<td>86.48 13.76</td>
</tr>
<tr>
<td>Alphabet</td>
<td>8.61 2.48</td>
<td>7.69 2.29</td>
</tr>
<tr>
<td>Conventions</td>
<td>8.16 1.88</td>
<td>8.10 2.18</td>
</tr>
<tr>
<td>Meaning</td>
<td>9.16 2.31</td>
<td>8.43 2.84</td>
</tr>
<tr>
<td>TERA:3 Pretest Scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Quotient</td>
<td>84.22 8.07</td>
<td>81.78 11.93</td>
</tr>
<tr>
<td>Alphabet</td>
<td>7.11 1.56</td>
<td>7.13 2.03</td>
</tr>
<tr>
<td>Conventions</td>
<td>7.72 1.49</td>
<td>7.00 1.56</td>
</tr>
<tr>
<td>Meaning</td>
<td>7.83 .98</td>
<td>7.35 2.57</td>
</tr>
</tbody>
</table>

Hypothesis Four: There would be an increase in the conventions of print skills on the posttest TERA:3 scores.

The results do not support the hypothesis that there would be an increase in the print awareness skills on the posttest TERA:3 scores (see Table 2). An ANCOVA revealed that no significant difference between groups on the conventions of print ($F(1,40)=0.082, p=.776$). The scores of the experimental group reported on the conventions of print pretest ($M_{technology}=7.72, SD=1.49$) did not increase significantly more on the posttest conventions of print ($M_{technology}=8.16, SD=1.85$) than the increase between the control group pretest conventions of print ($M_{books only}=7.00, SD=1.56$) and the posttest ($M_{books only}=8.10, SD=2.18$).

Hypothesis Five: There would be an increase in construction of meaning from print on the posttest TERA:3 scores.
The results do not support the hypothesis that there would be an increase in the construction of meaning on the posttest TERA:3 scores (see Table 2). An ANCOVA revealed that there are no significant difference between groups on the construction of meaning ($F(1,40)=0.973, p=.332$). The scores of the experimental group reported on the conventions of construction of meaning pretest ($M_{technology}=7.83, SD=.98$) did not increase significantly more on the posttest construction of meaning ($M_{technology}=9.16, SD=2.31$) than the increase between the control group pretest construction of meaning ($M_{books\ only}=7.35, SD=2.57$) and the posttest ($M_{books\ only}=8.43, SD=2.84$).

**Post Hoc Results**

During both of the experimental conditions, various degrees of “reading acts” were defined for observation. Observational data indicated there were differences in participants’ behavior during experimental sessions. The frequency of each of these reading acts were recorded during each of the six sessions. Actions were coded into four activities, described as Reading Act 1, Reading Act 2, Reading Act 3, and Reading Act 4. Reading Act 1 was defined as the subject physically orientated towards the materials, turning pages, and/or touching items on the system or the books. Reading Act 2 was defined as the subject pointing to and verbally naming pictures, letters, or words on the system or books. Reading Act 3 was defined as the subject running their finger along the words of the story in the correct order (on the books alone or with the interactive base), telling the story, inventing a story for the pictures while turning the pages, or in some way demonstrating an awareness of the existence of a story as it relates to a book. Reading Act 4 was defined as “other” non-reading activities refers to any observed actions that did not fall within the description of Reading Acts 1-3.

Reading Act 1 is considered a more basic emergent literacy skill. Reading Acts 2 and 3 are considered to be increasingly more complex literacy skills. Figure 2 illustrates the larger percentages of higher order reading acts in the books only condition compared to the technology condition (see Figure 1). A follow-up ANOVA revealed the difference between experimental conditions for engagement in Reading Act 1 was significant ($F(1,40)=12.55, p=.001$). The differences in Reading Act 2 between experimental conditions was also significant ($F(1,40)=8.97, p=.05$). These two differences were in opposite directions. The more frequent occurrence of Reading Acts 2 and 3 in the books
only condition may contribute to the lack of expected effects on emergent literacy skills (as measured by the TERA:3) of the technology enhanced condition.

Figure 1

Time spent in reading acts by experimental condition

A final post hoc item to be discussed related to the correlation between the time spent engaged in literacy related activities at home, as reported by parents on the parent survey, and the time spent in the experimental sessions. Results indicated that the more time a participant spent engaged in literacy related activities at home, the more time they spent engaged in literacy related activities in the experimental session (Pearson two-tailed, $r = .592$, $p = .084$).
Chapter V
Discussion

This study was designed to explore the difference between the effects of the technology enhanced toys and literacy books using the pretest and posttest scores from the TERA:3 and through the collection of observation data. This chapter discusses research supporting technology, play, and emergent literacy skills. Also, the post hoc results and limitations of the research are discussed. Educational implications for school psychologist as well as recommendations for future research are described. Finally, conclusions and summary comments are made.

Review of Literature

Our results did not demonstrate that technology enhanced toys demonstrate a significant effect on emergent literacy skills. A review of literature suggested that research has identified specific skills in early literacy development with Head Start children that are associated with success in prereading, such as; phonological awareness, letter knowledge, print awareness, and vocabulary development (Adams, 1990; Wagner, Torgesen, & Raschotte, 1994; Lonigan, Burgess, & Anthony, 2000; Whitehurst & Lonigan, 1998). This research study does not support any increases in development in prereading skills or what this study refers to as emergent literacy skills with the use of technology enhanced toys. There are several differences between the studies presented in the review of literature and this study. One difference was former research was primarily comprised of longitudinal studies This study was for a duration of six weeks.

Other literature suggested that alphabet knowledge can be developed by involving children in a variety of reading activities, such as; pointing out and naming letters in books or playing games using the alphabet (Adams, 1990). This study did not support the development of alphabet knowledge of children involved in interacting with the technology enhanced toy. This may have been due to the relatively small sample size, however, and the difference approached significance ($F(1,41)= 3.04$, p=.09).

Other literature asserts that literacy activities involved in play enhance children’s level of play and later literacy skills development. According to Neuman and Roskos (1989) suggests that children apply the functions of literacy when they are exploring their environment, interacting with others, expressing themselves, confirming incidents, and
transacting with text. This study did not closely examine the level of play in relation to literacy skills development. The second hypothesis of this study did, however, look at the time engagement in the activities with the technology enhanced toy. There was a greater amount of time spent engaged in literacy activities during experimental conditions by the technology enhanced group than the books only group. The technology enhanced group spent a total of 87.28 minutes, while the books only group spent 38.9 minutes.

Other literature asserts that children may benefit from technology enhanced activities and electronic books that promote literacy skills. According to McKenna (1998), electronic storybooks hold the potential to help children extend their vocabulary, word knowledge, and concepts about print, and story comprehension. Several studies discussed how the digitalized pronunciation of the word of the word and repeated readings led to substantial gains in sight words acquired (McKenna, 1994; McKenna & Watkins, 1996). The results of this research do not significantly support the hypothesis that there would be an increase in posttest TERA:3 literacy scores between participants in the technology enhanced condition and participation in the books only condition. A larger sample population may yield different results. A closer investigation of the effectiveness of the various lessons embedded in the story books and technology enhanced toy may be appropriate for various age levels.

Finally, the literature does support the basic need for research on technology and literacy development. The Panel on Educational Technology (1997) recommended that technology should continue to be used by educators as research is conducted. Society is changing and exposure to various technology enhanced materials is growing. There is limited research on the effect of technology enhanced toys on emergent literacy skills and preschool children. This research supports the need to examine technology and emergent literacy skills.

Limitations

Research that examines the effects of technology enhanced toys on emergent literacy skills of young children is subject to a variety of limitations. The most significant limitation to this research relates to the attrition of participants due to the loss of transportation. During the last week of data collection, the public funded bussing was unavailable to all children attending Head Start classrooms in the region in which the
research took place. Nineteen participants from the original sample of 60 were lost from
the population. Although pretest data and experimental data had been collected for these
participants, posttest information was unable to be assessed. This also created an
imbalance of the experimental condition due to attrition. The drastic decrease in sample
size significantly impacted the results presented in this research. Additionally, the loss of
participants also contributed to an imbalance of the number of participants in each
experimental condition.

Secondly, more than half of the children overall (52.3%) spent less than half the
time available in session. This may have been influence by two factors. The first
involves the structure of the experimental sessions. The experimental sessions were
divided into six, twenty-minute sessions. These sessions may not have been an
appropriate length of time for the children involved in the study. Many of the children
lost interest in both the interactive, technology-enhanced toy as well as the books due to
the lengthy session time.

A third factor that may have influenced the lack of engagement for the entire
session time may have been due to other classroom or student variables. Students may
have been more or less willing to remain in session based on what was going on in the
classroom when they were removed. For example, if a participant enjoyed playing
outside and their session happened to occur during outside time, they may have been
more likely to request to leave the session prior to the scheduled ending of the session.
Additionally, other student factors such as illness may have contributed to session length.

Fourthly, the formality of the research setting may have impacted the study. The
children were not presented with a free choice about engaging in the activity outside of
the classroom.

Finally, exploration may be a necessary part of measuring new technology with
young children. In addition to the advanced nature of the games and activities included
on the PowerTouch™ system, it may have been more appropriate to provide the
preschool children with an extended “exploratory” period, in which various features and
“rules for play” could be explored and better understood. A longer and more thorough
instructional vignette may have better prepared the participants for experimental sessions.
**Educational Implications for School Psychology**

Children’s preschool experience with books and technology play an important role in their emergent literacy skills. For school psychologist, enhancing the quality of the environment for emergent literacy skills in early childhood programs is a promising target for research and social policy that aims to improve the lives of children of all children. There is ample research evidence that early literacy skills are key predictors of future reading engagement and success. Today’s technology enhanced environment warrants school psychologist to utilize and assess the endless opportunities to access instruction and practice reading, listening, and speaking skills. The school psychologist should be providing information regarding various means to provide collaborative supports or scaffolding for the learner with technology. The school psychologist should explore means of targeting the appropriate form and the amount of educational assistance that young children may need that fits closely to the child’s zone of proximal development for learning. School psychologist can design programs, assessments, and interventions that develop children’s emergent literacy skills in the context of play and cultivate interesting, spontaneous, independent, and flexible literacy behaviors in preschool children.

**Recommendations for Future Research**

Future studies should explore the research hypotheses with a larger sample size. Future research with preschool children may also consider adjusting the structure of the experimental sessions may assist in engaging preschool participants for longer overall amounts of time. In this study, the lengthy nature of the experimental sessions may have contributed to the abbreviated engagement of the participants. We propose having 12, ten minute sessions rather than six, twenty minute sessions may extend the total amount of time preschool children remain engaged with similar toys. Additionally, structuring the sessions to occur at the same time of the day may eliminate variations on what the students were missing from their daily classroom routines. Also, researchers may want to study the impact of free choice in the preschool classroom.

**Conclusions and Summary**

This study examined the effects of technology enhanced toy, PowerTouch™, on the emergent literacy skills of Head Start children. Data collection proceeded as planned,
with exception of attrition of participants due to loss of transportation. An ANCOVA revealed that the results related to proposed hypotheses were not found to be significant. The observation notes were useful for a better understanding of the children demonstrating certain reading acts and how the children reacted in each of the conditions. Finally, the findings of this study demonstrate a greater need to investigate technology enhanced toys, the effects on young children’s literacy development and time spent engaged in literacy activities.
References


& D. Reinking (Eds.), *Developing engaged readers in school and home communities*, (pp.3-20). Mahwah, NJ: Lawrence Erlbaum Associates.


Appendix A

Teachers:
Hello! We are second year school psychology graduate students at Miami University in Oxford, Ohio. We are writing to inform you of a research study that we are conducting for our theses and ask for your assistance in this study.

About the Study
The study is entitled “The Effect of the PowerTouch™ Learning System on Emergent Literacy Skills”. The purpose of the study is to determine if the use of the PowerTouch™ Learning system impacts emergent literacy skills in preschool children. The study will examine if using the PowerTouch™ Learning system will increase letter knowledge, print awareness, and language acquisition in 55-65 typically developing preschool children.

The study will be conducted in from September 2004 through February 2005 in three phases: pretest (where children with signed parental consent are administered the TERA:3), individual sessions (where the children are given the PowerTouch™ Learning system or Power Touch™ books alone and interactions are observed), and the posttest (where the TERA:3 is re-administered). It will be primarily conducted by three School Psychology graduate students. Approximately twice a week, for 25 minutes each session, the researchers will present the PowerTouch™ Learning system or books to the child and observe the child’s interactions with it. The researchers will be observing and recording the child’s engagement in the literacy activities provided by the PowerTouch™.

Why you should help?
Emergent literacy skills can serve as predictors of later reading ability. Technology enhanced toys are often being promoted as literacy tools. This study is valuable because it will provide educators with information regarding the effect of technology enhanced toys on the promotion of greater early literacy skills. The knowledge gained from this study will also be helpful in determining useful literacy tools for children and their families at home. In addition, all participating classrooms will receive a PowerTouch™ Learning System upon completion of the study.

How you can help?
Please inform families about the study and its importance. You will be given parent forms for children’s participation in the study. When a parent/caregiver is interested, have the parent read the parent letter, complete the Parent Questionnaire, and sign the permission form. Finally, please submit both completed forms to us by placing them in _____________ mailbox.

Thank you for your time. If you have any questions, please contact us at (513) 529-8051 or at wilsonj8@muohio.edu or Dr. Doris Bergen at Miami University at bergend@muohio.edu. For questions regarding this study’s compliance with the protection of human subjects and participant rights, you can contact the Office for the Advancement of Research and Scholarship: (513) 529-3734. We appreciate your willingness and look forward to working with you.

Sincerely,
Judith Wilson, M.S., Deanna Strigens, M.S., Sara Michelucci Vondracek, M.S.
Appendix B

Dear Parent:

The Fisher Price toy company, which makes the PowerTouch™ Learning System, has donated 20 PowerTouch™ toys to us to do a study on early reading skills in Head Start children. The PowerTouch™ is a toy with books to insert, so a child can touch the pages, and the toy “reads” the words and sounds out loud. This means preschool children can learn about reading by reading a book on their own.

We want to find out more about how these toys can help young children learn to read. We hope you allow your child to join this study because it will help us to learn more about how these types of toys might help children get the strong base in reading that they need to succeed.

If you agree to let your child join the study, you will also be asked to answer some questions about your child’s reading and use of reading toys at home. It will also ask about the main language spoken in your home. A reading skills test will be given to your child before and after the study. This test will allow us to see what reading skills your child has gained during the study. Your child may work with the PowerTouch™ toy and books or with PowerTouch™ books alone.

Your child will play with the toy or books in about two 25 minute sessions per week over six to twelve weeks starting in October. During each session, they will spend some time learning how to use the PowerTouch™ toy or books, and for the rest of the time they will play on their own with the item. At the end of the study, your child will take the test again.

There is no risk to your child; if your child does not want to be in the study or wants to stop at any time, s/he is free to do so. Please return the questionnaire with the signed permission slip to your child’s teacher. We really hope you will let your child participate in this important study.

Anything you share about your child will be confidential and your child’s name will not be in the results. If you have any questions about the study, please call Deanna, Sara, or Judith at (513) 529-0851 or Dr. Doris Bergen at 513-529-6622. If you have questions on human subject’s protection, please contact the Miami Research Office, 513-529-3734. We appreciate your help.

Sincerely,

Deanna Strigens, M.S.
Sara Michelucci Vondracek, M.S.
Judith Wilson, M.S.
Appendix C

Permission Slip

I understand the purpose of the PowerTouch™ study being conducted by Deanna Strigens, Sara Michelucci Vondracek, and Judith Wilson, of Miami University and agree to let my child (name)__________________ participate in the study, if s/he is willing to do so. I understand that the study will be at my child’s preschool and that my child will spend six sessions of about 25 minutes playing with a PowerTouch™ learning system or PowerTouch™ books. I also understand that my child will be given a pre- and posttest on reading skills, and be observed at play. I agree to answer some questions about my child’s usual at home reading and language(s). I understand the study will protect my child’s privacy and nothing will be reported that will identify my child. I also know my child can choose not to be in the study or can stop at any time with no penalty for either me or my child.

Parent Signature_________________
Parent Address____________________
____________________
Parent Phone Number_______________
Child Birthdate_________________

Number___________
Appendix D

Number: ________

Miami University
School Psychology Program
Judith Wilson, Deanna Strigens,
Sara Michelucci Vondracek, Principal Investigators
Phone: (513) 529-8051

Dear Parents:

We are interested in knowing about literacy activities in your home. There are no right or wrong answers. Your answers will help us to better understand the development of early literacy skills in children. Please answer all of the questions on this questionnaire.

Parent’s Name __________________________ Phone Number ____________
Child’s Name ___________________________

--------------------------------------------------------------------------------------------------------------------------
Child’s Date of Birth _____________ Gender: ______ Male ______ Female

1. Approximately, how many times minutes per day do you or another adult at home read with your child? (Circle one)
   0-10        11-20        21-30        31-40        more than 40 minutes

2. Is the person who does most of the reading with your child:
   ___ Male ___ Female

3. Please check any of the following that you may have in your home:
   ___ Leap Pad
   ___ Fisher Price Power Touch
   ___ Educational phonics or reading computer software
   ___ Other: __________________
   ___ None of the above

4. Has your child used one of the toys mentioned in question 3 during the past month?
   Yes No
   If so, how often?
   1-2 times a week 3-5 times a week Daily

5. What language is primarily spoken in your home?
   Spanish       English       Other______________

6. In what language do most reading activities occur in your home?
   Spanish       English       Other______________

7. Is a second language used in your home regularly?
   Spanish       English       Other______________ None

8. Does your child have any known history of speech, language, or motor difficulties? If yes, please specify the difficulty.

Thank you for completing this questionnaire.
If you have any questions about this questionnaire, please contact us at (513) 529-8051.

Number: ________
Appendix E

Technology Enhanced Session Protocol
Possible duration 25 minutes.

1. The PowerTouch™ is turned on and opened. Stopwatch/watch ready.

2. Mark start time.

3. Give session instructions: “Today we will be reading (insert book name or offer choice of book). You can read the story using your finger to underline the words (demonstrate so child can see) like this, or you can read each word (touch word to demonstrate) like this, or you can touch things to find out their name (demonstrate) like this. You can learn letter sounds by first pressing here, then each letter (demonstrate) like this. You can read by yourself now. Let me know if you need help.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more of your book?”

6. The examiner will make observations on provided observation sheet.

7. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

8. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you spend a little more time reading the books?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

9. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Books Only Session Protocol
Possible duration 25 minutes.

1. The book is out and opened. Stopwatch/watch ready.

2. Mark start time.

3. Give session instructions: “Today we will be reading (insert book name or offer choice of book). You can read the story using your finger to underline the words (demonstrate so child can see) like this, or you can read each word (touch word to demonstrate) like this, or you can the names of things (demonstrate) by looking here. You can also practice letter sounds (demonstrate). You can read by yourself now. Let me know if you need help.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you work more on your PowerTouch™ book?”

6. The examiner will make observations on provided observation sheet.

7. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

8. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you read some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

9. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Technology Enhanced Training Session Protocol
Duration 25 minutes. Examiner introductions will occur during class time.

1. Examiner goes to classroom to retrieve student: “It’s your turn today to come with me to do some reading, okay?”

2. Explain experiment: “I am a graduate student from Miami University, and I and two others are studying how different things help kids learn to read. Would you like to help with that? ... Once a week, one of us will get you from your classroom and spend about half an hour practicing reading. Today I am going to show you how we do that.”

3. Demonstrate PowerTouch™: “We’re going to use this book to help read. When you put a book in it, you can read the story using your finger to underline the words (demonstrate so child can see) like this, now you try it. You can read each word (touch word to demonstrate) like this, now you try. Or, you can touch things to find out their name (demonstrate) like this, can you do it? You can also learn letter sounds by first pressing here, then each letter (demonstrate) like this. You try. Now I’m going to let you play with it for a while. Go ahead.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more with your book?”

6. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

7. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you practice reading some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

8. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Books Only Training Session Protocol
Duration 25 minutes. Examiner introductions will occur during class time.

1. Examiner goes to classroom to retrieve student: “It’s your turn today to come with me to do some reading, okay?”

2. Explain experiment: “I am a graduate student from Miami University, and I and two others are studying how different things help kids learn to read. Would you like to help with that? ... Once a week, one of us will get you from your classroom and spend about half an hour practicing reading. Today I am going to show you how we do that.”

3. Demonstrate PowerTouch™ books: “We’re going to use these books to help learn to read. You can read the story using your finger to underline the words (demonstrate so child can see) like this, now you try. You can read each word (touch word to demonstrate) like this, you try. Or you can find the names of things (demonstrate) by looking here, can you see that? You can also practice letter sounds. Now I’m going to let you play with it for a while. Go ahead.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more of your book?”

6. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

7. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you practice reading some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

8. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Appendix F
Observation Sheet/Fidelity Checklist

___Child observed is part of sample population

___Child is observed by trained observer

___Child is observed in secluded area, away from distraction

___Observer interacts with child for five minutes at the start of the session

___Observer follows protocol for any unique circumstances/questions from child

___Observer makes appropriate books available according to session #

**Book Schedule**
Session 1, 7 = Sesame Street & Ernie
Session 2, 8 = Ernie & Blues Clues
Session 3, 9 = Blues Clues & Clifford
Session 4, 10 = Clifford & Sesame Street
Session 5, 11 = Sesame Street & Ernie
Session 6, 12 = Ernie & Blues Clues

Book(s) selected by child (first=1, second=2):
___Sesame Street
___Ernie’s Neighborhood
___Blues Clues
___Clifford

Experimental Condition: with PowerTouch™ base without PowerTouch™ base

Subject #:________ Observer name: ______________________________

Session #:________ Date: _______ Gender of child: _______

Session begin time: _______ Session end time: _______

Did the child wish to terminate the session early:   yes         no
If yes, what time was the first prompt given? _______
At what time was session terminated? _______

How session ended:
___child selected to end session following one prompt
___observer ended session due to time limit
___other distraction in school ended session (fire alarm, other emergency)
   If so, what distraction ended session: ______________________
Operational Definitions:

Child engagement = Any of the following:
- child face and body oriented toward the PowerTouch™ materials
- child is interacting with or listening to the PowerTouch™ materials
- child is using or participating in one of the PowerTouch™ activities

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<tr>
<th>Interval # (1 minute duration per interval)</th>
<th>Reading aloud</th>
<th>Using of book</th>
<th>Child engagement</th>
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