Can the Headsprout Early Reading Program Improve Reading Skills in a Head Start Preschool Classroom?

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CAN THE HEADSPROUT EARLY READING PROGRAM IMPROVE READING SKILLS IN A HEAD START PRESCHOOL CLASSROOM?

By

Tracy Newton Cadeau

THESIS

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ABSTRACT

CAN THE HEADSPROUT EARLY READING PROGRAM IMPROVE READING SKILLS IN A HEAD START PRESCHOOL CLASSROOM?

By

Tracy Cadeau

This study investigated the effects of Headsprout Reading Basics, a computerized early reading program delivered over the Internet, on at-risk four year-old Head Start eligible students. The study took place in two preschool classrooms, one comprising the control group and the other the treatment group. Both classes were closely matched by age, gender, geographic location and socioeconomic level.

Two assessment tools were used for the study: the Individual Growth and Development Indicators (IGDI), and a simple one-minute reading test. The initial IGDI assessment showed that, at the beginning of the semester, there were no significant differences between the groups on any of the three preliteracy skills measured by this instrument. The one minute reading test, administered two months after the end of the school year, showed a significant gain in actual reading ability among children in the treatment group (a Chi-square test for independence was significant at the p<0.001 level), but there was no gain by children in the control group. Nevertheless, the IGDI assessment administered again at the end of the semester showed no differences between the groups, but significant growth within each group (Repeated measures t-test, significant at the p<.01 level), indicating the treatment group’s participation in the computerized reading program did not impede children’s normal growth of skills acquired by those in the control group.
DEDICATION

This thesis is dedicated to the many that have helped me amidst this process. To my husband, Kevin for his continuous love and support. To my children, Elizabeth and Adam, who tolerated all the busy hours I had to spend at home and away. To my supervisor and friend Karen Johnson, whose support and encouragement kept me going. To my assistants Lisa Holmstrom and LaVerne Kytta who, without question, were ready to step in at any time making it possible for me to attend graduate school. To my twin sister Lori Newman, whose encouragement and support kept me going each step of the way. To my friends Gayla and Pat Willmert, who kept me company over the years on many of the long winter nights driving home and listened when I got discouraged.
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classroom and students for the study; to BHK staff Cheryl LaRose and Karen Johnson who both supervised the BHK facilities, Lisa Holmstrom, my assistant, who without question was ready to step in at any time, and LaVerne Kytta who helped supervise the children when using the computers. I would like to thank the parents of the children in the study for permitting their child to participate in the project. Finally, I would like to thank the Calumet Public School Elementary Principal, Karyn King, for her help in providing information from the local school districts about the cost of reading intervention and the kindergarten DIBELs scores.
PURPOSE OF THE STUDY

To examine the difference in reading abilities between preschool students using
the Headsprout Early Reading computer program in a preschool classroom setting to
those who receive a traditional preschool experience. By demonstrating that using an
Early Reading Program will be an investment with benefits that will outweigh the cost of
children who are at-risk for reading failure, and the need for supplemental instruction and
intervention in learning to read once they enter their primary education.
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In most states, kindergarten eligibility begins at age five. Although children may meet this specific age criterion, they vary widely in how prepared they are for the demands of kindergarten. For one thing, child development is irregular and episodic. Children also vary considerably in their pre-kindergarten education experiences. Thus, they enter kindergarten with a wide variety of skills and knowledge (Zill, 1999). Children may be able to recognize letters, numbers, and shapes; some may have participated in the kinds of activities that would seem to promote success in kindergarten, but have birthdays later in the year that make them considerably younger than their classmates; teachers and parents may question if children are ready for kindergarten (Ackerman & Barnett, 2005).

Readiness can also be adversely affected by various risk factors. Studies show that differences in children’s cognitive, language, and social skills upon entry to kindergarten, are correlated with families’ poverty status, parents’ educational levels, ethnic backgrounds, and children’s health and living environments (Currie, 2005). The family’s income has been correlated with children scoring low on an assessment of verbal abilities, thus making children at-risk for experiencing problems in school. Children from low-income or less educated families are less likely to have the supports necessary for healthy growth and development, resulting in lower abilities at school entry (Kohen, Hertzman, & Brooks-Gunn, 1998).

Preschool/ No Preschool

A recent review of the variables contributing to school readiness concludes that “the most promising strategy for supporting readiness is to increase access to high-quality
center-based, early childhood education for all low-income three and four year olds.” (Mantzicopulos, Neuharth-Pritchett, 1998). A study conducted in North Carolina in the early 1990s, showed that the amount of time in a high-quality childcare predicted better letter recognition and math skills upon entry to kindergarten, for children whose mothers had less than 13 years of education and had poor reading, writing, or comprehension skills (Christian, Morrison, & Bryant, 1998).

Children in high-quality preschools, such as state funded programs, showed faster rates of growth in vocabulary, phonemic awareness, and pre-literacy skills than those children who did not attend any preschool (Magnuson, Meyers, Ruhm, & Waldfogel, 2004). The difference in outcomes is most likely related to the fact that teachers in state funded, pre-kindergarten programs, such as Michigan School Readiness Programs (MSRP), are required to obtain a bachelor’s degree related to Early Childhood, more frequently than teachers in private preschools (Xiang, Schweinhart, Hohmann, Smith, Storer, & Oden, 2000).

Many middle-income families would benefit from high-quality preschool, but often lack access to the kinds of preschool education that sends them to kindergarten ready to learn; often a family’s income is above the federal guidelines to qualify for programs for disadvantaged children but not high enough to afford high-quality programs.

In 2002, the state of Maryland found that only 52% of children entering kindergarten to be ready (Bowler, March 26, 2003; National Center for Educational Statistics, 2003). With the academic requirements increasing for children in kindergarten, there is a greater demand on children to be prepared to learn. Children need to be exposed
to and learn about early reading skills prior to kindergarten in order to meet the requirements necessary to be successful in the foundational years of elementary school. Many different factors must be considered when determining if a child is ready for kindergarten. Such factors include social and emotional maturity, self help skills, and the ability to follow a daily routine and instruction; however, for the focus of this paper, the readiness referenced focuses on reading readiness.

No Child Left Behind

The demands for kindergarten have increased in recent years as states have responded to a public push for higher standards. In 2001, President George W. Bush signed into legislation the “No Child Left Behind Act (NCLB)”, a law proposing five billion dollars to improve reading achievements in U.S. public elementary schools (US Department of Education, 2002; Wright, Wright, & Heath, 2010). This act mandates the use of scientifically based classroom reading instruction for all students. The act also requires education accountability for school districts and states, with greater flexibility for states using federal funds, and a stronger emphasis in public schools. The law proposes that every child should be able to read by the end of third grade. In order to accomplish such achievement in reading, several related initiatives were developed including Reading First and Early Reading First (U.S. Department of Education, 2002).

These initiatives significantly increased Federal investment in scientifically based reading instruction and intervention programs for children. In 2004, President Bush signed legislation reauthorizing the bill known as, Individuals with Disabilities Education Act (IDEA). The current IDEA 2004 Statues (P.L. 108-446) for part C contain many requirements that states have to meet including specifying the minimum components of
comprehensives in state wide early intervention systems (Wrightslaw, 2010; IDEA, 2004; www.wrightslaw.com/info/ei.index.htm).

The law of IDEA requires research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs and employs systematic empirical methods that draw on observation or experience (National Reading Panel, 2000). The use of scientifically based classroom reading instruction is for all students.

The national goal of ensuring that every child is able to read by the end of third grade is a difficult task to accomplish with many multicultural and socioeconomic differences between children. For example, while the reading achievement scores are slowly increasing for children as a whole, much of this increase is due to the high rate of improvement among students from socio-economically advantaged school districts. In contrast, the scores among students from low socioeconomic districts are continuing to decline.

The Nation’s Report Card

The nation’s report card on fourth grade reading in 2006 reported 37% of fourth grade students in public schools were reading below the basic level. Basic level skills are defined as the essential skills that are fundamental for proficient work at the fourth grade level. According to this report, 60% of children from low socioeconomic families were below the basic level. In contrast, only 26% of the children from economically advantaged families fell below the basic level (National Center for Educational Statistics, 2003). However, family’s socioeconomic condition does not explain it all. Children from literacy rich environments have a greater success in learning to read, the home
environment does influence how well and how soon students read (American Federation of Teachers, March 2004).

**Results of poor reading skills**

Research suggests that those who fall behind in their first three years of school will continue to fall behind and may never become fluent readers (National Reading Panel, 2000). The Public Library Association points out, “Research has shown that there is nearly a 90% probability that a child will remain a poor reader at the end of the fourth grade if the child is a poor reader at the end of first grade.” (Layng, Jament, Twyman, & Stikeleather, 2004).

Reading is a fundamental skill upon which all formal education depends. More than any other factor, low reading achievement is the cause of chronically low-performing schools, which harms students and contributes to the loss of public confidence in our school system (Torgesen, 2004). Early reading problems have been framed as developmental precursors to a wide range of later social disabilities, school behavior problems, incarceration, drug and alcohol use, and serious emotional disturbances. Adults with low levels of literacy are highly likely to have significant difficulties at the socioeconomic level, most likely due to their impaired ability to function in employment situations. Individuals with low literacy skills can be considered functionally at-risk for a multitude of debilitation problems (Satz, Taylor, Friel & Flecher, 1978).

**Reading intervention**

From the No Child Left Behind Act, many different reading programs have become popular to promote better outcomes in children’s reading levels. Developed in
1991, the Reading Recovery program was designed as an intervention to help first
graders who fall in the bottom 20% of peer readers. The three main components of this
program are: diagnostic survey, tutoring sessions, and teacher training. Each student
receives 30 minutes of daily one-on-one instruction for a period of up to 20 weeks.
According to Elbaum in *The Journal of Educational Psychology* (2000), the Reading
Recovery program is not cost effective because program developers require
individualized intervention by highly trained teachers (Elbaum, et.al., 2000). Analyst
Hiebert (1994) found the Reading Recovery program to be very expensive, costing over
$8,000 per student, a reflection in part to the cost of training. It was also found that
students who participated in Reading Recovery did not outperform students who were
provided individual reading instruction by trained volunteers.

At least two studies have compared Reading Recovery to single grouping with a
modified version of Reading Recovery administered in small groups. There was no
advantage of one-on-one ratio instruction over small group instruction (Elbaum, Vaughn,
Hughes, & Moody, 2000). According to Elbaum in *The Journal of Educational
Psychology* (2000, pp. 605-619), 81% of children who completed the Reading Recovery
program still required support to obtain the basic reading skills through the federally
funded, Title 1 reading intervention program. Only 14.7% of these students reached
national norms (Pollack, 1996).

According to Wake County Public School System in North Carolina, students of
the Reading Recovery program, compared to a control group, were just as likely to be
retained, placed in special education, or served in a Title 1 program a year later. Only
6.5% of all eligible students in the study reached national norms (Wake County Public School System, 1996).

**Local school district budget for reading intervention**

The local school district, in a rural town in Northern Michigan, where the study was conducted, has received a budget of $500,000 for the Title 1 reading program that serves 214 students from kindergarten to sixth grade. This is a cost to the federal government, and local taxpayers, in the 2010-2011 school years (K. King, personal communication, November 4, 2010).

If children at-risk of developing delays do not receive more teaching/learning opportunities per day than other children, it is likely that their reading skills will develop too slowly, pulling them into a downward spiral. Some children are at-risk because they learn more slowly than others. These children require more repetition in order to solidly establish critical work, reading, and comprehension skills. Other children are at-risk due to the lack of instructional opportunity before they started school. Such children may learn at average rates, but have much more to learn than children who came to school with typical levels of preparation. Thus, these children must be given more learning opportunities in order to catch up to their peers (Torgeson, 2004; Hart & Risley, 1995). Research has demonstrated that of the children experiencing reading difficulties, only a small percentage will continue to have reading problems when provided with appropriate early intervention (Vellutino, Scanolon, Sipay, Small, Pratt, & Denckla, 1996, p. 629).

**Skills for successful reading**

Language knowledge and language proficiency differentiate between good and poor readers. As they begin to learn, poor readers are not less intelligent or less
motivated. They are, however, less skilled with language, especially at the level of elemental linguistic units smaller than whole words. Poor readers are usually slower readers and make more mistakes in sounding out words. Their comprehension suffers as a consequence. Students benefit from instruction that develops awareness of sounds, syllables, meaningful word parts, relationships among word meanings, and the structures of written text (Moats, 1999).

**Effective Reading Instruction**

In the largest, most comprehensive, evidenced-base review of effective reading instruction, (a congressionally mandated National Reading Panel, 2002), research was selected from approximately 100,000 reading research studies published since 1966, and another 15,000 had been published before that time (National Right to Read Foundation, 2009). The Panel concluded that early identification of reading problems holds promise for literacy improvement only when it is linked to reading interventions that are effective. The Panel determined the most successful way to teach children to read is through instruction that includes a combination of methods. The National Reading Panel identified five basic, interconnected sub-skills that all children must master if they are to become proficient readers (National Right to Read Foundation, 2009).

The Panel’s review focused on the following areas: phonemic awareness, phonics instruction, reading fluency, reading comprehension, alphabetic principal application, and teacher education, and computer technology (National Reading Panel, 2000).

**Phonemic awareness** is the recognition that all words are made of separate sounds. This association between letters and sounds must become fluent so that learners can decode words almost instantly. Beginning readers must learn a strategy to sound out the sequence
of phonemes in a word and blend the sound back together to read whole words (Layng, Twyman, Stikeleather, 2004).

**Phonics awareness** focuses on the processing and manipulation of phonemes in spoken words. It does not involve the use of print. Instruction should move from simple to more complex tasks and should explicitly and systematically teach the manipulation of phonemes with letters (Santi, Manchetti, & Edwards, 2004).

**Comprehension** focuses on reading comprehension, by constructing meaning from text. Successful readers apply specific strategies appropriate for the kind of text they are reading and for their purpose in reading (Mathes, Howard, Allen, & Fuchs, 1998). Explicit instructions in comprehensions strategies are required, for most subjects are taught in the context of reading. Some of these strategies include activation of prior knowledge, predicting what will accrue in the story, identifying the main idea of the story, and summarizing what happens in the story (Fuchs, Fuchs, Mathes, & Simmons, 1997; Mathes et al., 1998; Mathes & Babyak, 2001). For beginning readers, comprehension can be developed both through reading and through listening.

**Alphabetic principal application** consists of letter knowledge, which is directly related to the development of phonemic segmentation (Carroll & Snowling, 2004). The English language uses the 26 letters to represent 44 sounds; sounds that can be written in over 400 different ways (Layng, Twyman, Stikeleather, 2004).

**Reading Fluency** is the accuracy and rate of students reading and is one of the most important aspects of learning to read. Fluency development is also critical for achieving the ultimate goal of comprehension. Fluency is a necessary feature of good reading and can be improved through explicit training to improve overall reading ability (Mathes, et
al., 1998). Research has demonstrated that fluency increases as children learn to recognize large numbers of words automatically and accurately (Honig, Diamond, Gutlohn, & Mahler, 2000; Mathes, et. al., 1998). Fluency develops as children have repeated opportunities to practice reading skills with a high rate of success (Honig et al., 2000; Mathes, et al., 1998). Thus, the central strategy for developing fluency is to provide extensive reading opportunities with manageable text, text within the reader’s range. There are a variety of early reading programs that are developed for specific age groups with text that is within developmental range.

It is critical that we begin teaching scientifically based programs that are age appropriate designed for pre-kindergarten to ensure reading readiness. According to Dr. Mel Levine, who specializes in Developmental Pediatrics and Child Psychiatry, instruction of teaching the sounds of letters can begin at about four years of age. Simple reading instruction with or without a computer can be started about the same time. Providing children with early reading instruction can help support their academic success as they enter elementary school (Levine, 1994).

**Kindergarten readiness**

Preparation for Kindergarten does not wait to begin until a month or two just before kindergarten. Transition to kindergarten is a process that is most successful when it is carefully planned out over the entire pre-kindergarten year (Wrightslaw, 2010; [www.wrightslaw.com/info/ei.index.htm](http://www.wrightslaw.com/info/ei.index.htm)). It is recognized that there is a strong conceptual linkage between preschool development and later competency and functioning in home and school environments ( McConnell, Priest, Davis, & McEvoy, 2000). The young child’s experiences in the first five years of life can have a dramatic, longitudinal effect
on their level of functioning. These experiences not only affect the child’s readiness for school, but can also influence the quality of their relationships with others and their ability to grow up to be effective citizens (Bowman, Donovan, & Burns, 2001). Thus, the early childhood years have implications not only for the children and their families, but are of central concern to social and economic health (Groark, Mehaffie, McCall, & Greenberg, 2007).

**Using computers in preschool**

There is an ongoing debate between educators, psychologists, technologists, cognitive scientists, and philosophers about the advantages and disadvantages of using computers in early childhood education. Many of the concerns are influenced by myths more than factual information; some myths have had a negative impact on children’s learning. One example of such a myth is that children who spend time at the computer will become antisocial and fail to develop critical communication and interaction skills. There is no evidence that supports this myth (Bewick, 2000). Wheatley (2003) has observed preschool children with and without computer experience, and investigated the long-term effects of the use of computers with young children.

Computer Assisted Learning (CAL) can be seen as an effective instruction tool to supplement traditional reading instruction, and to improve the reading skills of American children (Tillman, n.d.). Some data have confirmed a noticeable positive difference for second-graders who had the opportunity to use computers appropriately when they were preschoolers, as compared to second graders who did not have the opportunity (Wheatley, 2003). Computer Assisted Learning eliminates many impediments to effective intervention, such as requiring young children to sit still and attend to teacher
Choosing computer reading programs

Computer assisted learning can be an essential component in supporting children’s active learning by providing a multiple of individual opportunities and allowing the child to work at their own pace. Not all early childhood reading programs are created equal, and selecting appropriate software is critical to supporting children’s active learning. Colorful graphics, cute animation, and musical tunes may distract even highly informed educators from critically reviewing content and underlying objectives (Tasntis, Bewick, & Touvenelle, 2003, p 5).

Many reading programs claim to be based on research but the precise meaning of this claim is often left to the reader’s interpretation. Many reading programs do not mean that their program has been developed and tested through rigorous research protocols (Twyman, Layng, Stikeleather, & Hobbins, in press). Often, the statement of content of these programs includes practices that earlier research has shown to be effective, but the program itself has not been so tested (Layng, Twyman, & Stikeleather, 2003).

State mandates for reading

The No Child Left Behind Act of 2001 (NCLB), signed into law by President George W. Bush in January 2002, reauthorized the Elementary and Secondary Education Act (ESEA), which was adopted in 1966. The sweeping reforms of NCLB were intended to reduce the number of experimental programs created under the ESEA, and re-focus educational dollars on proven, research-based approaches that would help most children to learn. In brief, NCLB called for: annual testing of all public school students in reading
and math for grades three through eight and high school by the 2005-06 school year; annual report cards on school performance for parents, voters, and taxpayers, to ensure that every child read by the third grade; and, a highly qualified teacher in every public school classroom by the 2005-06 school year.

Reading First was the component of the NCLB act, which mandated reading proficiency for all children by the third grade. Specifically, Reading First identified the five areas of reading instruction that had been shown to be effective in helping children learn to read, including phonemic awareness, phonics, vocabulary development, reading fluency, oral reading skills; and reading comprehension strategies. These components, explained above, are referred to as the five interconnected sub-skills for teaching effective reading proficiency.

The Early Reading First component of NCLB was intended to prepare young children to enter kindergarten with the necessary language, cognitive, and early reading skills to prevent reading difficulties and to ensure school success. It was hoped that early intervention would reduce the need to spend special-needs funding on older students (National Institute of Child Health and Human Development, 2000).

**Headsprout Reading Basics Program**

Headsprout Reading Basics program is a research-based, online early reading program designed for preschool age children as a home base early reading program. The program was designed so that each student would master the skills of each lesson before advancing to the next lesson. Each lesson introduces a new skill, followed by a practice session, with speak-out-loud portions and comprehension components. The learner must reach accuracies of 80% or better to continue to the next lesson. If the child has lower
than 80% accuracy in any given segment, the program remediates by branching into one of four domains based on the child’s errors in the practice section. Each time the learner works through one of these corrections, the program returns the child to the original lesson to assess the level of skill for that specific lesson. If the child continues to work below the 80%, again the program will branch to another of the four domains. This feature of the program ensures that the child masters the necessary skills that are needed to be a successful reader.

The program highlights a specific letter as it is introduced, giving a visual cue when differentiating between letters shown. The speak-out loud portion instructs learners to repeat specific sounds, and models how to correctly produce the sounds and words as the learners increase their skill bases. At the end of each lesson is a comprehension component in which the child is presented three different scenarios involving characters in the lesson; the child is then asked to identify which scenario took place in the lesson. The Headsprout Early Reading Program provides visual, auditory, recall, and kinesthetic interactions that engage different learning modes, and comprehension skills to ensure the child is prepared to read (Headsprout Early Reading, 2003).

The National Right to Read Foundation has identified the same five basic interconnected sub-skills (that all children must master to become good readers) as the Reading First program. These basic sub-skills were deliberately integrated into Headsprout Reading Basics, including phonemic awareness, phonics, spoken vocabulary, reading fluency development (including oral reading skills), and reading comprehension strategies.
Phonemic awareness is a subcategory of phonological awareness, and refers to both the ability to hear and manipulate the sounds in spoken words, and understanding that spoken words and syllables are made up of sequences of speech sounds. Phonemic awareness, which linked to letter identification, compels children to notice how letters represent sounds and prepares them for moving towards reading print (Yopp, 1992).

Learners in the Headsprout program hear letter sounds in order to select visual stimuli, and then hear them again as confirmation of selections. Learners are asked first to say particular sounds, then to listen to cartoon characters say several different sounds, and finally to select the character that said the sound just like the child did. Learners are taught to put the sounds together, hear them slowly blended, say them slowly blended, and then hear the sounds said quickly. They learn not only to identify and say the sounds letters make, both independently and as blended units, but to listen to and identify the sounds they themselves say. Phonemic awareness is a critical step in a speaker’s becoming his or her own listener (Layng, Twyman, & Stikeleather, 2003).

Phonics teaches children the correspondence between letters of the written language and the individual sounds (phonemes) of spoken language. Although phonics instruction has been controversial over the past 20 years, a large body of research points to its essential role in teaching children to read. Effective reading instruction provides children with essential phonics-based strategies for reading comprehension. According to Chall (2000), the association between letters and sounds must become fluent before learners can move to the next step of decoding words. It has been found that systematic phonics instruction provides significant benefits for elementary age students.
Research suggests that the absence of explicit instruction in phonemic awareness and phonics can cause learning problems that place students at a “permanent educational disadvantage” (National Reading Panel, 2000). In Headsprout Reading Basics, children learn 84 phonetic elements, most of which maintain consistent pronunciations in nearly 85% of the words in which they appear. The program begins with such letters and sounds as “ee,” “V,” “cl,” and “an”; the children learn to read words containing these sounds correctly from the outset, and to decode new words containing these without yet having to memorize any potential exceptions. Practice frames help ensure the transfer of the learners’ newly acquired segmenting and blending skills from words learned in the program to words encountered outside the program. The instructional sequence also presents one, two, and three letter combinations, to teach learners that sounds can be combined to make meaningful units of phonemic information, that some sounds can have other sounds inside them, and that sound units can be combined to make new sounds, all within a “discovery learning” context, rather than teaching these insights directly. Finally, learners are required to use their phonics knowledge for sounding out words in isolation, as parts of sentences, and when reading stories with words they have not been directly taught (Headsprout Early Reading, 2003; Layng, et al., 2003).

**Vocabulary** development is important to independent reading and leads to gains in comprehension, and overall academic achievement; vocabulary development is also the mark of an educated, literate individual (Archer, 2003). Headsprout Reading Basics teaches children that words have meaning, and requires them to create sentences that, in turn, make short stories. Learners begin to add words that are likely to be in their spoken vocabularies to their reading vocabularies as they sound out new words and learn selected
sight words. Through the use of characters’ names, they learn that words they may have never encountered before have meaning as well. More phonetic elements are added as the initial sounding-out strategies are learned; again, practice frames endure that the words made from the elements become a permanent parts of the learners’ vocabularies. Once the sounding-out skills are well-formed, and all eighty-four sound elements have been taught, the typical learner would, in less than thirty hours of instruction, have a potential reading vocabulary of over 5000 words (Headsprout Early Reading, 2003; Layng, et al., 2003).

**Reading fluency**, including oral reading skills, is a critical element to all Headsprout Reading Basics activities. Often, fluency work is left to the end of the reading process when a learner practices reading sentences. Headsprout builds fluency at the component skill level – this has been shown to be critical to fluency at the composite skill level (Johnson & Layng, 1994; LaBerge & Samuels, 1974; Samuels & Flor, 1997). From lesson one, learners engage in fluency-building activities for finding sounds in words. By lesson four, the program builds fluency on words made up of the sounds the learners have mastered in previous lessons. By lesson five, learners read their first stories. Soon, learners are practicing reading entire passages in carefully designed fluency activities. Not all students will demonstrate such mastery on all units at the same time, but mastery is necessary for students to be able to continue through the program; thus, self-pacing is as critical as the students’ progress through the program (Engelmann, 1999). In the eighty lessons that comprise the Headsprout Reading Basics program, over fifty fluency-building opportunities are included to build strong reading repertoires. In fewer than thirty hours of instruction, a learner will read seventy separate stories,
designed to promote independent reading. These stories include narrative and expository text as well as poetry. The stories begin with a few sentences and grow to include chapter books. Some early stories are to be read with someone else, such as a parent; these stories are a bit more complicated, punctuated with sentences learners can easily read. Thereby, learners are exposed to fluent reading at a higher level than they can currently handle alone, and they must pay close attention so they can read their sentences when it is their turn (Headsprout Early Reading, 2003).

**Reading comprehension strategies** - An article in *Behavior Technology Today*, about beginning reading, begins with the following observation (paraphrased): A teacher writes, “Look at the ceiling,” on a blackboard, and a student reads the sentence aloud, demonstrating the skill of decoding. The student then tilts her head back and glances upward, demonstrating comprehension of what the sentence said. This vignette makes the important point that the evaluation of comprehension requires indicator responses that are separate from simply seeing and saying words or sentences. These indicator responses are crucial to demonstrating comprehension (Layng, et al., 2003).

Accordingly, Headsprout Reading Basics employs frequent use of comprehension indicators to test whether what is being decoded is also being understood. Carefully designed indicator responses are used to teach self-observation, as well as sentence and story comprehension. After each reading exercise, learners must choose one of three pictures that go with a given sentence. The pictures vary in such a way as to ensure that the words in the sentence have been read and understood. From as early as the fifth lesson, learners are taught that the sentences they read are not simply lists of words but
units of meaning. The program then transitions to continually more challenging comprehension activities (Layng, Twyman, & Stikeleather, 2003).

**Mastery** is another explicit component of the Headsprout program. The learner must master in each lesson before progressing to the next episode or lesson. This mastery feature requires that students continue to study the content of a particular unit until their assessment score equals or exceeds predetermined standards of 80% and 90% (depending upon the given lesson). If students do not demonstrate mastery, they are required to work through branching sequences within that unit that remediate the particular errors the learner made earlier, and then to take another form of the assessment of the unit. They may continue to do this as many times as needed until they have demonstrated mastery. There is no penalty for taking multiple forms of the assessment before demonstrating mastery. Once the students have mastered one unit, they may begin work on the next (Engelmann, 1999; Headsprout Early Reading, 2003; Layng, et al., 2003).

**Motivation** is a critical component for keeping students engaged in the instructional sequence. To this end, the program provides immediate feedback about the accuracy of responses the learners are practicing; confirmation that they are correct serves to motivate students to continue. When they receive feedback that their responses are incorrect, the program arranges for them to make immediate changes rather than continue to practice incorrect responses. The feedback for incorrect responses tells students the response is incorrect, provides the correct response, and prompts the student to repeat the correct response. Providing the correct responses allows students additional opportunities to imitate the models, and to receive feedback that confirms their now correct responses. Effective instruction continually presents the correct responses, as
models at the outset of instruction, as confirmation of the students’ correct responses, or as correction for the students’ incorrect response (Moran & Malott, 2004).

The Headsprout program is designed to provide the feeling of success and play, not of rote memorization and assessment. The activities and books are designed to complement classroom teaching by creating an atmosphere of fun and enthusiasm that infuses all aspects of learning. The online and printed activities use positive reinforcement to guide children in making correct responses. Because students meet with success throughout the program, they are motivated to learn to read (Layng, et al., 2003).

**Assessment** – Developmental assessment in early childhood is designed to gain information about a child’s skills and capabilities that provide the context for their learning, in order to make decisions that will support the development of the given child. The current model for assessment in early childhood intervention consists of a sequence of several distinct steps that serve different assessment purposes: screening; diagnosis and determining eligibility; programming; and evaluation (Bagnato, Neisworth, & Munson, 1997; Meisels, 1994, 1996). The screening aspect of the assessment and the method used to obtain the information, is the basis for the present research.

The first step, screening, is a procedure used to identify those children who have a suspected developmental delay and might require further assessment. Typically, the tools used are standardized, norm-referenced instruments that have been designed to discriminate children who may have developmental delays and need further assessment from typically developing peers who do not need special intervention. This is done by comparing the performance of an individual child on the test to the performance of normative groups on the same measure. Screening tests are quick and easy to administer
so that they can be used to screen large numbers of children in an efficient and cost-effective manner. Examples of screening tests include The Denver Developmental Screening Test (DDST-II) (Frankenburg, Dodds, & Archer, 1992), Developmental Indicators for the Assessment of Learning (DIAL) – Revised (Mardell, & Goldenberg, 1983), and Individual Growth and Development Indicators (IGDIs) (Early Childhood Research Institute, 1998).

For the present study, the Individual Growth and Development Indicators (IGDI) assessment tool was chosen to coincide with the local school district’s assessment of Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 1996). The IGDI scores can provide valuable information for a possible longitudinal study on children who remain in the district. The scores will prove pertinent information to the administrative staff which places children into kindergarten classrooms.

The present study compared the reading readiness and reading abilities of children in two Head Start preschool classrooms in a rural community. One classroom, comprising the control group, received the routine curriculum implemented by the school, and the other, comprising the treatment group, was given the opportunity to use Headsprout Reading Basics, a computer-based early reading program delivered over the Internet, in addition to the traditional curriculum. Outcomes were measured using a simple narrative reading test, as well as the IGDI assessment instrument.
Methods

Subjects

Before the start of the school-year, a coin flip determined that the morning class would be assigned to be the treatment group, and the afternoon class would be the control group. Students were placed in classrooms according to geographic location and bussing routes. However, all of the children in the study lived within a ten-mile radius and were Head Start eligible. All subjects were four years old and assigned to Head Start preschool classrooms. In the treatment group, there were seven girls and eight boys. In the control group, there were seven girls and nine boys.

The Northern Michigan University Institutional Review Board determined that no additional consent was necessary to conduct the present study because the scope of the research did not entail anything different from what was done traditionally in the selected school setting. Also, the agency under whose auspices the study took place had obtained written permission within their routine registration from parents/guardians to administer assessments and age-appropriate academic testing and teaching activities.

Materials

Location and Equipment used. Along the wall in front of a large window, six e-Mac computers with Internet access were placed in the classroom. The computers, keyboards, mice, and headsets with splitters (allowing teachers to listen) were set up on a low standing eight foot table with partitions creating individual carrels for each computer. Larger free-standing partitions were placed behind the children’s chairs to reduce distractions from the wider classroom environment (see Figs. 1-3, below).
Figure 1. Partitions between and behind children seated at computers.

Figure 2. Partitions separating computers from rest of classroom.

Figure 3. Classroom placement of computers.
Procedures

Children’s introduction to the computers

Each student was introduced to the computer and how it worked until he/she felt comfortable to interact with the computer and use the equipment before beginning the program. The children took turns using the Headsprout computer program during “open work” (play) time. The computers were turned on with all the children’s names listed in alphabetical order. Teachers invited each child to work on the computer each day. Some children who weren’t ready or willing when asked, were invited again later in the day. On some days, a few children chose not to work at all on the computers. Children who weren’t working on the computers were free to move around the classroom and to engage in alternative activities available to all students.

Several of the children asked if they could sit next to their friends when working on the computers. The children were allowed to pick the particular computers they wanted to work on. Some preferred computers on the ends of the tables, and others chose computers with specific headsets. Once the children were seated with their head sets on (see Figure 4, below), teachers supervised the ensuing lessons. They found the students’
names listed on the screen and clicked on them, which opened the program to the respective students’ individual subscriptions.

In each episode/lesson, the children were introduced to a new skill, followed by a practice section, and a review section. The program presented cartoon characters that made different sounds: in review sections, they made a mix of phonemic sounds which the children were required to differentiate and identify the sounds presented. When they responded correctly, the program automatically moved forward to the next lessons. For incorrect responses, the program would return to the skill within the current episode that the given child had not yet mastered. Students worked on the Headsprout program approximately 10 to 20 minutes a day, three to four times a week, until they had completed all 40 of the episodes or until the end of the school year, whichever came first.
Supporting children’s progress.

A large graph was used as a visual support for the children to see their accomplishments as they worked through the episodes. Upon completion of each episode, the children put stickers of choice on the graph board marking their individual progress (see Fig. 5a, below) so others could celebrate with them. The children also took home large smiley faces saying, “I finished my episode today,” to share with their families (see Fig. 5b).

Assessment Part 1 – Individual Growth and Development Indicators

As part of the assessment process, this study used the standardized assessment, Individual Growth and Development Indicators (IGDI) for preschool age children.¹ This test assesses phonological awareness, alphabetic principle, vocabulary, accuracy, and fluency within connected text. The IGDI scores are considered to be comparable to the standard procedures for this assessment are detailed at the website, http://ggg.umn.edu/get/index.html.

¹ The IGDI assessment instrument was developed by Scott McConnell, Ph.D., of the College of Education and Human Development (CEHD) at the University of Minnesota in 1996, under the Early Childhood Research Institute on Measuring Growth and Development (ECRI –MGD).
local school district’s traditional assessment tool for school age children, Dynamic Indicators of Basic Early Literacy Skills (DIBELS), and could be used in further institutional research on the preschool program.

The IGDI assessment was used to ensure that each child was developmentally ready to begin the Headsprout program. Those students whose scores were too low to pass the sample sections of picture naming, rhyming, and alliteration tests were required to wait before beginning the Headsprout Reading Basics program. Children with lower scores spent time in small groups each day for approximately 10 to 15 minutes working on activities to support the development of emergent literacy skills. Examples of such activities included looking at books, listening to stories being read, singing songs, identifying letters and phonic sounds of letters, writing letters, playing board games designed to expand preschoolers’ vocabulary and articulation, playing word games of rhyming and matching letters, and drawing and dictating stories.

The district’s own school psychologist trained the staff involved in the present study to administer the IGDI assessment. To ensure the integrity of the testing procedures and consistency in the assessments, the same staff member administered the testing for both groups in this study. Each bout of testing was conducted over a period of two days, to accommodate individual students’ attention levels, daily schedules, and absences. The assessments were conducted in the hallway outside of the classroom to reduce distractions. Materials needed for the assessment included a stop watch for timing accuracy, a pen, chairs, picture cards, and a score sheet.

Each child’s skills were assessed along three different indicators: picture naming, rhyming and alliteration. Assessment began with picture naming and rhyming on the first
day, and alliteration on the second day. To ensure accurate assessment, the cards were not used for any other activity, in accord with IGDI standardized instruction. These assessments were conducted four times over the course of the study. The first assessment was done in October, the second in January, the third in March, and the final one in May.

**Picture Naming portion of IGDI assessment.** The child was presented with images of objects commonly found in a preschooler’s natural environment, one at a time. Categories of objects used in this format included familiar animals, food, people, household objects, games, sports, materials, vehicles, tools and clothing. After the IGDI set of sample items were shown, and the child correctly identified all four samples, the assessment proceeded. The child was told to look at each picture and name it as quickly as possible. The timing started at the first response to the first card. After exactly one minute, the activity was stopped, and the total numbers of pictures named correctly were counted and recorded. The non-sample cards were shuffled after each child. A sample picture naming card is shown in Figure 6, below.

![Sample Naming Stimulus Card](image)

Figure 6. Sample Naming Stimulus Card

**Rhyming portion of IGDI assessment.** This section of the IGDI comprised six sample cards, used to evaluate whether the assessment process could proceed with the given student. The child had to answer at least two of the sample cards correctly to proceed. The assessment began with the presentation of a sample card that included a photo (e.g., bees) and a set of three images in a row at the bottom of each card (e.g.,
pants, gate, and cheese). Standard oral instructions were provided: “We’re going to look at some pictures and find the ones that sound the same. They rhyme.” The test administrator pointed to each of the pictures on the sample cards and said their names. The child was then told, “Now I will find two that rhyme.” The tester then pointed in turn to the pictures of bees and cheese saying, “Bees, cheese, these two sound the same. They rhyme. Bees, cheese.” Another demonstration followed, again using a sample card. The tester said, “My turn: star, jacks, car, horse. Now I will find two that rhyme,” then pointing to the pictures of the star and car, saying, “Star, car, these two sound the same. They rhyme.”

Sample cards three and four were presented in the same manner as described above, but now the student was also provided with corrective feedback for any errors that might occur. For these cards, the following instruction was provided: “Let’s do one together. First it’s my turn.” The tester then pointed to each of the pictures and named it, afterward saying, “Now it’s your turn.” The child was then instructed to “point to the picture that sounds the same as (picture name),” with the tester moving her finger along the three comparison pictures shown at the bottom of the card. If the child pointed to an incorrect picture, the tester drew her finger across the bottom row of pictures and said, “What word sounds the same as (picture name),” and named the target picture. The same procedure was repeated for the fourth card. Sample cards five and six were presented in the same manner as the previous cards, but now without feedback. Scores were not recorded for the sample cards.

Once a student answered two or more sample cards correctly, the actual assessment began. Timings started at the first response to the first card of the timed
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assessment. The numbers of correct answers were recorded on paper, and non-sample cards were shuffled after each child. A *sample rhyming stimulus card* is shown in Figure 7, below.

![Sample Rhyming Stimulus Card](image)

**Figure 7. Sample Rhyming Stimulus Card**

**Alliteration portion of IGDI assessment.** To accommodate the short attention spans of the children, this section of the IGDI was administer on day two of the assessment. This section was similar to the previous rhyming section; however, the child was now asked to identify the two pictures that started with the same sound. This test also lasted two minutes, requiring at least two correct answers to conduct the timed assessment. Timings started with the first response to the first card of the timed assessment. A *sample alliteration stimulus card* is depicted in Figure 8, below.

![Sample Alliteration Stimulus Card](image)

**Figure 8. Sample Alliteration Stimulus Card**

**Assessment Part 2 – One minute reading sample**

A routine part of the school’s preschool program is testing and retesting of students at intervals throughout the school year to document individual growth. The Headsprout program was designed such that, as students progressed through five
consecutive lessons, they read short books reviewing their newly learned skills. The books were keyed to specific skills the child was to have learned up to that point in the program.

Approximately two months after completing the school year, thirteen children from each group took a one minute reading assessment. The assessment was conducted in locations where the parents felt their children were comfortable, (for examples, at the kitchen table, on the living room couch, on the floor, or sitting at a desk). The parents were asked beforehand to remove any potential distractions, such as other children watching television. The students were assessed on the last book they had finished while progressing through the Headsprout reading program. In the earliest reading books, the words were the same as those presented in the lessons, but as the child progressed further through the program, the reading books required some decoding of new words not seen before. The children were allowed to look through the book for a few minutes until they were comfortable. Once at ease, they were instructed to read the story aloud, doing the best they could. The timer was started with the child’s first response. Following along with the written text on the Bench Mark Assessment Form (see Appendix C), the tester marked each word that was read correctly. Scores on this assessment comprised simply the numbers of words read correctly by the children within the one-minute timing interval.
Results

Eleven children from each group participated in the one-minute reading post-test two months after the end of the school year. Although the scores weren’t so high as might have been expected from previous outcomes with school-age children, it was clearly evident that the preschool students in the treatment group made significant gains from their participation in the Headsprout reading program. The raw scores from the treatment group were 2, 3, 5, 6, 6, 6, 8, 8, 9, 10, 11, and 17 words read per minute, while none of the children in the control group read even a single word during the post-test. The mean for the students in the treatment group was 7.4 and the mean for the control group was 0 (see Fig. 9, below). A Chi-Square test for independence revealed

Figure 9. Outcomes of the reading post-test for the control and treatment groups.
that, despite the relatively small sample sizes used, this difference in outcomes was statistically significant at a p < .001 level (see Table 1 below). The computed Chi-Square statistic was 26, larger than the critical value of 10.8 (for p<.001 with df=1), making it highly unlikely that the difference between the groups’ scores occurred simply by chance.

There was also a correlation ($R^2 = 0.37$) between the numbers of episodes completed and the numbers of words read by children in the treatment group (see Fig. 10, below). This direct relation between reading performance and lessons completed lends further supports to the view that the significant difference in reading outcomes between the control and treatment groups was attributable to the latter’s participation in the Headsprout reading program.
The IGDI assessment tool was administered four times in eight months during the school year. The test was in three different domains: picture-naming (for vocabulary), rhyming, and alliteration. Scores for the treatment and control groups along these measures showed no significant differences. Repeated-measure t-tests of pre-test and post-test differences between the control and treatment groups indicated no significant differences between these groups on any of the three IGDI measures, either at the start of the school year or at its end (see Figs. 11, 12, & 13, below). Nevertheless, there were comparable significant gains in all three scores within each group.
Figure 11. Growth in picture naming over four IGDI assessments of control and experimental groups over the school year

Figure 12. Growth in rhyming over four IGDI assessments of control and experimental groups over the school year
For the control group, the differences between pretest and posttest mean scores for picture naming, rhyming and alliteration were 7.56, 3.24 and 4.12, respectively. The critical t-score value was 3.012 at the p<.01 level with 13 df. All three difference scores were larger than this critical value, thus improvement in scores on all three measures were significant at the .01 level (see Table 2, below).

<table>
<thead>
<tr>
<th>Differences within Control Group</th>
<th>Picture naming</th>
<th>Rhyming</th>
<th>Alliteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>dif(pre/post)=</td>
<td>10.71</td>
<td>5.86</td>
<td>5.93</td>
</tr>
<tr>
<td>t(obt)=</td>
<td>7.561</td>
<td>3.244</td>
<td>4.118</td>
</tr>
<tr>
<td>t(crit)=</td>
<td>3.012</td>
<td>*</td>
<td>* p&lt;.01</td>
</tr>
<tr>
<td>df=</td>
<td>13</td>
<td>*</td>
<td>* p&lt;.01</td>
</tr>
<tr>
<td>α=</td>
<td>0.01</td>
<td></td>
<td>* p&lt;.01</td>
</tr>
</tbody>
</table>

For the treatment group, differences between the pretest and posttest mean scores on the IGDI measures of picture naming, rhyming, and alliteration were 4.312, 5.228 and 7.714,
respectively. The critical \( t \)-score value was 3.012 at the \( p < .01 \) level with 13 df. All three difference scores were larger than this critical value, thus improvement in scores on all three measures were significant at the .01 level.

<table>
<thead>
<tr>
<th>Differences within</th>
<th>Picture naming</th>
<th>Rhyming</th>
<th>Alliteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>dif(pre/post)=</td>
<td>7.79</td>
<td>6.07</td>
<td>7.29</td>
</tr>
<tr>
<td>4.312</td>
<td>5.228</td>
<td>7.714</td>
<td></td>
</tr>
<tr>
<td>( t(crit) )=</td>
<td>3.012</td>
<td>* p&lt;.01</td>
<td>* p&lt;.01</td>
</tr>
<tr>
<td>df= 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \alpha )= 0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The control and treatment groups were, therefore, evenly matched in preliteracy skills (as assessed by the IGDI) at the outset of the study. The IGDI assessment outcomes showed no significant differences between the pretest scores of the two groups. However, during the school year, there was comparable and significant growth within both groups. This showed that the natural development of those preliteracy skills measured by the IGDI in the treatment group was not impaired by the use of computers, as some educators have warned.

The most substantial difference between the control and treatment groups was that children in the treatment group could read whole words after using the Headsprout Early Reading program, but children in the control group could not. The children in the treatment group gained an understanding of reading concepts, such as identifying letters’ phonemic sounds, and the skill of blending two or more phonemes together. This was seen even as the children moved about the classroom in their daily activities. Examples included looking at books voluntarily to identify letters and phonemic sounds of letters,
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associating words with the sounds of the letter in the word, writing letters, and trying to spell new words – one child even wrote a note to the bus driver.
Discussion

At the outset of present study, children in the control and treatment groups were comparable in both demographic variables and developmental pretest measures obtained with the school district’s routinely-used assessment instrument (the IGDI). Students in the treatment group, who were given access to the computer-based Headsprout Reading Basics program, but not the control group, showed significant gains in a narrative reading post-test, delivered two months after the end of the school year. The IGDI assessments of both groups, administered at two month intervals throughout the school year, showed significant gains within both groups on measures of vocabulary growth, and rhyming and alliteration skills, but there were no significant differences between the groups on these measures.

The one minute narrative reading assessment yielded reading scores of two to seventeen words a minute, with an average of 7.4 words a minute in the treatment group. The number of words read was correlated with the number of lessons the students had completed. In contrast to this, none of the children in the control group was able to read any of the written text in the booklets used in the one minute reading assessment. By the end of the school year, the majority of children in preschool are able to identify at least ten letters, including the letters "A" and "I". However, when the letters A and I were presented within a text, none of the children in the control group were able to identify them when asked to read the words.

There was no significant difference between the two groups in their pre- and post-tests. The IGDI assessment is designed to show whether children are in the developmental range to begin to acquire early reading skills, and to monitor the growth
and development of children on a continuum of fundamental reading skills that are necessary to prevent failure and ensure academic success for all students. For further study, it might be beneficial to use an alternative assessment tool or another assessment in addition to the IGDI that is more sensitive to the growth made by participating in an early reading program.

When assessing young children, the present study did not take into account the human element of children’s potential desire to do what everyone else was doing. Nine out of fifteen children in the treatment group did not score high enough on the sample pre-assessment to begin the project. After many requests, under close supervision, six children were permitted to try to “play the game” (the teachers’ euphemistic way of describing the Headsprout program). Despite their low IGDI scores, four out of six children worked through the first episode without difficulty and continued working. This could have occurred partly because the children simply didn’t respond well to the initial testing process. The two other children participated in small group emergent literacy activities.

Students’ demonstrated additional skills throughout the classroom as they progressed through the program. Examples included writing letters and words, and voluntary activities that required phonemic awareness and phonics skills. Several of the students were able to discriminate and identify the sounds in spoken language, to and hear the similarities between rhyming words.

Students at-risk of attaining only low levels of reading proficiency need concentrated instruction to bring their basic skills up to par with more advantaged peers. A systematic and reliable method of delivering supplementary instruction is needed.
Early reading intervention is essential in helping to close the gap in academics for children at-risk. Programs like Headsprout Reading Basics are designed to support children’s early reading and oral language skills through the programmatic requirement that each lesson be mastered before the child progresses to the next lesson. Each lesson is structured so that children must master each learning objective before advancing in the instructional sequence, with branches in the instructional sequence to personalized practice and correction depending upon individual error patterns (Layng, Twyman, Stikeleather, 2004).

Motivation

Most students appeared interested in and excited about the program. Pairing students with their friends when working on the computers worked as one incentive. Children seeing their progress and understanding that they were beginning to read proved to be another important motivation to continue. In addition, after completing each episode, a note was sent home with the student saying, “I finished my episode.” The parents’ enthusiasm about their children’s progress prompted several parents and grandparents to come to school to watch their children learn to read. Having family members visit the classroom was emotionally rewarding for the children. Staff also sat beside some of the students while they worked at the computers; these children seemed to enjoy the extra individual attention that they received when working on the program. When the Kindergarten teacher came to visit treatment group’s classroom, the children were very excited to show the teachers how they could read. The response of the Kindergarten teachers was very positive, apparently further motivating the children.
Things to consider with pre-school age students in future studies

One factor to consider for future study of preschool-age children using computers would be to provide enough computers for all the children to work at the same time in a lab style setting. The present study used only six computers, requiring that students be scheduled at different times throughout the school day. Additional computers would help to ensure that all students would have an opportunity for daily participation.

Allowing students to participate at the same time would also provide staff with more opportunities to attend to the other aspects of the preschool experience and help maintain a classroom routine, which is an important element of early education. Additional staff is needed to attend to children of this age group, to help eliminate the kinds of small mishaps that were experienced during the present study. These included children logging in on another child’s subscription, clicking on the tool bar and accessing the Internet, moving the screen below the desktop view, changing the volume to lower levels, not participating in the oral reading portion of the program (known as “speak out-louds”), distractions by other children, chewing on the headset cords, not paying attention to the instructions given by the program, and random mouse-clicking without listening to instructions. If additional staff could be utilized, many of these mishaps could be avoided.

Preschoolers and the use of computers

There have been many concerns expressed in the education of early childhood about young children using computers as a teaching aid. It has been stressed in the early childhood education community that children at this young age would be better served spending their time interacting with peers. What we found was that the vocabulary skills
that are developed ostensibly while interacting with peers were not impeded by the time children in the treatment group spent using a computer. Comparing the two groups in the pre- and post-tests of the picture naming section of the IGDI assessment, both groups showed significant vocabulary growth throughout the school year, but there was no difference in growth between the groups.

The Headsprout program was designed to require the use of both receptive and expressive language skills. The program establishes the learners’ being attentive to what is said, and their abilities to comprehend messages, increase the speed of processing messages, and concentrate on messages. Receptive language includes understanding figurative as well as literal language, and being able to follow series of commands (Newman & Dickinson, 2004). Studies also have found that oral language is related to phonological sensitivity in the years prior to direct reading instruction and that language, especially vocabulary, plays an important role in supporting reading during the initial stages when decoding is the primary challenge facing children. In a preschool sample, Dickinson and Snow (1987), found interrelationships among measures of print knowledge, phonological sensitivity, and oral language (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003).

With the increasing academic demands made on young children as they enter elementary school, it will become increasingly necessary to continue to research the use of computer assisted learning with young children. Vellutino, Scanolon, Sipay, Small, Pratt, & Denckla (1996) demonstrated that, among children experiencing reading difficulties, only a small percentage will continue to have reading problems when provided with appropriate early intervention.
Limitations

In the present study, time was a limitation for many of the children who spent many days out of school for various reasons, limiting their opportunities to complete the 40 episodes in the Headsprout program. Using only six computers limited how many children were able to work at once, which also interfered with some staff’s attention to other aspects of the preschool program.

The assessment tool IGDIIs was very time consuming, requiring an extra staff member to act as a substitute teacher while testing was conducted outside of the classroom. The IGDI assessment tool appeared not to be sensitive enough to show growth in actual reading abilities over a short period of time.

Conclusion

In conclusion, a language rich classroom appears to promote substantial growth in preschool children’s picture-naming, rhyming, and alliteration skills. There was no significant difference between the control and treatment groups on any of these measures. However, the Headsprout program did substantially improve actual reading skills, as shown in the one minute narrative reading post-test. Further studies could include following these two groups of children into kindergarten and first grade to see if there are enduring differences in their reading skills.
REFERENCES


Tillman, Patricia S., (n.d.). *Computer-Assisted Instruction (CAI) and Reading Acquisition: A Synthesis of the Literature.* Retrieved from: [http://teach.valdosta.edu/are/TillmanPLRFinal.pdf](http://teach.valdosta.edu/are/TillmanPLRFinal.pdf)


APPENDIX A: SAMPLE PARENT CONSENT FORM

Child’s Name: ________________________ Date of Birth: ____________

Release
1. Are there any activities you do not want your child to participate in for health, religious or other reasons? Yes _____ No _____
Describe these activities ______________________________________________________________

2. Parent Permission Statements. Circle to indicate whether you agree with the following:

  a. I (do) (do not) give permission to BHK for my child to receive screenings as needed. (Health and education testing such as vision, hearing, height, weight and developmental assessments.)

  b. I (do) (do not) give my permission to BHK to give my child a daily Major Brand children’s chewable multiple vitamin.

  c. I (do) (do not) give permission to BHK to send my child’s health record to his/her physician.

  d. I (do) (do not) give permission for BHK to release information necessary for insurance billing.

  e. I (do) (do not) give permission for BHK to take and use photos, recordings and/or videos of my child participating in program activities, for education or public relations purposes.

  f. I (do) (do not) give permission for BHK to apply Off! Brand Skintastic Family insect repellent and NO-AD Brand SPF30 Kids Sun Block as needed (summer programming only).

  g. I (do) (do not) give permission to BHK Child Development Board, licensed by the Department of Human Services, to secure emergency medical and/or emergency surgical treatment for the above named minor child while in care.

  h. I (do) (do not) authorize the following agencies and/or my child’s physician to share all medical and education records. I understand that my child may be enrolled in a comprehensive program that could include my local school district, Copper Country Early On, the Copper Country Intermediate School District, Western Upper Peninsula District Health Department, Tribal Health Services, Keweenaw Family Resource Center and BHK. I understand that such information is always available to me to review and will be kept confidential. This release will become effective immediately and will remain in effect through school completion. This release may be withdrawn if requested in writing by parent/guardian before information is released.

  i. I (do) (do not) give permission to BHK for my child to be transported in a vehicle and participate in field trips.

3. Volunteer Screening Statement.
Volunteering is a critical part of the program. You will be asked to volunteer once every 3 weeks and to ride the bus when you volunteer in the center, if your center provides busing. Please initial _______ Please provide the name and phone number of an alternate for when you cannot volunteer.

• Please initial _______ I am aware that abuse and neglect of children is against the law and will be reported.

• Please initial _______ I have no personal history of criminal conviction, child abuse conviction, or involvement in substantiated child abuse or neglect. If yes, explain __________________________________________________________

• Please initial _______ I have not been convicted of a felony involving harm or threatened harm. If yes, explain __________________________________________________________

Thank you for your patience during this registration process. All the information provided on this registration is confidential. Funding sources for agency-operated programs place some limitations on enrollment of children. Completing this registration form DOES NOT guarantee enrollment. Parents will be notified whether their children are enrolled.

Signature of Parent _____________________________________________ Date ____________________

Signature of Staff ______________________________________________ Date ____________________

Signatures above certify that all information contained in this registration is complete and accurate.

NOTE: This form does not permit information about HIV/AIDS and federally funded programs on drug and/or alcohol use/abuse to be shared. A separate authorization to share, specific to this information, must be obtained and signed.

Funded in part by the federal Deps. of Health and Human Services, Education and Agriculture, Michigan’s Deps. of Education and Human Services, and the Children’s Trust Fund. BHK is an equal opportunity employer/service agency.
APPENDIX B

SAMPLE GET IT, GOT IT, GO! RECORDING FORM
## APPENDIX C

### SAMPLE HEADSPROUT BENCHMARK CLASS LIST FORM

**BENCHMARK READING ASSESSMENT: CLASS LIST**

<table>
<thead>
<tr>
<th>Read After Episode</th>
<th>Seel</th>
<th>Fran and Lee</th>
<th>Feel the Bend!</th>
<th>Clee and Pip</th>
<th>Filing and Scout</th>
<th>Blng!</th>
<th>Blake and the Cake</th>
<th>In the Lake</th>
<th>Playing in the Band</th>
<th>Who Will Play in the Bend?</th>
<th>From San to Vee</th>
<th>In Line at Zog’s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>13</td>
<td>10</td>
<td>12</td>
<td>22</td>
<td>37</td>
<td>68</td>
<td>81</td>
<td>95</td>
<td>90</td>
<td>114</td>
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</tbody>
</table>

*Write student names in the left column, then check off each Headsprout Reader Benchmark as completed. You may also record the total number of words correctly read, oral reading rating (I=Independent, S=Satisfactory, N=Needs Practice) and date.*
### Benchmark Reading Assessment Form

**For the 12 Headsprout Readers**

| Learner: |  |
| Grade: |  |
| Teacher: |  |
| School: |  |
| Year: |  |

Students read a different Headsprout Reader at 12 key points in the program. These “benchmark assessments” are critical in determining whether students are transferring the sounds, words, and reading skills taught online to printed text.

<table>
<thead>
<tr>
<th>Total Words</th>
<th>Accurately Read</th>
<th>Rating*</th>
<th>Date Story was Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed (after Episode 5)</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See Vee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See San</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See the van</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = A; DRA = A; Rugby = 1; Grade Level = K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fran and Lee (after Episode 11)</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fran sees the fan.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee feels the can.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fran can see the van.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = A; DRA = A; Rugby = 1; Grade Level = K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel the Sand! (after Episode 18)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee flips.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fran sleeps.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fran and Lee feel the sand.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = B; DRA = A; Rugby = 1; Grade Level = K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleo and Pip (after Episode 23)</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleo and Pip see sand.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pip feels the sand.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleo shouts, &quot;Pip!&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = B; DRA = 1; Rugby = 2; Grade Level = K</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fling and Scout (after Episode 30)</td>
<td>22</td>
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<td></td>
</tr>
<tr>
<td>The pea is old.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;I can fling the old pea.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Can Scout free his wing?&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fling holds the pea.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scout is free!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = C; DRA = 1; Rugby = 3-4; Grade Level = K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sing (after Episode 49)</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The tree can swing and sing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fling and Trish can sing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;I wish I could sing.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He can sing! He can sing!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Hold hands and sing!&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Level Correlation: FF = C; DRA = 3; Rugby = 5; Grade Level = 1T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blake and the Cake (after Episode 47)</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;I would like some cake.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fling needs a cake.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;I could bake a cake.&quot;</td>
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<td></td>
<td></td>
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<tr>
<td>Blake makes the cake.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blake holds the cake.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Blake is bringing the cake and slips!</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Trish brings the cake.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fling takes some cake.</td>
<td></td>
<td></td>
<td></td>
</tr>
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- Stories continue -

---

**APPENDIX D**
### APPENDIX E

#### RAW DATA

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<th>Alliteration</th>
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<th>Alliteration</th>
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<td>Post</td>
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</tr>
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<td>22</td>
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<td>4</td>
</tr>
<tr>
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<td>IJ</td>
<td>24</td>
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<td>3</td>
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APPENDIX E (CONT.)

RAW DATA: DIFFERENCES BETWEEN GROUPS

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<td>dif(pre/post)=</td>
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<td>3.244</td>
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<td>t(crit)=</td>
<td>3.012 * p&lt;.01</td>
<td>* p&lt;.01</td>
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<tr>
<td>α=</td>
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<table>
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<th>Differences between</th>
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</thead>
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<td></td>
<td>Picture naming</td>
</tr>
<tr>
<td>Pretests</td>
<td></td>
</tr>
<tr>
<td>dif(pretest)=</td>
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</tr>
<tr>
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</tr>
<tr>
<td>t(crit)=</td>
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<tr>
<td>df=</td>
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<tr>
<td>Posttests</td>
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APPENDIX F

IGDI Data for both groups

Pre- & Posttest IGDI Scores for Control Group

Pre- & Posttest IGDI scores for Treatment Group

Dibels scores

Pic nam
Rhym
Alliteration

Pretest
Posttest

Pretest
Posttest
APPENDIX G

Reading Samples

See the Sand
“I can see the sand!”
Lee and Fran feel the sand.

Clee and Pip Can See
Lee and Fran slip, but they are okay!
They are laughing. Clee and Pip can see them, and they laugh, too!
Clee and Pip want to play with Lee and Fran. What do Clee and Pip do?

Fling and Scout
“I can fling the old peel.”
Can Scout free his wing?